An Overview on the Leadership Experience

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Abstract— Developing leadership skills may occur in a variety of ways and settings. On every pitch, having the ability to lead is crucial. Motivating people and ensuring that objectives are met effectively and efficiently are key components of excellent leadership. Discussed in this chapter are the ambiguous role of leadership in higher education, leadership themes, good to great: a leadership case study, and a phenomenology of relational leadershi..

Index Terms— Authority, Leadership, Organization, Power, Relation

I. INTRODUCTION

Modern America has been more fascinated with the potential and enigmas of leadership, maybe alone in the globe. Both the theory and the practise of leadership are of fundamental relevance to a wide range of organisations, from little human service organisations to enormous multinational enterprises, from the halls of government to the neighbourhood school. Libraries and shops are stocked with literature on leadership, and every organisation looks for methods to help its members hone their leadership abilities. People are interested in learning what good leadership is and how to use it, whether they are in the role of citizens, professionals, or volunteers [1]–[3].

Leadership's Uncertain Role in Higher Education

There are various ironies surrounding the phenomena of leadership as a field of study, as a goal of education, and as an organisational process when it comes to institutions of higher learning. The issue has long been the focus of research in both the social sciences and the humanities in one way or another. As part of their body of knowledge, studies in these domains provide varied perspectives of leaders and leadership. Indeed, the theme has lately grown much more obvious in many disciplines and cross-disciplines, and the study of leadership is becoming a more common topic for structured curricular and campus programmes. Also, universities and colleges often use terminology associated with leadership to explain how their educational initiatives will provide students with the skills necessary to assume intellectual and social obligations in the future. But at the same time, many academicians are reluctant to support the leadership theme because it is still linked to nebulous and impossible-to-achieve educational goals and it seems suspiciously connected to the moral ambiguities of privilege and power, to which history's leaders frequently bear bloody testimony.

The greatest irony may be that colleges and universities, which do analytical and empirical research on leadership, rarely make their own decision-making and leadership practises the focus of formal programmes of growth or enquiry. In bigger organisations, there are noteworthy and

expanding exceptions to this rule, although even in these instances, the focus is often on the duties of defined positions of power. They often place more emphasis on management than on leadership, at least when leadership is seen as a process that entails creating goals, inspiring people, and managing change.

When it comes to making academic decisions properly, governance rather than leadership is the phrase that is popular in higher education. A lot is said about "joint effort" or "shared governance" in the official texts and agreements that define campus decision-making, but not much is said about leadership. Faculty and administrative action often focuses on achieving the correct balance between different types of cap- pus power and the decision-making process, interpreting documents and defining methods to achieve this. Through activities like strategic planning, which have an odd position in the formal governance structure itself, the wider and often urgent subject of leadership—of, for example, the means to build a common vision for the future—is handled indirectly. Leadership as a method of inspiration and transformation is still a taboo subject.

With the increasing demands on colleges and universities in a difficult climate, this is an odd and unsettling type of neglect. The creation of responsible, effective, and balanced governance, leadership, and management is one of the most critical tasks for the American university as it enters the new Millennium, says Frank Rhodes, Cornell's emeritus president. It will in part be because to the converging understandings of leadership that have arisen in a range of professions over the last several decades that we will be able to bring fresh resources to bear on this complicated collection of difficulties. There is much to be gained from the finest of the literature, even if the material on leadership is of highly uneven quality and relevance, ranging from egotistical memoirs to ground-breaking studies. It gives us cause to think that it would be beneficial to reexamine college and university leadership from these views. We will keep a key question in mind while we examine and summarise some of these leadership studies. What can we learn about leadership to deepen our knowledge and enhance its application in colleges and universities?

A Motifs As For Leadership

In common speech, the terms "leadership" and "leaders" are used to express a wide range of connections and situations in which certain people or organisations have an impact on the perceptions and behaviours of others. To distinguish between distinct methods and ideas, leadership researchers have created a bewildering number of schools, categories, and taxonomies of leadership and leadership theories. Before offering a more formal analysis, it is worthwhile to quickly separate out a few strands of scholarly and ordinary use in order to have a handle on the problem.

We sometimes refer to leadership as a kind of power that stems from an individual's or a group's original thoughts and artistic accomplishments beyond the purview of official organisations. When we talk of leadership in this sense, we often refer to distant figures like the founder of a certain school of thought, the creator of a particular set of professional standards, or the main protagonist of a particular artistic or social movement. For example, even though none of them did so by virtue of holding a formal position of authority, we can easily comprehend the claims that Albert Einstein was a leader in the development of modern physics, Paul Cézanne in the evolution of twentieth-century painting, or Martin Luther King, Jr., in civil rights. Howard Gardner contends that this kind of leadership is genuine but covert in Leading Minds.

Many motifs become apparent when we use the concept of leadership in organisations, institutions, and numerous social movements. As it takes place in smaller or larger groups with members having a variety of roles, duties, and mutual expectations set by the collective itself, this kind of leadership is more direct and involved. The phrase "leadership" is used to describe those in formal positions of authority, such as those who hold political office or have important duties in a complicated organisation. This use of the term may be the most common. These meanings of "leader" and "leadership" revolve on power and authority and are common in speech and daily life.

The conventional view that leadership is variably characterised by the distinctive qualities of leaders, which we might classify as talents and personal traits, must be acknowledged in any sketch of common usages. According to this viewpoint, leaders are unique people distinguished by fixed traits and skills, including great resolve, energy, knowledge, expertise, persuasiveness, and a strong or magnetic personality, which is sometimes referred to as charisma. Often times, great leaders are seen as people who change the course of history. Many people in the modern world still hold the belief that leaders exhibit unique attributes and talents, such as assertiveness, decisiveness, and confidence, as shown by the memoirs, biographies, and studies of commercial and political leaders. They are often seen by the general public as offering a compelling vision that provides the organisations they lead a reason to exist and a course to follow. It would be foolish to ignore this

perspective's widespread appeal and enduring effect. Strong echoes of these conventional notions may be heard in many of the modern debates on leadership, despite the fact that recent study provides a far more nuanced, perceptive, and contextual understanding of the qualities of leadership [4]–[6].

II. DISCUSSION

One of the top researchers in the topic, Bernard Bass, uses the term "charisma" to define one of the qualities he refers to as "transformational" leaders. Charisma is not a fixed personality feature since he uses the term to refer to leaders whose followers have a magnetic attraction to them in a particular organisational setting. A widespread presumption in the academic literature and in many fields of practise is that leadership effectiveness depends on the context or setting. This understanding has been shown by various research published by other experts. For instance, Fiedler has shown in several studies that a more relationship-focused style of leadership fits better when conditions are more normal as opposed to less orderly or on the verge of a crisis. Effective presidential leadership at colleges and universities, as argued by Clark Kerr and Marian L. Gade, is very situational as it relies on the appropriate fit between circumstance, person, and institution. An institution's hero could be that institution's failure [7]–[9].

As we will examine throughout this research, formal authority and personal qualities have lately been distinguished from leadership both philosophically and practically. Several academics have concentrated on the duties or behaviours of leaders, or what some would refer to as a behavioural orientation. What leaders really do is more significant than who they are or what positions they occupy. In various conditions, they define purpose, look to the future, establish high ethical standards, and refresh the organisation. It's possible that the idea that leadership is largely a connection between leaders and followers is the one that modern thinkers agree on the most. In an interactive connection, followers react to a leader's influence via a range of social processes, behaviours, and activities, while leaders respond to the needs and ideals of their followers. My leadership concerns will specifically be focused on the creation of a collaborative and interactive approach to strategic leadership as a methodical organisational process. Although not completely excluding an emphasis on the importance of authority or a concern for the abilities, temperaments, traits, and behaviours of leaders, our main concern will be the elements of strategic leadership as an interactive form of goal-setting and decision-making.

A leadership case study entitled "Good to Excellent"

It would be helpful to take a quick glance at the conclusions of one famous examination of leadership in business, the widely read book by James Collins, Good to Great, in order to appreciate the shifting interpretations of the phenomenon. The book looks for the qualities that set apart

excellent firms from great ones using long-term better performance in earnings and stock appreciation as indications of success. The study's conclusions about leadership are startling since, at least in terms of general assumptions, they defy logic. The author presents a typology of leadership that includes five degrees of aptitude and productivity and culminates in the theme of the executive leader who instills excellence in a business. Ironically, though, none of the great company executives were regarded as visionaries or as having especially strong or powerful personalities. They were often uncomfortable in the spotlight and did not draw attention to themselves or their own accomplishments. They were frequently quiet and self-effacing. Collins refers to this as the conflict between individual humility and firm professional resolve. While these executives contributed a strong degree of devotion, unmatched tenacity, and exceptional management abilities to their responsibilities, the main emphasis was always on the objectives of the firm. These chief executives preferred to lead by asking questions rather than offering solutions, by engaging in conversation and debate as opposed to compulsion, by performing autopsy of errors without assigning blame, and by incorporating warning signs of potential problems into their information systems [10], [11].

A clear, compelling vision was undoubtedly an essential element of leadership in both situations, but it emerged as the consequence of a collaborative approach, open discussion, and lengthy conversations. The discussion did not centre on claims that the firm was the finest in its field. Instead, the focus was on employing collaborative approaches and analytical techniques to identify the precise industries or product lines in which the firm excelled or had the potential to succeed and become the greatest in the world. The senior executives of these firms would find it absurd to believe that an audacious leader could force a brilliant vision on a compliant group. "Certainly, vision has a role in leadership. Nevertheless, leadership is also about fostering an environment where the harsh realities are faced and the truth is heard. Collins draws the following conclusions from these data in a striking, hilarious reversal of conventional wisdom about leadership: "The minute a leader permits himself to become the main reality people care about... you have a formula for mediocrity, or worse. Less charismatic leaders often outperform their more charismatic colleagues in the long run. Hence, charisma is a weakness that a good leader can overcome.

Collins' results are substantially congruent with the interpretations of leadership that have developed over the previous several decades in a variety of professions, as we will see in the succinct phenomenology of relational leadership that follows. Effective leaders may have a wide variety of personalities and leadership philosophies. They typically have the ability to delegate power, but they also regularly get mired in the minutiae of the business. The most important factors are their behaviours, commitments, and the deliberate leadership techniques they instill across their businesses.

A Moving Toward A Relational Leadership Phenology

This excerpt from Collins' study and contemplation paves the way for a wide ocean of adverse conclusions about leaders and leadership. Leadership is one of the most observed and least understood phenomena on earth, according to one of the most renowned leadership students of all time, James MacGregor Burns, who made this statement around 25 years ago.

In a number of academic formats and organisational situations, attempts have been undertaken over the last few decades to address this shortcoming. It quickly becomes clear from reading some of the most significant leadership studies that there are several shared ideas and results, but no one predominate systematic framework. It becomes feasible to identify similar themes and comparable findings, particularly with regard to the reciprocal interaction between leaders and followers, despite the lack of any claim to provide a full explanation of an ever-expanding body of knowledge and enquiry. While this is often referred to as the "social exchange" theory of leadership, the phrase is deceptive since the connection is generally far more profound and compelling than the fairly mechanical term "exchange" indicates. As long as there is a major emphasis on the abilities, characteristics, behaviours, practises, styles, circumstances, and authority of leaders, leadership is still often seen as something leaders do to or for others rather than as a clearly engaged relationship. A relational concept of leadership is one of the most intriguing and promising themes for comprehending and practising leadership in academic settings.

We will use certain phenomenological analysis and description approaches in order to identify the fundamental implications of relational leadership that emerge from recent research. From this vantage point, our duty is to enquire: What qualities distinguish leadership as a phenomenon of human relationships? What prerequisites for possibility must be met for it to happen? How is it made up? What fundamental meanings does it, both implicitly and openly, communicate as a result?

B Administration as Agency

First, we learn that a lot of contemporary researchers prefer to see leadership as an activity and a kind of human agency. Humans are autonomous beings who control their own behaviour because they are agents. With their decisions and behaviours, which are carried out within multiple systems of meaning, they provide structure and purpose to their existence. Instead, than being a position of power inside an institutional hierarchy, leadership in this context is largely a pattern of interaction and a relational activity within a greater framework of human sense making. Leadership is found in the area of life where people create connections with one another and work together to achieve shared institutional and

societal objectives in order to meet their needs and live out their ideals. Leadership as agency is evident throughout the history of human endeavour because, in Burns' view, interactive leadership is the essence of historical causation itself.

C Basic Principles of Leadership

Leadership is a basic concept as well as a relational one. It names the connection that exists between specific people and the people they influence and are affected by in order to illustrate the dynamics of an unavoidable sort of social contact. One of the characteristics of the relationship is that leadership is an essential component of human social organisation rather than an optional addition to it. "If leadership is considered as a process through which people, organisations, and communities seek to attain shared objectives," as Thomas Wren puts it, "it incorporates one of the primary currents of the human experience." You don't build an institution first, then look for methods to infuse it with leadership. Rather, social organisation and leadership take place concurrently.

D relationship-based leadership

This viewpoint has the effect that the concept of followership is always included when the word "leadership" is used. No one is leading if no one is following. For either side of the leadership equation to make sense, followers and leaders must work together. According to Joseph Rost, "Leadership is the connection that followers and leaders build in which they affect one another as well as the organisation and society. While they don't act in the same ways in their partnership, both are crucial to leadership. The connection contains distinguishing characteristics and interactional patterns that give it texture and significance.

Leadership as Common Sense

Effective communication between leaders and followers about the problems and difficulties they share is one of the fundamental aspects of reciprocity. Leaders employ a range of verbal and nonlinguistic techniques of communication to persuade their followers to embrace the leader's interpretations of their shared experience. To create a feeling of common meaning, they use symbols, metaphors, and tales of identity and desire. Leaders generally provide a compelling sense of the future while speaking with their followers. "A leader explains things as it may be rather than 'as it is. A sense-giver is the leader. People are given a feeling of potential that they may manage a hostile, uncaring, or incomprehensible reality via the providing and construction of meaning.

E Leading with morality

Modern leadership studies has made it evident that followers or constituents, particularly in a democratic environment, are not empty vessels that are filled by the leader's content. Followers must at the very least agree with the leader's objectives and ambitions. They commit to the

leader's programme and often to him or her personally when they are totally involved. Nonetheless, it is evident that followers do not provide their support irrationally; rather, they do so in light of their own wants and interests, which the leader satisfies.

The connection between the leader and the followers is founded on mutual respect, and followers contribute expectations and standards to it. Treating people with respect is what moral leadership is all about, as James O'Toole puts it. Individuals anticipate having their opinions heard, having their issues resolved, having their wants met, and having their wishes realised. They look for safety and defence against dangerous situations. Their support will eventually wane if the objectives they sought to obtain in the partnership are not realised. Leaders who fail to remember that support is always contingent do so at their own risk. While it is never given in the name of higher social and organisational aims, authority is always evaluated in accordance with the standards set out by those ends. Together, leaders and followers serve a "third thing," a shared goal that characterises their relationship. No of the social setting, followers always have the power to make decisions and judge the reliability and efficacy of their leaders. Followers are skilled at influencing and ousting their leaders using a variety of methods, including the meeting of the elders, the voting booth, passive opposition, and street violence.

Because leadership may go so far, followers have clear moral expectations of their leaders. The legitimacy, reliability, and credibility of the leader are prerequisites for their followers' support. If there are several false notes, the leader's credibility quickly erodes. The leader's credibility instantly disappears if falsehoods or deceit are exposed. Trustworthiness also requires honesty in the leader's commitment and actions, therefore it goes beyond communication accuracy. The leadership relationship will deteriorate or end if the leader does not uphold the ideals that the organisation stands for. Leaders gain followers' respect or even veneration when they use sophisticated ethical reasoning, set and uphold high standards, live by the principles they promote, and sacrifice their own interests in the process. The core of leadership, according to modern leadership experts like, is ethics and moral integrity.

F Change, Conflict, and Leadership

Another distinguishing trait of leadership is the invariable stoking of opposition and engendering of opposing interests among certain constituents due to changing circumstances or the leader's chosen directions. Inequality and conflict are at the core of social experience because the resources of time, space, attention, and money are always rigorously restricted and because people's values, interests, and appetites can never be totally harmonised. Leaders put forth a lot of effort to settle disputes of all kinds and at all organisational levels. The leader must also deal with frightening types of change that arouse opposition and anxiety and may even spark their own acrimonious battle. As a result, leadership is always a

challenging endeavour that requires leaders to adapt to conflict and change continuously. They put a lot of effort into inspiring, convincing, influencing, and manipulating others to join them in reacting to stress and change; alternatively, they may use more forceful techniques to achieve their goals. History demonstrates that in order to accomplish their objectives, leaders would use a wide spectrum of severe consequences, the natural conclusion of which is coercion and violence. Where dominance starts and leadership ends becomes a fascinating and complicated question of historical and moral interpretation.

G Empowerment and Leadership

The ways that the leadership relationship results in the explicit empowerment of followers are often emphasised in current leadership study. Empowerment is, of course, a key component of democratic institutions in political circumstances. Yet the definition of the term has expanded through time. It now also refers to the strategies used by executives to provide people and teams throughout the company greater power and responsibility over decision-making. Often, the emphasis is on methods to enhance procedures that are best understood by people who are closest to them. This kind of empowerment often leads to the establishment of strategies for enhancing the motivation, decision-making abilities, and talents of the whole workforce or community, which opens up new avenues for human growth and personal satisfaction. People are much more involved in their responsibilities when employment has a stronger sense of meaning. When they experience accomplishment, they grow in self-assurance, optimism, and regard for themselves. A person's sense of identity and self-esteem seem to be affected by leadership at this level, which results in a variety of powerful intrinsic motives for success and for working well with others.

Individuals and organisations are held personally responsible for their performance to an increasing extent when choices are distributed more widely. When people and organisations react to the influence of others and exert their own leadership, the roles of leader and follower become ambiguous. Academic communities may particularly benefit from the statement made by leadership expert Gill Hickman that "individuals go from participant to leader or leader to participant depending on talents, knowledge, motivation, ideas, and situations, not just on position or authority." When leadership is integrated into an organization's operations, it becomes a mindset and a process.

Ronald Heifetz examines some of the challenges of entrusting constituents with tasks they may like to avoid in essential research on adaptive leadership. This is a problem that often arises in academic communities. He places emphasis on the leader's responsibility for concentrating on, deciphering, diagnosing, and interpreting threats to the group's values and effectiveness. The duty of the leader is multifaceted, but it is important to remember Heifetz's advice to "Give the work back to the people, but at a pace they can

stand." By applying pressure to the individuals who are the source of the issue, place and grow accountability [12], [13].

III. CONCLUSION

A precise and generally recognised meaning of leadership does not exist and may never be discovered due to the complexity of the position. However, the conclusion that leadership is the capacity to motivate a team to achieve a shared objective. People use their leading traits to accomplish this. Leaders inspire people to be committed and enthusiastic about achieving objectives. Interaction between the boss, followers, and surroundings results in leadership

REFERENCES

[1] [1] R. Rybnicek, K. H. Leitner, L. Baumgartner, and J. Plakolm, "Industry and leadership experiences of the heads of departments and their impact on the performance of public universities," Manag. Decis., 2019, doi: 10.1108/MD-10-2018-1173.

[2] [2] A. L. Nichols, "What do people desire in their leaders? The effect of leadership experience on desired leadership traits," Leadersh. Organ. Dev. J., 2016, doi: 10.1108/LODJ-09-2014-0182.

[3] [3] I. Blau, T. Shamir-Inbal, and S. Hadad, "Digital collaborative learning in elementary and middle schools as a function of individualistic and collectivistic culture: The role of ICT coordinators' leadership experience, students' collaboration skills, and sustainability," J. Comput. Assist. Learn., 2020, doi: 10.1111/jcal.12436.

[4] [4] M. Ammann, "Leadership for Learning as Experience: Introducing the Use of Vignettes for Research on Leadership Experiences in Schools," Int. J. Qual. Methods, 2018, doi: 10.1177/1609406918816409.

[5] [5] S. Bergner, A. Kanape, and R. Rybnicek, "Taking an Interest in Taking the Lead: The Influence of Vocational Interests, Leadership Experience and Success on the Motivation to Lead," Appl. Psychol., 2019, doi: 10.1111/apps.12150.

[6] [6] M. Snyder and J. L. Embree, "Leadership experiences in a healthy work environment," J. Contin. Educ. Nurs., 2021, doi: 10.3928/00220124-20210611-04.

[7] [7] K. Longman, J. Daniels, D. L. Bray, and W. Liddell, "How organizational culture shapes women's leadership experiences," Adm. Sci., 2018, doi: 10.3390/admsci8020008.

[8] [8] A. Apesin and T. Gong, "The impact of freshmen college leadership experiences on their leader self-efficacy development in historically black institutions," J. Appl. Res. High. Educ., 2018, doi: 10.1108/JARHE-10-2017-0121.

[9] [9] D. H. Jarvis and C. Mady, "Culture, confidence, and crêpes sucrées: Exploring teacher candidate perceptions of francophone homestay community leadership experiences," J. Lang. Teach. Res., 2021, doi: 10.17507/jltr.1204.02.

[10] [10] D. Kragt and H. Guenter, "Why and when leadership training predicts effectiveness: The role of leader identity and leadership experience," Leadersh. Organ. Dev. J., 2018, doi: 10.1108/LODJ-11-2016-0298.

[11] [11] L. Byrne, A. Stratford, and L. Davidson, "The global need for lived experience leadership," Psychiatr. Rehabil. J., 2018, doi: 10.1037/prj0000289.

[12] [12] S. Solansky, "Education and experience impact leadership development psychological empowerment,"

Leadersh. Organ. Dev. J., 2014, doi: 10.1108/LODJ-07-2012-0091.

[13] [13] S. W. Brown, "The Leadership Experience," Marketing Management. 2003. doi: 10.1177/107621758801100610.

Positions of Authority and Leadership

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Abstract— Leaders have the ability to change the values that affect how others behave. The principles of authority and power are crucial to leadership. The capacity or capability to sway people's opinions and manage their behaviour is referred to as power. The term "authority" describes the formal and legal ability to issue orders and make judgements. This chapter discusses strategic leadership within the framework of transactional and transformative leadership, leadership as service, implications for higher education, and implications for modern notions of leadership.

Index Terms— Authority, Education, Leadership, Management, Strategic

I. INTRODUCTION

These empowerment-related statements make a crucial point about authority clear, which has significant ramifications for how leadership is exercised in institutions of higher learning. The majority of the power and responsibility for leadership in the organization's many departments, committees, and programs is held by academic professionals. We can plainly see why people who occupy official positions of power, such as president, dean, or chairman, are not always the only leaders, or even the most successful leaders, in academic organisations given our concept of leadership. On the basis of this comprehension, it is quite coherent to state that a person may serve as an organization's nominal leader but not its actual leader. In other cases, this person might be better categorised as a manager, an authority figure, a figurehead, or a paper shuffler. They may act as autocrats who take great pleasure in forcing their will on others at one extreme or as mere figureheads with no real power at the other. On the other hand, people with limited official authority or influence often fill key leadership positions. At every level of an institution's formal hierarchy, leadership is shown, particularly in academic societies where power is diffuse and broadly distributed [1]–[3].

Of course, we shouldn't hurry to sever the connection between authority, power, and leadership. Successful leaders are often identified by their capacity to appropriately and effectively wield their administrative, legal, coercive, and symbolic authority. The ability to do so is a significant achievement that has both organisational and ethical implications. By using their connections, abilities, knowledge, and political savvy, leaders of all stripes—designated and undesignated—can likewise amass influence informally. As we'll see many times, the crucial consideration for leadership at colleges and universities is how authority, influence, and power are used to set and accomplish shared goals. Governance and reciprocal leadership are two different things, but those who have been given power have the chance and duty to turn it into interactive leadership. As we'll see, one approach to implement this transition methodically is by integrating strategic leadership processes throughout the whole business.

Transformative and Transactional Leadership

We would be wise to take a moment to consider a crucial contrast between transactional and transformative leadership as we continue to examine the fundamental components of reciprocal leadership. These ideas were first put forward in Burns' seminal 1978 study Leader- ship and revised in his 2003 book Changing Leadership. They have since emerged as a crucial organising principle for a large portion of leadership-related research and literature. According to Burns and now a large number of others, one fundamental style of leadership is a mutuality of immediate interests and exchange of advantages between leaders and followers and is consequently known as "transactional leadership."

Leaders are rewarded by their followers' support or punished by it being withheld when they fulfil their followers' conscious demands and interests. In turn, leaders employ incentives and penalties to increase their authority and enforce discipline among the workforce. A manager can win or lose an operating unit's trust by providing or withholding capital resources, and a college dean is seen as effective if she raises faculty salaries and budget lines. These are just a few examples of the classic exchanges that come to mind: the politician elected to office rewards his supporters with jobs and punishes his opponents by reducing their influence. As the reciprocity of the connection is obvious, this style of leadership passes the fundamental reciprocity test. Yet, transactional leadership often favours status quo acceptance and avoids or diverts significant kinds of dispute over goals and values. It is unable to adapt imaginatively to forces of change, to motivate followers to excel, or to exhort the society or organisation to uphold rigorous moral obligations [4]–[6].

Burns describes changing leadership in Leadership mostly in terms of morality. It includes the leader's power to inspire followers to a greater degree of ethical knowledge and commitment, such as the ability to shift the group or society's

focus from mere fulfilment of material needs and desires to higher issues such as justice and equality. According to Burns in Transforming Leadership, the changing leader who engages followers at these all-encompassing levels of values and purposes also brings about significant, long-lasting, and fundamental changes in organisations and communities.

Burns' theories have been developed by other academics, like Bernard Bass, and have been adapted for use in many situations and idioms. For Bass, the pattern of relationships between leaders and followers in the military, industry, and other organisations is transformational leadership. Transformational leaders push their followers to think differently, take a personal interest in their growth, motivate them to accomplish more, and function as a magnet for attention. Bass makes it very evident that transactional and transformative leadership are not mutually incompatible concepts since most leaders exhibit both traits in their work.

It is evident that the phrases "transac- tional" and "transformational" might be deceptive when used to categorise leaders or their effect in segregated groups in the context of higher education leadership. These should not be seen as strict categories to be haphazardly applied to all of an individual's or group's activity, but rather as leadership themes and methods that are substantially intermingled in practise. According to Burns, many transformative improvements may take decades to complete and may be the outcome of little, slow advancements made over time. The crucial concern for colleges and universities is how the leadership processes will be shaped and intended, as well as how well they will be able to inspire the academic community to adapt to change.

II. SERVING AS A LEADER

These concepts led a lot of current commentators to the conclusion that the best way to understand leadership is as a type of service to others and to shared ideals. The idea of servant leadership now has a significant position in debates about the duties and roles of leaders because to Robert Greenleaf's profound insights. According to him, a new moral principle is developing that states that the only authority worthy of one's devotion is that which is given to the leader voluntarily and intentionally in response to and in proportion to the leader's obvious servant status. Some of the elements of servant leadership are the disciplines of leading via attentive listening, persuasion, and empathy as well as through expressing a vision of new moral possibilities.

III. THE IMPLICATIONS OF MODERN LEADERSHIP CONCEPTS

Our discussion of some of relational leadership's distinguishing characteristics suggests several avenues for understanding and applying leadership. We propose that leadership is an interactive relationship of sense making and sense giving in which certain individuals and groups influence and motivate others to adopt and to enact common

values and purposes, to pursue shared goals in responding to change and conflict. This definition serves as a working definition for our purposes.

If leadership introduces us to the core elements of how people express their identities in organisations, it also makes clear fundamental human wants and potential. In the end, leadership is a function of the human condition. A person cannot exist without ideals and commitments that make the human endeavour meaningful in the face of the constraints and dangers that must be overcome. Humans look for leadership in their organisations and institutions that will safeguard and advance their beliefs. Due to the nature of human nature, moral and spiritual standards end up being the ultimate tests of leadership.

IV. DISCUSSION

A Relevance to Higher Education

The framework we have created enables us to evaluate and critically analyse diverse theories of leadership in higher education and to derive insightful conclusions from them. Our phenomenology of relational leadership will be a key point of reference in our attempts to articulate a process of strategic leadership, which is the most essential thing. The general requirements that it will need to meet are already clear. The procedure must include:

B Sense-making and sense-giving

Collaboration and empowerment, direction-setting and values-drivenness, change-orientedness and conflict-resolution, and motivation and influence are all desirable traits. When we get on campus, the traditional leadership tenets of reciprocity and responsiveness to participants' needs and values will be back, except this time they will be dressed in the elaborate and colourful garb of collegial governance. Academic decision-making is based on professional standards and ideals that have strong ethical weight. Yet, in both theory and reality, leadership at colleges and universities is often difficult and uncertain of itself. Since structural conflict is a certainty in the decision-making process, leadership jobs are often made more difficult. Hence, as we explore the potential of strategic leadership, these initial notions about leadership will be put to the test.

C Leadership Education

The relationship between a leader's personal traits and the leadership process is one of the often-asked topics concerning reciprocal leadership. We have discussed leadership often, but not much about leaders. Yet people who we refer to as leaders are at one pole of the connection. What can be said about the role of leaders in the leadership equation? Leaders must logically contain some collection of features and qualities that give the word "leader" meaning, even if they are not simply defined by fixed traits or the existence of formal power. While the traits and abilities of leaders might vary greatly depending on the situation and

context, it is nevertheless hard to resist making certain generalisations about them. To make a formal technique of strategic leadership precise, we must concentrate on these elements. Finally, the queries, who will utilise the process? must be addressed. What qualifications will they need? How are they going to learn them?

In this setting, several queries about the psychiatric, experiential, genetic, and educational backgrounds of leaders often arise. Are they created or born? Can you learn leadership? Or, to be more specific, how do you learn it? The answer to these questions is always ambiguous in genuine studies—it is always both yes and no. As we've seen, leadership requires a broad range of intellect, information, skills, practises, commitments, and personal characteristics. This creates some uncertainty. Throughout the species, leadership ability is widespread but not evenly distributed. Although there is much that can be studied and taught about the nature and practise of leadership, some of its most important elements, such as bravery and resilience, are entirely beyond the purview of formal education.

Naturally, there are many complicated and challenging concerns that are raised when discussing the many facets of leadership and whether or not it can be learnt. Using Bass's research as a foundation, we compiled a list of general competences, talents, and traits that, in practise, are changed by context and situation. When we look at many of these overarching traits of leadership, we also start to get a clear understanding of how many facets of leadership may be taught and acquired, as well as the value and promise of studying a systematic approach to strategic leadership.

D An Overview of Leadership Qualities

In actuality, the potential of learning both the qualities and methods of leadership may be seen as points along a crooked and jumbled spectrum, broken up by the unpredictable effects of external factors on people and communities. Although though there is a lot of fluctuation and diversity in the leadership spectrum, it is useful to consider about three main areas: fixed qualities, practise and behaviour types, and ways of thinking, problem-solving, and making decisions. The qualities of leadership become more predictable as one progresses along the spectrum and are influenced by various types of experience, deliberate growth, and formal education.

E Definable Features

Think about some of the categories that appear to describe a person's modes of existence, or the fixed elements of identity that are more or less defined by genetic propensity, the consistent traits of personality, the influences of significant formative experiences, and the strongest commitments to values and beliefs. High intellect, fortitude, and resolve, a will to succeed, a readiness to take on responsibility, confidence and assertiveness, adaptability, and physical stamina are some of the kinds of qualities Gardner mentions. While there are probably numerous unusual situations and instances, it is difficult to consciously

or fundamentally alter these traits by teaching and learning throughout the adult years.

F Practice and behaviour types

The traits of leadership often take the shapes of practise, action, and conduct in the middle of the scale. As a result, Gardner's list includes interpersonal abilities, the capacity to inspire others, an awareness of followers' needs, and the ability to establish and maintain trust. Through a range of social, educational, and personal events throughout life, including both classroom and experiential education, these patterns of behaviour and forms of interaction are mostly taught. Nonetheless, unlike the majority of a person's permanent features, they are open to ongoing reinterpretation and alteration via the influence of fresh experiences, the capabilities of practical intelligence, and formal programmes of education and personal development. Few would argue that careful attempts to build the necessary interpersonal and behavioural competences are ineffective, despite the fact that results are very individual and dependent on each person. One may use knowledge of leadership to practise it, particularly if it is connected to an efficient system of methodical techniques, such one finds in an efficient strategy process.

G Knowledge, Competence, and Experience

On the other end of the scale are leadership qualities that are obviously amenable to traditional teaching and learning methods. It is obviously possible to teach people how to improve judgement through knowledge, to become experts in complex fields, and to use complex systems of decision making and management—all of which are necessary in a strategy process. However, this is always within the bounds set by motivation and talent. In these situations, the practise of leadership is intimately related to learning and using information from fundamental and applied disciplines. Whether they work on Main Street or Wall Street, in a courtroom or a classroom, leaders in any field will only be able to lead their peers if they have a command of the intellectual and practical tools of their profession.

H Education and Development in Leadership

Almost every significant business has taken advantage of the potential of leadership education and development to the point that it resembles its own profession. Nowadays, most corporations, government organisations, and several schools and institutions offer various leadership programmes. We should stress, however, that many of the programmes do not provide us with consistent or accurate information regarding the potential for teaching leadership as a means of inspiring change and establishing future course. They may give the impression of having a disorganised and unclear agenda, much of which consists of various types of executive development or management training that are focused on the abilities required for a particular position. These may cover everything from computer proficiency to leading productive

meetings to increasing one's own level of self-awareness. To improve an executive's preparedness for leadership, many firms use a range of developmental techniques, including as mentorship, coaching, formal education, and developmental tasks.

In reality, the activities and initiatives that are referred to as leadership development are often completely different businesses. The majority of them are useful and legitimate in their own right. There is reason to assume that such efforts may incrementally improve a person's performance as a positioned leader as long as expectations are reasonable, particularly in terms of increased self-awareness, expanded professional experience, and a wider range of talents. Yet, any evaluation of how well these programmes is able to foster the qualities or practises of engaged, relational leadership requires a rigorous dissection of their real objectives and procedures. To achieve the core of leadership, which is to organise and inspire an organization's members to uphold common values and goals, they must serve a greater purpose.

Our argument focuses heavily on demonstrating that an essential component of reciprocal leadership can be taught and acquired as a decision-making process and discipline. We have made an attempt to go beyond the usual approach of using the qualities of outstanding leaders as the foundation for understanding leadership. Bill George writes, "In my desire to become a leader, studied the biographies of world leaders, as well as great business leaders of my era, trying to develop the leadership characteristics they displayed. This is my compelling account of authentic leadership as the chief executive of a major corporation. That wasn't successful.

It's true that there can be no leadership without leaders, but many of their abilities and talents only contribute to successful leadership when they are integrated into a wider range of decision-making processes that are focused on achieving the goals of the company. We may see the abilities and capabilities of leaders from a fresh and dialectical viewpoint within the framework of a relational theory of leadership. The capabilities of leadership are resources waiting to be identified and given substance until they are woven into the accomplishment of shared aims and commitments. The tests of leadership as a reciprocal process geared on values are not met by a leader's talents unless they have more significance than individual brilliance and inspire others. The hard effort and effectiveness of talented leaders, whose abilities and attributes are required but insufficient to motivate commitment to shared objectives, are also necessary for the maintenance of engaged and deliberate leadership [7]–[9].

J The Setting of Strategic Leadership Practice

These analyses help us foresee the potential benefits of a formal, organised approach to strategic leadership. It is a discipline and technique of organised, group decision-making that can be taught and acquired. It will be performed more successfully by some people than others, just like other procedures and disciplines. It necessitates, as we

will see, integrative and systemic thinking, quantitative reasoning, collective decision-making, effective communication, sensitivity to narratives and values, and the ability to participate in organised group processes. As our examination of the characteristics of leadership suggests, not everyone has these skills to the same degree, but each stage of the overall process is a component of an applied discipline that can be studied.

The utilisation of a structured leadership process by individuals with strategic decision-making duties is maybe the most viable alternative. While we conduct our investigation in this manner, we focus on the real selection procedures used by academic institutions. Strategic decisions are made in a college system by the governing board, the president and other senior officials, a large portion of the administrative staff, and perhaps a large portion of the faculty. Leadership is a constant topic of discussion when it comes to concerns that touch on questions of direction and purpose, whether in committees, departments, schools, or the institution itself.

Both the faculty and the administration are well aware of the need for good leadership in all of these situations and many more, but they are also acutely conscious of their distinct lack of power. That is just the way things are that the majority of colleges and universities lack the power structures necessary to quickly develop or put into action a future vision. On the other side, in hierarchical organisations, a vision may need to be developed with input from many parties, but once it is chosen, it is executed via a defined hierarchy of power.

Leaders often crave for unambiguous authority and support in a chain of expectations that, for presidents, terminates with the governing board. This need is one sign of the tension in academic institutions. Many other executives implicitly believe that if they could only develop their leadership abilities, they might produce far greater outcomes for their company. While the objective is worthwhile and significant, leadership as the development and implementation of a common vision for the future is disproportionate to the abilities and practises of leaders taken in isolation, even if they could alter themselves and their gifts. The dialectic between leaders and leadership encourages us to change course and systematically rely on recent leadership discoveries. Relational leadership provides a new way of thinking about the responsibilities and authority of leadership by focusing on its function in empowering and including people in a collaborative strategic process. In this way, the systems and processes of decision-making in a genuine institutionalised process may be tightly correlated with leadership. Decision makers may mobilise and magnify their current authority and skills by being drawn into a leadership style in order to effectively execute the process' phases without having to reinvent themselves or their roles [10], [11]. James MacGregor Burns first emphasised the necessity of properly understanding and assessing leadership

as a phenomena that significantly influences our lives in politics, the workforce, science, academia, and the arts some time ago [12][13]. He continued by lamenting the lack of an "intellectual or practical school of leadership." Since that assertion, schools, institutes, and programmes on leadership have sprung up both within and outside of academic institutions, and tools for understanding it have expanded as a result of the work of several academics and reflective practitioners.

V. CONCLUSION

The study of leadership has evolved into a self-aware, cross-disciplinary discipline with a variety of theoretical and practical accomplishments. Nonetheless, we would continue. Theory generates strategies of leadership decision-making as well as information about leadership. The development of an applied and integrative discipline for the practise of strategic leadership may be framed by an idea of leadership as the realization of shared aims. The purpose of the focus of this effort is to achieve that translation between theory and practice. When an organization is evolving, the roles of leadership and management can both function in various ways while remaining the same. Without creating a management framework based on systems, leadership is worthless, and management would be ineffective without leadership's efforts serving as the foundation for values

REFERENCES

[1] [1] S. Takano, "Re-examining linguistic power: Strategic uses of directives by professional Japanese women in positions of authority and leadership," J. Pragmat., 2005, doi: 10.1016/j.pragma.2004.06.007.

[2] [2] L. E. Eberman, J. R. Edler Nye, E. R. Neil, and K. E. Games, "Leadership and Management Perspectives from Athletic Health Care Executives," Athl. Train. Educ. J., 2021, doi: 10.4085/1947-380x-19-078.

[3] [3] J. M. Erickson et al., "Challenge at the Intersection of Race and Kink: Racial Discrimination, Fetishization, and Inclusivity Within the BDSM (Bondage-Discipline, Dominance-Submission, and Sadism-Masochism) Community," Arch. Sex. Behav., 2022, doi: 10.1007/s10508-021-02102-9.

[4] [4] H. R. Bowles, "Claiming authority: How women explain their ascent to top business leadership positions," Research in Organizational Behavior. 2012. doi: 10.1016/j.riob.2012.10.005.

[5] [5] N. Wellman, S. J. Ashford, J. Sanchez-Burks, and D. S. DeRue, "Leading When the Boss is Present: How Leadership Structure Schemas Affect Leadership Behavior," J. Leadersh. Organ. Stud., 2022, doi: 10.1177/15480518221076767.

[6] [6] D. W. Ng and W. vanDuinkerken, "A Crisis in Leadership: Transforming Opportunistic Leaders into Leaders that can be Trusted," J. Manag. Gov., 2021, doi: 10.1007/s10997-020-09549-3.

[7] [7] N. L. Cundiff and M. Komarraju, "Gender differences in ethnocultural empathy and attitudes toward men and women in authority," J. Leadersh. Organ. Stud., 2008, doi: 10.1177/1548051808318000.

[8] [8] J. E. V. Johnson and P. L. Powell, "Decision Making, Risk and Gender: Are Managers Different?," Br. J. Manag., 1994, doi: 10.1111/j.1467-8551.1994.tb00073.x.

[9] [9] M. K. Hamilton, "Introspective Faculty Assessment of Self Leadership," SAGE Open, 2021, doi: 10.1177/21582440211031902.

[10] [10] Y. Yang, N. V. Chawla, and B. Uzzi, "A network's gender composition and communication pattern predict women's leadership success," Proc. Natl. Acad. Sci. U. S. A., 2019, doi: 10.1073/pnas.1721438116.

[11] [11] Å. Gornitzka, P. Maassen, and H. de Boer, "Change in university governance structures in continental Europe," High. Educ. Q., 2017, doi: 10.1111/hequ.12127.

[12] [12] N. Organista, "'The Top is Always Reserved for Men': Gendering of Leadership Positions in Polish Sports Federations," Polish Sociol. Rev., 2020.

[13] [13] N. Lari, M. Al-Ansari, and E. El-Maghraby, "Challenging gender norms: women's leadership, political authority, and autonomy," Gend. Manag., 2022, doi: 10.1108/GM-06-2021-0159.

Higher Education's Leadership: Its Ambiguities and Possibilities

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Abstract— This is yet another crucial trait that a leader in higher education has to possess in order to succeed. Developing intellectual curiosity is crucial, even while leaders like deans, academic heads, and chancellors may wind up spending a lot of time in regular meetings on and off campus. It aids in the development of new disciplines in leaders as well as their understanding of stakeholder and institute demands and how to improve learning environments. And, of course, in improving our ability to make decisions. This chapter covers forms of leadership in higher education, leadership as knowledge and skills, multiple constituents: the president as jugglier-in-chief, authority in "organized anarcies," and leading with limited authority..

Index Terms— Authority, Decision, Higher Education, Leadership, Strategic

I. INTRODUCTION

A technique of strategic leadership must satisfy numerous strict requirements in order to be successful. One is its propensity to work well within the frameworks and cultures of academic decision-making. Investigate the standards, procedures, and requirements of academic leadership and governance. Examine some of the most important theories of leadership from the last several decades, focusing on the college president. One of my main objectives will be to connect these concepts to the modern leadership paradigms that were examined. How does a certain style of leadership decide to handle the challenges of academic decision-making, in particular the rules and expectations of shared governance? What techniques and procedures does a certain leadership stance advocate or involve? What does it hope to accomplish? What presumptions does it have?

Leadership styles in higher education

Having knowledge and skills of leadership the leadership library in higher education is expanding quickly and will soon need additional shelf space. Following a protracted era in which presidential leadership was the primary emphasis, writers and publishers are now producing a large number of books with "leadership" in their names, often focusing on the issues faced by practitioners. Several of them concentrate on the characteristics, knowledge, and abilities necessary for success in certain positions of leadership, including chief academic officer or department chair. A selection of the many current publications shows how similar they are to the conventional themes of management education and growth in this respect. While these publications may take into account more general leadership results and ideas, their focus is primarily on the duties and practical obligations of a particular academic job. They might go through issues including hiring, evaluation, development, tenure, curriculum changes, equity and affirmative action, legal issues, planning, budgeting, pay, group dynamics, and conflict resolution. These books focus on one part of the leadership equation and are particularly helpful for academic professionals who may have little or no administration experience [1]–[3].

Engaging Leadership

Literature has also made obvious appearances of the modern idea of leadership as a process of mutual influence between leaders and followers that mobilises dedication to shared goals. A transformational change approach described by Peter Eckel and Adrianna Kezar has many similarities to interactive direction-setting leadership. Rita Bornstein illustrates how the notion responds to the various expectations of important campus participants and other constituencies by employing the theme of legitimacy as the prerequisite for transformational presidential leadership. Several facets of interactive leadership are well understood in the publications of the Institutional Leadership Project, which Robert Birnbaum oversaw in the late 1980s. Yet in none of these instances have the implications of reciprocal leadership been formalised into a methodical approach to corporate leadership and decision-making. Paul Ramsden gets very close to achieving this, but he also views leadership as a collection of traits. As we will see, the strategic planning manuals for higher education generally revolve on management, however there are instances when the idea of participatory leadership emerges subtly. Some of the themes of interactive leadership are also reflected in several representative articles and collections of research on governance, management, and leadership from journals and other sources. They provide a range of insights on topics including symbols and sense-making, gender and multiculturalism, and strategic transformation that have an immediate or long-term impact on strategic leadership. Yet, as descriptive studies, these publications' main objective is to provide research and conclusions that have significance for leadership, not to suggest a methodical approach to its application.

The College Presidency in the Case of Leadership as Authority

The primary concern of authority in collegiate leadership naturally leads us to think about the college president, which has been the subject of the most intense, organised, and significant leadership studies over the last few decades. The subject of the president is still a focus of research since new books and papers on the subject keep coming out.

There are various reasons why we are captivated to this literature. It presents a test case to examine the ideas and terminology of leadership in higher education in the first place, and it offers suggestions for the practise of leadership in the second. Most crucially, the campus culture and structure of authority and decision-making are mirrored in presidential leadership. It illustrates the unique manner in which academic institutions use decentralised, independent groups of knowledge workers to accomplish their goals. Strategic leadership must first comprehend how academic governance functions if it is to prosper within the principles and practises of the academy.

The Presidency's Weakness

Notwithstanding whatever potential skills and abilities that a particular person may bring to it, the most authoritative evaluations of the college president reach the conclusion that it is fundamentally weak in power. University presidents "work from one of the most anaemic power bases in any of the major institutions in American society," according to the powerful 1996 Commission on the Status of the President of the Association of Governing Boards of Universities and Colleges. The classic study of the presidency by Cohen and March makes the following much more emphatic assertion: "The president is an illusion. On closer inspection, significant elements of the position seem to have vanished. The president only has a limited amount of power on college life's happenings. These claims and the evidence that backs them may be contested, but for many years they have defined the parameters for presidential discussion.

System Loosely Coupled

It is important to look at a number of structural aspects of academic and organisational governance that contribute to these grim assessments of presidential power and leadership, from shared authority to what Cohen and March refer to as "organised anarchy." First off, within a single institution, presidents rule over two separate systems of power, one for academic issues and one for administration. The administrative structure follows many of the same hierarchical patterns of management power, control, and coordination that are common in other companies. Today's world encompasses a constantly growing range of intricate activities, from technology to sports, from venture capital spin-offs to cultural institutions. The current requirements of university administration may be further complicated by the fact that these activities may only be tangentially and incidentally related to one another.

Both within the academic community and with the administrative community, the governance structure is just a loosely connected one. The two systems are connected in sporadic, convoluted, and often contentious ways on matters like money and resources, which are very important in both domains. The academic sector runs on a highly decentralised system of departments and programmes, most of which are run independently by academic specialists. The units represent both geographical limits and intellectual and professional standards. The majority of academic institutions operate independently of one another, and the majority of faculty members do the majority of their teaching and most of their research.

Academic professionals seldom engage with one another while doing their duties, which is the definition of loose coupling. Usually a form of supervision, presidential power over the academic system is filtered via numerous tiers of faculty committees and other collegial decision-making procedures. These collegial mechanisms often have poor relationships with one another and oppose attempts to have stronger ties [4]–[6].

II. DISCUSSION

The president's role often separates duty from authority. Presidents often feel confused or upset because they are blamed for choices or occurrences, they had little to no influence over. For example, since the majority of the faculty members have permanent posts, they are unable to employ or dismiss them. The president often has limited room for unilateral action since the majority of crucial decisions—about everything from economics to student discipline—are decided via some kind of participatory procedure. Presidents who urge change but lack the power to implement it are held accountable for their failure to do so, but faculty members who kill a good new academic idea, often working in secret, are not held personally accountable for their actions. Presidents may be held accountable by trustees for the shortcomings of a curriculum, by lawmakers for a staff member's objectionable remarks, or by neighbours for drunken students' impolite conduct [7]–[9]. Presidents may better comprehend these conditions with the aid of leadership academics, but they cannot change them. They contend that regardless of whether the attribution is true or erroneous, the majority of stakeholders and participants have their own expectations of what leaders should accomplish and use these expectations to judge the president's performance.

Joint Governance

The shared governance procedures include many of the obstacles to effective presidential leadership. The 1967 "Statement on Governance of Colleges and Universi- ties" is the traditional document that is often regarded as the organization's constitution. Paradoxically, "combined effort" rather than "shared authority" or "shared governance" serves

as the document's guiding principle. The declaration outlines the need for a collaborative effort on crucial issues related to institutional purpose, direction, and programme. Depending on the kind of topic being considered, the concepts of counsel, permission, consultation, initiation, and conclusion are the many types of shared authority. Different decision-making processes apply to diverse decision-making realms, from academic decision-making, where faculty will have precedence but not complete authority, to distinct administrative decision-making, where faculty members advise and, sometimes, also assent. According to institutions, "differences in the weight of each voice from one point to the next by reference to the responsibility of each component for the specific topic at hand" should be determined.

In addition to reaffirming the president's primary administrative role, the statement creates the expectation that the faculty's opinion would be heard on all significant topics. The president is largely portrayed in the paper as a "positional" leader rather than as a collaborator on ideas and education with the faculty.

As faculty and administrative expectations regarding shared governance's meaning are sometimes muddled by mistrust and are always changing, the theory and practise of it frequently diverge. Faculty and staff personnel alike often emphasise the need for extensive collaboration when making critical choices, regardless of their substance. Even when judgements are made via well-established processes that involve representatives from multiple organisations, failing to engage with all interested parties is seen as being arbitrary. "Consultation" is often a code phrase for permission, according to the Association of Governing Boards of Universities and Colleges' study Renewing the Academic Presidency. Effectively, each of the three groups has a veto power over proposed courses of action. This leads to the conclusion that "Higher education is sluggish and cautious at a time when it should be vigilant and flexible. Reform is urgently needed. Similar opinions on the difficulties of shared governance for leadership are held by many scholars and practitioners.

Having power in "Organized Anarchies"

We must go deeper to comprehend other facets of our preferred academic procedures if we are to fully comprehend the complexity of the difficulties pertaining to leadership and shared governance. Cohen and March refer to a number of the salient characteristics of university decision-making as "organised anarchy" in their seminal study of the presidency. This doesn't imply that colleges are overrun by roving gangs of instructors and students, but rather that they exhibit a number of formal "anarchic" characteristics, one of which is the presence of problematic objectives. Two famous words that describe what this implies in a college environment are: "Nearly any educated person can present a lecture titled "The Objectives of the University." Hardly nobody will willingly attend the lecture. Why? Because the objectives must be articulated broadly enough to be accepted and prevent

disagreement without being vague or meaningless.

Colleges and universities also stand out for having unclear fundamental instructional procedures. There are many different, independent approaches to teaching, learning, and research in higher education; there are no set standards. Professors struggle to evaluate the impact of their teaching and learning strategies since they are mostly determined by habit, trial and error, preference, and intuition.

Universities and colleges are also distinguished by the open involvement in their governance structures. Many academics have little interest in administrative issues and would rather be left alone to do their job. Depending on the situation and their inclinations, they move in and out of the decision-making process. These traits "do not constitute a university a poor organisation or a disordered one; but they do make it a difficulty to define, comprehend, and lead," according to Cohen and March.

Separated Decision Processes

Moreover, Cohen and March provide a significant investigation of the "trash can" process, a disconnected structure of organisational decision-making. Organizational decision-making is not only what it seems to be, i.e., a collection of logical processes for making choices and for settling disputes via logical justification and negotiation. It may be these things, but it might also be something entirely else. The obscene representation of rubbish is used to highlight how views, issues, and solutions often have no direct bearing on the decision that is being debated inside an organisation. Universities are prime examples of disconnected patterns of choice because of their ambiguous goals, the lack of a central authority to establish relevant regulations, and the fluid involvement in governance.

For instance, almost every particular action on many, if not most, campuses, from moving a parking lot to publishing a new admissions booklet, may spark a contentious discussion about shared governance. There may be spirited discussions over the fundamental purpose of liberal education as a result of the hunt for a vice president for development. In other words, whether a proposal or choice is significant or not, individuals tend to associate their interests and concerns with it.

Various constituents: The President as Juggler-in-Chief Trustees are often perplexed when they learn how severely constrained a president's leadership is by a wide range of interests on and off the campus. The president is accountable to a large number of internal and external stakeholders, and many of these organisations have official roles or a significant voice in decision-making. The majority of them—faculty, staff, alumni, sports fans, students, parents, lawmakers, the media, local citizens, and public officials—expect the president to promote their interests, and he or she is judged on his or her ability to do so. Those who dislike the president increasingly go public with their grievances through email networks, anonymous opinion blogs, and websites. "As a consequence, presidents run the

danger of being whipsawed by an ever-expanding list of concerns and interests. If the president takes a harsh stance, there is no assurance that the board or the faculty will accept the decision. The president has evolved into a juggler-in-chief rather than a leader.

Split authority and shared governance, decoupled systems, anarchic structure, unconnected decision processes, and diverse constituencies are structural characteristics that together describe the complex organisational realities in which presidential leadership in higher education is performed. These characteristics help to explain why, despite holding the highest position in the institutional hierarchy, the president's leadership via authority may be seen as severely constrained and even unreal. These views do not imply that the job presidents conduct is of little consequence. They have the greatest sway on a school and have significant administrative, legal, and symbolic responsibilities. The advantages of presidential leadership will work on the margins for the institution's benefit if the president makes an effort to act in the right ways and do the right things. Nonetheless, it is unlikely that the person's impact will be significant or persist for very long beyond the president's tenure. The role is crucial, yet many people can fill it and achieve similar outcomes. Presidents are like lightbulbs in that they are both essential and "interchangeable," as March once said. The first step towards wisdom is humility about the position and its potential.

A Limited Authority Leadership

Administration strategies

So what does leadership ultimately become when it is so constrained and dispersed? The solutions take many various shapes, one of which is the methodical, thorough advice to use "tactics of administrative action." These strategies show "how a purposeful leader may work inside a purposeless company." The suggested strategies are inferences made from the university's features as an ordered anarchy. In this instance, knowledge does not produce leadership processes but rather just administrative techniques. Administrators can use the following strategies to their advantage when making decisions: spend time on issues because most people will get tired of them; persist because circumstances may change; trade status for substance and give others the credit; involve the opposition and give them status; overload the system, ensuring that some things will pass; create processes and issues that will take free-floating interest and energy away from important projects; manage unobtrusively; and reinterpret

It is persuasive that the suggestions made by a highly regarded study on presidential leadership include potentially shady methods of controlling decision-making procedures. No matter how they are defined, they stand for the rejection of the majority of conventional notions of leadership. There are no examples of the transactional, transformational, engaging, interactive, or strategic leadership styles that have

been identified in studies of corporate executives or political leaders. This technique and its results have a very obvious lesson to teach us. It becomes challenging to identify and characterise the interactive and strategic forms of leadership that are at play within college institutions if we assume that having power is the defining form of leadership. If we don't alter our presumptions about the nature of leadership, we could be left with nothing but administrative strategies.

Leadership Lessons

Birnbaum gives a distinctly different set of assumptions regarding the potential of presidential leadership after identifying presidential power constraints that essentially coincide with Cohen and March's findings. He offers his theories as cognitive insights gained from actual research on the attitudes, actions, and interactions of presidents with important constituencies. Since they are presented as prudential principles rather than as rules or systematic procedures, they are lessons that may act as a roadmap for more successful presiden- tial leadership. They have their roots in the idea of cultural leadership, which entails "influencing perceptions of reality" through fostering a common understanding of the organization's values, customs, and goals. In this cultural setting, evaluations of the president's performance by the board of trustees, the staff, and the faculty are considered to be accurate indicators of the president's success. As they might be the product of other people's efforts or of external factors that the president has no actual influence over, more quantitative measures of organisational success could be less reliable.

The leadership tenets of Birnbaum provide suggestions on how college presidents might make the most of their legitimate but constrained power in the context of their unique social and professional environments. Making a strong first impression, learning to listen, balancing governance systems, avoiding simple thinking, downplaying bureaucracy, affirming fundamental principles, focusing on strengths, assessing personal performance, and knowing when to step down are thus important for presidents. This strategy makes it apparent that using power alone does not constitute leadership, but that it may be a valuable tool in the greater cultural work of creating a sense of shared values and objectives. It is obvious that Birnbaum's cultural and cognitive insights may assist presidents in achieving organisational balance, but they do not constitute a leadership style for strategic transformation [10], [11].

Defining and Reiterating Presidential Authority

We discovered that the study Renewing the Presidency by the Association of Governing Boards of Universities and Colleges provided an insightful diagnostic of the challenges of presidential leadership. When it comes to recommendations for taking action to solve the issues, it suggests reforming shared governance via a deliberate process distinction. "It shouldn't be hard to establish and specify the circumstances in which faculty decisions are the norm and may only be overturned with good cause. Faculty

should be active and consulted in crucial areas like the budget and planning, but they will not have final say in these decisions. When not participating in other areas, academics will nonetheless be kept abreast of advances. Following its own lead, the Association of Governing Boards published a revised Institutional Governance Declaration in 1998 that makes unambiguous claims about the board's supreme power over governance.

Neither the 1996 commission nor the 2006 Association of Governing Boards of Universities and Colleges Task Force on the Status of the President offer any additional institutional components or decision-making capabilities for the president. Both groups' findings, which were both presided over by former Virginia governor Gerald Baliles, strongly urge governing boards to support and review presidents on a frequent basis. Presidents are advised to use all of their executive powers and to have "the fortitude to continue with projects for change." The president's primary responsibility is to "provide strong and comprehensive leadership for the institution by developing a shared vision of its role and mission, forging a consensus on goals derived from the mission, developing and allocating resources in accordance with a plan for reaching those goals," which is interesting to note given our focus on strategic leadership. The 2006 report's focuses share a lot of the same strategic goals. The study refers to the president's job as "integral leadership," which involves the president "pursuing a common academic vision" with the faculty and creating a strategic plan. No matter how much the president's job is defined and enhanced, it is important to emphasise that these responsibilities cannot be fulfilled just by reinforcing his or her power. Each of the suggestions made by the Association of Governing Boards of Universities and Colleges must be implemented in conjunction with effective collaborative strategic leadership techniques.

The Strong Administration

The Association of Governing Boards of Universities and Colleges Commission's conviction that enhanced presidential leadership is desirable and feasible is not an isolated viewpoint; it finds solid support in the literature. In their 1996 book Presidential Leadership: Making a Difference, James Fisher and James Koch contend that a large portion of the data that downplays presidential influence and authority is deceptive and unreliable. They assert: "The successful leader will learn how to wield power and understand its worth, which is a startling reversal of the majority of the viewpoints we have investigated. Being powerful means exercising influence, authority, and leadership. They base their results on study and firsthand knowledge that refutes theories about the presidential office's shortcomings. They contend that the key elements of leadership—presidential inspiration and vision—should not interfere with cooperative efforts. The president definitely created the idea, and it is more of a gift to the school than something that came from it. The president should have a variety of personal qualities, including charm.

The ability to maintain appropriate social distance and control campus appearances while yet giving off the impression of friendliness and warmth is a useful talent and a crucial component of a methodical approach to managing the presidential image. Strangely, Birnbaum specifically names each of them as presidential leadership myths.

Fisher and Koch continue to argue for the need of presidential leadership in The Entrepreneurial College President, this time employing the concepts of entrepreneurial and transformational leadership as its main categories. They contend that leaders who are willing to pursue change, take risks, and challenge the status quo and who do not let organisational structures discourage their efforts are typically more successful and effective collegiate leaders based on statistical analyses of questionnaires from "effective" and "representative" presidents, as defined by peer nominations. They vehemently reject Birnbaum's methodical attack on effective presidential leadership. The authors' confusing association of the terms "entrepreneurial" and "transforming leadership," which are two concepts that are extremely distinct, raises several problems about the methodologies and presumptions utilised to analyse the entrepreneurial approach. Their questionnaire's content is particularly problematic since it focuses on a small number of self-attributed attitudes rather than more impartial evaluations of the president's actions and accomplishments or the opinions of others inside the institution.

The question of how presidents develop the traits required for entrepreneurial leadership is also worth considering, especially because these traits seem to be personal attributes that are difficult or impossible to develop. There doesn't seem to be a system or way of making decisions for entrepreneurial leadership that can be taught. In addition, it seems to apply to all leadership situations rather than being a function of how well the leader fits the organization's conditions. But rather than the study's accuracy, we are most interested in what it means for the field of leadership research. The emphasis here, in contrast to "weak" presidential theories, is on how the lawful authority of the presidency may be united with the personal traits, knowledge, and abilities of the president to provide a strong type of leadership. Fisher and Koch, more so than other analysts, provide a viewpoint that unifies several facets of leadership, including self-managed conduct, into a coherent paradigm [12], [13].

III. CONCLUSION

Academic leadership tactics by offering insights into efficient dynamic leadership procedures characterized by enabling each individual in bolstering the connection between administrative identity and adaptive demands. Depending on each university's unique organizational culture, tradition, mission, etc., academic leadership practices may vary.

REFERENCES

[1] "Higher Education's Leadership Soft Skills Reflected in Covid-19 Responses," م, 2021, doi: 10.21608/jsre.2021.92771.1361.

[2] A. Appadurai, "Higher Education's Coming Leadership Crisis," Chron. High. Educ., 2009.

[3] P. F. Barlett, "Campus Sustainable Food Projects: Critique and Engagement," Am. Anthropol., 2011, doi: 10.1111/j.1548-1433.2010.01309.x.

[4] S. A. M. Aldosari, "The future of higher education in the light of artificial intelligence transformations," Int. J. High. Educ., 2020, doi: 10.5430/ijhe.v9n3p145.

[5]]. Gearhart, M. D. Abbiatti, and M. T. Miller, "Higher Education's Cyber Security: Leadership Issues, Challenges and the Future," Int. J. New Trends Educ. Their Implic., 2019.

[6] F. Denney, "'What I wish I'd known' – academic leadership in the UK, lessons for the next generation.," Soc. Res. into High. Educ., 2020.

[7] M. K. Hamilton, "Introspective Faculty Assessment of Self Leadership," SAGE Open, 2021, doi: 10.1177/21582440211031902.

[8] M. E. Giess, B. P. Correia-Harker, E. Patel, and N. Silverman, "Interfaith Leadership as a Civic Priority: Higher Education's Role in Developing Bridge-Builders," New Dir. student Leadersh., 2020, doi: 10.1002/yd.20384.

[9] J. Jones, "Clogged pipelines," Divers. Issues High. Educ., 2014.

[10] H. L. Johnson, "Infographic Brief PIPELINES , PATHWAYS , and INSTITUTIONAL An Update on the," Am. Counc. Educ., 2017.

[11] R. Katz and E. C. for A. Research, "Information technology leadership in higher education: The condition of the community," Educ. Cent. Appl. Resarch, 2004.

[12] E. E. Hornsby, H. A. Morrow-Jones, and D. A. Ballam, "Leadership development for faculty women at the Ohio State university: The President and Provost's Leadership Institute," Adv. Dev. Hum. Resour., 2012, doi: 10.1177/1523422311428758.

[13] H. L. Johnson, "Pipelines, Pathways, and Institutional Leadership," Am. Counc. Educ., 2017.

The Various Frameworks and Structures of Leadership

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Abstract— The requirements of individuals are the main emphasis of the human resource framework. Assuming that the organisation must provide for fundamental human needs through facilitation and empowerment, leaders operating within the human resource frame respect people's emotions and interpersonal connections. While resolving organisational conflicts, the structural leader attempts to match the internal workings of the organisation to the outside environment. This chapter covers topics such as cybernetics to strategy, diverging and convergent conclusions, the system and culture of academic decision-making, aiming for contextual leadership, human agent and values, leadership and core values, and towards contextual leadership.

Index Terms— Authority, Decision Making. Human, Leadership

I. INTRODUCTION

The manner in which the structures, politics, people, and cultures of organisations are intertwined into complex patterns have been the subject of theories created by students of organisations. In their book Reframing Organizations, Lee Bolman and Terrence Deal outline what they refer to as four frames. Each frame explains a particular aspect of an organisation and a cognitive lens, or "style of seeing," that prioritises that aspect in our thoughts and experiences. The examination of presidential leadership has been approached from this viewpoint by researchers including Birnbaum, Estella Bensimon, and William G. Tierney. The four changed frames are the symbolic, political, collegial, and bureaucratic ones. These are clarifying categories with obvious practical implications [1]–[3].

According to study and experience, people see organisational life and decision-making processes in very diverse ways. Although some leaders are somewhat ignorant to the problems of power, persuasion, and influence, others view political interactions as central and widespread when they look through cognitive windows. Nothing is more self-evident to other leaders than formal organisational structures and authority, as well as the necessity of successful leadership on efficient administrative procedures and checks and balances, particularly in today's complex enterprises. Although many of their academic colleagues are far more attentive to the processes and protocols of collegial decision making, which are supported by their own set of professional standards and norms, administrative leaders often think and act in this way. Academic leaders may inspire change via cooperative procedures when they are aware of and respectful of these standards. Some academic leaders are particularly focused on the norms and standards of the organization's culture, or symbolic framework. They make meaning of the world and influence others to go in the same direction by referencing its myths, metaphors, conventions, rituals, and customary behaviours.

Utilizing a Variety of Frames of Interpretation in Leadership

It is important to emphasise that interpretative frameworks impact choices and behaviours in addition to helping us understand organisational experience. For instance, if we see the world as fundamentally political, we will behave accordingly. Leaders will be more successful to the degree that they can master the skills and cognitive capacities to comprehend and make judgements with reference to many frames and dimensions as organisations cannot, in reality, be limited to a single dimension. Bensimon has demonstrated that most presidents—roughly two-thirds—conceive of their duties by mixing two or three of the leadership orientations in interviews with the presidents of 32 institutions. Experienced presidents who may have held the position of top executive at more than one institution as well as those who work in the bigger and more complex four-year institutions seem to be linked to this increased conceptual complexity.

It's interesting to note that when we concentrate on frameworks of interpretation, our attention shifts from focusing on formal authority to focusing on people's cognitive abilities and orientations. These traits then link in different ways to the needs and ideals of other members of the company, making them components of a reciprocal leadership process. We might consider the frames as influencing certain leadership philosophies due to their various qualities.

It also becomes obvious from the standpoint of leadership education and development that being conscious of one's own orientation to the responsibilities of leadership is an important type of self-discovery. It offers self- and situational insights that aid a leader in comprehending the traits of his or her strengths and shortcomings, issues, and frustrations. Most importantly, developing self-awareness may start the process of addressing imbalances to develop a more integrated style of leadership.

Conscious Leadership

Our exploration of the leadership frames has led to the conclusion that leaders who possess just one or two sets of cognitive skills would struggle to adapt to the variety of realities they are faced with. The unwavering dedication of faculty members to academic ideals and collaborative methods will astound those, for instance, who live by political insights and abilities. To lead only via administrative power and knowledge is to push management techniques beyond of their intended use and to rationalise or cost-benefit analyse every academic and interpersonal issue. Regardless of everything else, the studies of the president demonstrate the strict power restriction alone as a model of campus leadership. Yet, if symbolic leadership is emphasised to the exclusion of other skills, it may promote a cult of the past and an emotional appreciation of communal objects. The joy will end quickly if administrative systems are broken. The collegial model could work well on its own in a static society, but because of its propensity for exclusivity and stagnation, it needs alternative decision-making models to cope with the realities of change and competition.

Obviously, integrating the several frameworks is necessary for both accurately characterising and directing higher learning companies. Integration goes beyond employing a sequential mix of talents and insights, applying political skills to one set of problems, and switching to other frames as needed. An organisation could become stable as a result of such a strategy, but leadership that is cohesive cannot be produced. Another prevalent pattern, in which one method takes the lead while others play supporting roles, cannot lead to fully integrated leadership. A model like this wouldn't yield a real integration since it would alter certain facts to meet the prevailing orientation.

But, we should push harder to examine an integration of the many forms of leadership as complexity in both thinking and behaviour is probably more successful as a kind of leadership. The leadership model must combine components from other frameworks to create a fresh, logical whole in order to be integrative. The cognitive frameworks will need to be positioned inside a different and more expansive view on leadership in order to develop a new integrative logic for their connection to one another. We will need to develop leadership techniques that allow institutions to successfully handle change and disagreement while remaining committed to their core ideals [4]–[6].

II. DISCUSSION

A self-regulating cybernetic system automatically modifies the activity it regulates to remain within a permissible range. By automatically turning the heating system on or off, a thermostat, which Birnbaum provides as an example, maintains a room's temperature at a fixed level. When we apply this concept to a university, we can observe that each administrative area utilises a number of monitors to control its performance. Hence, purchase orders from a department that exceeds its budget may be rejected until corrective action is performed. Similar to this, if an admissions office falls short of its goal for first-year enrollment, it immediately makes adjustments by taking on additional transfers. As we've seen, decisions and actions taken by different units are often relatively independent of one another in a loosely connected administrative organisation.

Self-regulation often succeeds in achieving its goals since it has no negative effects on the whole system. Ensure that the monitoring systems are efficient as one of the leadership's major responsibilities. Especially if difficulties in one area have an impact on other units, leaders must ensure that a solid communications system is in place so that signals about concerns reach the proper individuals [7]–[9]. Leaders may sometimes need to make more drastic systemic changes. To restore equilibrium, processes may need to be shocked or redesigned. Therefore, it is always important to take care when radically altering a cybernetic system. The best cybernetic leaders are humble. They adopt three medical legislations. Keep going if it's working. Stop doing anything if it's not working. Don't do anything if you don't know what to do, is the saying.

The Cybernetic Model's Limitations

Is the cybernetic model as integrative as it claims to be when it comes to leadership? It kind of does, but not in the way that one would anticipate, with respect to the interpenetration or systematic connection of the frames. "Rationality is the goal of the bureaucratic administrator. Collegial administrators look for agreement, political administrators look for harmony, and symbolic administrators look for logic. Yet, balance is the cybernetic administrator's main goal.

This is supervision as leadership. The four cognitive frames do not undergo an internal restructuring or reorganisation as a result of cybernetic leadership since they continue to operate as separate systems. Integration results in an equilibrium where the frames' effects are proportional. They function as a collection of distinct methods that are brought into balance by a control mechanism that lacks any inherent substance of its own. Hence, if we can even talk of integration, cybernetic leadership integration is a passive one.

Cybernetic leadership is understated, as Birnbaum asserts often. Leaders should not fool themselves by anticipating transformational change, unless there are exceptional circumstances, such as a crisis, in smaller institutions, or when it is time for long-delayed reform to occur. As cybernetic leadership only acts when operational issues are detected, it is unable to generate and execute "disruptive" new ideas or inspire others to alter their course in reaction to change. Not procedures of leadership, but ways of administration and management, it offers cognitive insights and sensible advice.

A Narrative: From Strategy to Cybernetics

A simple tale might be used to illustrate these last ideas. As an example of a self-regulating device, consider the thermostat. The thermostat will function no matter where the temperature is set. What the temperature means to the family who lives there—not merely as a measurement, but as a value, a component of a way of life, and a sign of purpose—is the more intriguing question. Assume the family lowers the temperature to sixty degrees in the winter and raises it to seventy-five degrees in the summer in an effort to reduce energy costs. Teenage children and their parents often disagree on the surroundings, phrasing the problems in various ways.

As discussions regarding the ideal temperature develop, it becomes clear that neither the temperature nor the ageing furnace—and most definitely not the thermostat—are the issue. The family is forced to make a choice that continues expanding to include bigger questions of values, priorities, and objectives. It turns out that the discomfort is merely a sign of far more serious issues. The actual issue is the region's severe winters, high energy costs, and low wages. They decide to relocate to an area with a warmer climate and lower cost of living in order to live the life they envision. This illustration illustrates how strategic thinking enquires into problems to identify their root causes. We can observe the similarities if we apply the circumstances of the family to the admissions example from before. With fewer incoming students, what may seem to be a small operational issue might really be a strategic sign that the academic curriculum at the institution needs to be fundamentally changed. In reaction to market competition, new programmes may not be enough; the framework for collegial decision-making may also need to be revised. Cybernetic balance is unable to provide the integrative leadership needed to foresee and handle these bigger-scale types of change.

These examples demonstrate how systemic patterns of strategic thinking and leadership replace the fragmentation of operational decision making. This implies that we must expose and make conscious the values and goals that are ingrained in organisational structures and in the methods that we do business as usual. Leadership at the strategic level entails methodically defining our organization's identity and role in the larger world in order to determine its best future prospects. Monitoring systems of all kinds are necessary along the route to inform us of our progress towards our objectives, but they are management tools rather than leadership tools. These findings demonstrate the need of creating a strategic decision-making process that can successfully include the intricate frameworks and patterns of organisational decision-making. It will need to connect intricate kinds of knowing and doing while making sense of objectives and values. It will also be required of them to develop a vision for the future and bring it to fruition as a type of leadership.

Conclusions That Are Diverging and Converging

Numerous important authorities that we contacted feel that the college presidency lacks power, but for various reasons. According to organisational theorists, the structural components and decision-making procedures of academic institutions are to blame for the deficit. While the president's function is crucial for administration, expecting the prevailing leadership styles that could exist in other kinds of organisations is a fantasy. The position's requirements for leadership include the duties of symbolic interpretation and legal authority, administrative coordination and collegial facilitation. Presidents will be able to accomplish their goals if they add to these astute political judgements and strategies. As a result, authority, expertise, and skills are all important in the leadership job. Yet, the only presidential effect that can be had is a fleeting one that is limited, unless it is at times of crisis or in a few specific types of organisations. Notwithstanding rhetoric, reminiscence, and yearning, the fundamentals of the situation remain unalterable.

The president's power and leadership are not universally understood. According to the Association of Governing Boards of Universities and Colleges' assessments from 1996 and 2006, shared governance is confusing and the presidency is weak, but these problems may be fixed. It is possible to confirm and assert the president's authority, clarify governance, establish strategic procedures, embrace a vision, and lessen the impact of politics. Change may be inspired by a call to moral and professional responsibility. Even though it is often weak and inefficient, the president may be strengthened to attain holistic leadership.

Fisher and Koch contend that there is no need to modify the office's powers in order to exert presidential authority. They discuss the efficiency of presidents who exhibit entrepreneurial traits and are adept at making use of the authority that comes with the job. They contend that transformational and entrepreneurial leadership results when charm, knowledge, assurance, and risk-taking are joined with lawful authority.

Management and governance. Decision-making power.

The following basic themes may be found if we go further into the numerous research, analyses, and suggestions that we have reviewed: leadership, governance, authority, and organisational decision-making. In many respects, the difficulty of comprehending leadership in higher education comes down to new methods of conceiving these intertwined concepts, both to understand them in isolation and to take into account the connections between them. These elements together result in a number of ironies for the study of leadership. Instead of the dispersed and reciprocal leadership principles that we would have anticipated, there is a heavy emphasis on leadership as the execution of the duties of the presidency, whether that presidency is seen as strong or weak.

The study largely suggests administrative strategies to manage and cognitive concepts to comprehend a potentially intimidating structure of shared power when it comes to leadership practises. Recent writings provide useful advice

on how to handle the duties of academic positions, but studies of more comprehensive and systematic methods of effective and inspiring leadership are lacking. The development of a strategy for strategic leadership that taps into the deeper currents of organisational narratives and values, as well as the real integration of many leadership styles or frames, both await completion. In conclusion, it is necessary to broaden the scope of leadership knowledge and strengthen its application techniques.

We need fresh intellectual compass points in order to accomplish these aims. We will make use of the new ideas that have been revealed as a result of our analysis of the literature on relational leadership in modern research. As we do this, we'll look at what we believe to be the fundamental causes of shared governance in higher education's enduring problems. The need to redefine and reorganise collegial power and decision-making is at the heart of a significant portion of the leadership challenge facing academic institutions. We will also be establishing the groundwork for a holistic approach to strategy as a process and discipline of leadership as we trace these new conceptual aspects.

Consult the workshop notebook on "Chairing the Academic Department" by the American Council on Education, which is regularly published, for a solid bibliography on the duties of academic administration and leadership in a variety of roles.

The Procedure and Environment for Making Academic Decisions

We have discovered that leadership is a complicated phenomenon, made much more so if we want to have a deeper understanding of it in order to practise it more skillfully. In our search for comprehensive solutions to these problems in the literature, we have not been successful. Leadership studies often struggles to develop an integrated set of findings, particularly when it comes to the transition from leadership knowledge to practise, in part because it is a multidisciplinary discipline.

Ways Of Perceiving Leadership

We have also shown that interpretative approaches and models not only alter the subject matter they investigate but also provide insightful conclusions. They act as filters for what is important, but they only provide us access to the parts of experience they value. This seems to be how models of leadership such as entrepreneurial leadership, cultural leadership, structured anarchy, garbage-can procedures, and cybernetic leadership all work. While they are limited in their ability to regulate more than two or three factors at once, empirical research that contribute to or support the model provide important insights on leadership. Their conclusions often appear to go beyond their individual results as a consequence, leading to ideas that become self-sustaining. As a result, the integrated parts of leadership and human experience that do not suit the analytical paradigm are distorted or obscured.

Playfulness and stupidity

It turns out that the book's last part, Leadership and Ambiguity, has an insightful irony that suggests that, instead of exercising power, leadership may instead be a contextual sense-making process. Cohen and March elaborate on some of their previous ideas regarding the boundaries of rational decision-making by describing a "technology of stupidity" and a reflective "playfulness" They underline the irrationality of converting intentions into deeds in challenging the rational model.

The notion behind reflective playfulness is that aims should be seen more as tentative hypotheses to be investigated than as fixed targets to be met. Moreover, they make the case that rather than the other way around, our activities may lead to our objectives. They state that planning may include discovering the significance of the past in the present rather than defining future results. When previous experiences are reinterpreted in order to develop new self-understandings, this is referred to as using "experience as a theory." In line with these ideas, they see leadership as more of an exploratory trip than a strategic cruise where ships gather their supplies for conflict.

These viewpoints are completely congruent with the idea of leadership as a collaborative process that is focused on the intricate interaction of human values, narratives, and reason. Cohen and March have explored some of the most profound facets of the human experience and agency in their search of "foolishness."

Aiming for Contextual Leadership

Our findings would be vastly different if we began by asking contextual questions about the real patterns and processes of leadership at play in companies rather than with authority. When universities or programmes within them fulfil the objectives, they set for themselves, how are presidents and others truly exercising influence within the organisation? How are practical change management methods created and implemented? Something has happened in a lot of the world to create institutions of higher learning that are meaningful and effective centres of learning, whether it be in the leadership of presidents or, more likely, in the leadership and decision-making processes distributed throughout colleges and universities. It's true that purpose cannot be imagined as a king in exile awaiting a summons from college presidents to return home and carry out a sovereign's obligations. It is necessary to carefully excavate purposes from the job being done since they are often buried there. Many academic institutions, and particularly particular programmes and the individuals inside them, continue to adjust to change successfully in spite of significant difficulties, complexity, and flaws [10], [11].

Humanitarian Agent and Values

We have defined leadership as an integrated process of sense-making, decision-making, and action that motivates people and groups to work towards common objectives in the

face of change and conflict. Several components of the process are so dependent on individual traits and skill sets, environment and culture, and formal or informal authority and power that they are difficult to adapt for use in various contexts. Nonetheless, a lot of the characteristics of a leadership relationship may be translated into approaches to strategic decision-making. If we can identify the appropriate conceptual framework to understand and apply them within, we can teach and learn about certain facets of leadership. We need to change our intellectual focus to values as patterns and norms of self-enactment in order to identify those characteristics of leadership. The term "values" itself is ambiguous and may mean a variety of things, from judgements on morally contentious issues to, at the opposite end of the spectrum, personal preferences. intend a distinct but typical connotation. Despite the constant fluctuation and conflict in the values we hold, as individuals and agents of our own lives, we make decisions in the name of focused values. Even though we are not always aware of the values that guide our decisions, we may quickly identify them by posing a straightforward query that can take many different forms. We must ask ourselves, "What matters decisively to us as we give shape to our life and form to our experience?" in order to identify our values. Our life cannot be blocked from this question, despite our best efforts.

Values provide people, organisations, and communities the standards of choice that direct them towards happiness, fulfilment, and significance. As a result, they are crucial for comprehending and putting relational leadership into practise. Values are inextricably entwined in the decisions we make and the lives we lead, more gerunds than nouns, despite the fact that they may seem to be abstractions since we often use abstract phrases to define them. They orient and influence our thinking, emotion, and behaviour, whether they are lofty ideals like liberty and equality or more practical ones like ambition and lust. Our beliefs, emotions, and behaviours both reflect our values and have an impact on them. We discover them in the ways we exert ourselves in order to have more of whatever it is that draws us, whether it is love, justice, knowledge, pleasure, prosperity, or fame. We recognise them as assertions against us, as sources of power over us, and as manifestations of want and ambition. Moral, intellectual, artistic, personal, and professional values all have their own weights and textures, yet they all serve to both attract and assess us as values. No matter how we interact with a person's or an organization's existence, we always encounter values as requirements and objectives. Even if we wish they would, things don't always fit neatly into hierarchies since we all make decisions that are both sensible and foolish depending on the circumstances.

Value of Respect

A little example could assist to clarify these ideas. Think about a trait that many would consider essential to leadership, such as respect for others. Respect is a value that is expressed by the act of respect, making it an example of agency. It is a certain way of appreciating someone as an end in and of themselves. Respect as a value entails a pattern of decision-making and behaviour that shapes how one builds connections with others. No matter how much we know about it, advocate for it vocally, or feel favourably about it, respect does not really exist as a value for us as individuals or as leaders until we let it guide our intentions and deeds. Respect as a value offers a pattern of purpose and motivation that directs our behaviour.

It is difficult for a leader—or anyone—to value the other as a goal rather than an object. Anxieties, insecurities, obsessions, and stereotypes are only a few examples of the ideas and sensations that continually and unceasingly entice the self as agent away from acting with respect. In practise, the self is constantly presented with emotional, mental, and ideological opportunities to sate desires or compulsions that could be disrespectful to and destructive to others. Respect must exert sovereignty over the self's decisions among the competing options that swarm a person's intents and acts if it is to succeed as a means of respecting another person.

Identity and Values

It becomes obvious that choosing a particular set of values determines one's identity as a self when we contemplate the entire scope of human action and fulfilment. The selection of a set of values corresponds with the formation of the self. Charles Taylor, a renowned philosopher, says that when the "Who am I? This question cannot always be answered simply stating one's name and ancestry. An comprehension of what is of the utmost significance to us does provide an answer to this issue for us. Despite the fact that this evocation of values as the act of valuing has been framed in terms of personal identification, it is obvious that cultural and organisational identities operate similarly. They stand for institutionalised and shared commitments to values that must ultimately be put into action by human activity. What matters crucially to this institution, we should question participants in organisations. These kinds of inquiries set off a process of self-discovery and organisational identity articulation, which is where the task of strategy is born.

Leadership and Core Values

Understanding the dynamics of human agency and valuing are given a vital role, and this opens up fresh ideas on leadership. We can now more clearly see how, at its core, leadership is about upholding human values. More specifically, leadership is about making an effort to comprehend and address the needs and values of constituent groups and people. Leadership happens specifically in relationships between leaders and followers in situations when both sides' interests are at stake. Several aspects of the leadership process, including its breadth and approach to values, are distinctly context-dependent. But, with a value-centric perspective, we may better see why many modern leadership students refer to the moral component as the core of the issue [12][13]. This does not imply that leaders

have perfect personal lives or that they have a unique talent for resolving contentious moral quandaries. Instead, it implies that effective leadership entails upholding the ideals for which the organisation was founded and guaranteeing the sincerity of the dedication to those goals.

III. CONCLUSION

One of the conceptual pillars for constructing an integrated leadership approach is provided by the values topic. Among what could otherwise seem to be so many distinct ideas, facts, and artefacts of institutional history and culture, programmes, and resources, it provides a point of convergence for establishing institutional identity. Institutions embed their convictions in all of their concrete and intangible forms of organisational sense-making and decision-making, just as a person communicates his values in the fabric of his life. When an organisation is evolving, the roles of leadership and management can both function in various ways while remaining the same. Without creating a management framework based on systems, leadership is worthless, and management would be ineffective without leadership's efforts serving as the foundation for values.

REFERENCES

[1] [1] J. Varpanen, "Early childhood education leadership in Finland through the lens of structure and agency," Educ. Manag. Adm. Leadersh., 2021, doi: 10.1177/1741143220903727.

[2] [2] T. Marques, N. Reis, and J. F. S. Gomes, "Responsible leadership research: A bibliometric review," BAR - Brazilian Administration Review. 2018. doi: 10.1590/1807-7692bar2018170112.

[3] [3] A. Abbas, D. Ekowati, and F. Suhariadi, "Individual psychological distance: a leadership task to assess and cope with invisible change," Journal of Management Development. 2021. doi: 10.1108/JMD-09-2020-0304.

[4] [4] R. A. Pulk et al., "Dynamic pharmacy leadership during the COVID-19 crisis: Optimizing patient care through formulary and drug shortage management," Am. J. Heal. Pharm., 2021, doi: 10.1093/AJHP/ZXAA219.

[5] [5] B. Morrissey, "Theorising leadership for inclusion in the Irish context: A triadic typology within a distributed ecosystem," Manag. Educ., 2021, doi: 10.1177/0892020620942507.

[6] [6] "Personality Matters: Prediction of Organizational Commitment Using Leadership and Personality," Int. J. Organ. Leadersh., 2021, doi: 10.33844/ijol.2021.60529.

[7] [7] S. Stiller and S. Meijerink, "Leadership within regional climate change adaptation networks: the case of climate adaptation officers in Northern Hesse, Germany," Reg. Environ. Chang., 2016, doi: 10.1007/s10113-015-0886-y.

[8] [8] M. A. Khalifa, D. Khalil, T. E. J. Marsh, and C. Halloran, "Toward an Indigenous, Decolonizing School Leadership: A Literature Review," Educ. Adm. Q., 2019, doi: 10.1177/0013161X18809348.

[9] [9] J. G. Liang and L. R. Sandmann, "Leadership for community engagement-A distributed leadership perspective," J. High. Educ. Outreach Engagem., 2015.

[10] [10] L. Shaw-VanBuskirk, D. H. Lim, and S. H. Jeong, "Liminal leadership: leading betwixt and between," Eur. J. Train. Dev., 2019, doi: 10.1108/EJTD-01-2019-0010.

[11] [11] A. Zabaniotou, "A systemic approach to resilience and ecological sustainability during the COVID-19 pandemic: Human, societal, and ecological health as a system-wide emergent property in the Anthropocene," Glob. Transitions, 2020, doi: 10.1016/j.glt.2020.06.002.

[12] [12] Å. Gornitzka, P. Maassen, and H. de Boer, "Change in university governance structures in continental Europe," High. Educ. Q., 2017, doi: 10.1111/hequ.12127.

[13] [13] J. M. Rivas-Otero, "Evolution of leadership styles of the new political parties in Mexico and Spain: Andres Manuel Lopez Obrador, Pablo Iglesias and Albert Rivera (2014-2016)," Rev. Mex. Cienc. Polit. Soc., 2019, doi: 10.22201/fcpys.2448492xe.2019.235.64108.

Structural Conflict in Academic Decision Making in Strategic Leadership

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Abstract— The process of identifying and resolving problems in an equitable and effective manner is referred to as conflict management. The objective is to raise the likelihood of a successful conclusion while minimising any potential negative effects that may result from conflicts. Evaluating the immeasurable: values conflict inside the structure identification in the office and the home: personality and role, shared government and its discontents, fundamental and external values, the chapter's resolution of the tension between ideals and leadership.

Index Terms— Decision Making, Faculty, Leadership, Strategic Leadership, Structural Conflict

I. INTRODUCTION

The section above addressed some of the complexity and problems in collegial leadership, governance, and power. Here, we revisit those questions and explore them using the conceptual framework produced by our examination of agency and values. Through this lens, we can see many of the dilemmas of academic decision-making from a fresh angle. We will try to demonstrate that the fundamental principles of the academic decision-making system include a number of structural contradictions. We will start with a case study that is based on my own experience in order to evaluate how participants perceive different types of conflict [1]–[3]. A local candidate is suggested to the president by the faculty search committee after a nationwide search for a new dean at a selective liberal arts institution. The president promptly gets the nomination approved by the board, with the appointment taking effect in three months, since the person is the chairwoman of a small department who is well-liked and well regarded. The dean-elect gets jubilant calls and texts from several colleagues congratulating her on her appointment after the announcement. She also sees that a meeting with the chairman and two senior history department colleagues has been set. She enjoys the event since she knows and loves all of them.

She learns that the group is on a mission after some amusing teasing about "going to the dark side." They express their worries about the decline in departmental autonomy and faculty governance during the dean's term of office, but they are certain that she will restore the proper balance. Her coworkers continue by expressing their profound sadness about the recent decision by the departing dean not to fill a vacancy for a tenure-track post in the history department. They make it plain that they want the dean-elect to intervene before the choice is made with polite asides and apologises for bringing this to her too soon. Notwithstanding their admission that they did not originally take the discussions

regarding budgeting issues seriously, they now seem to think that the method was defective since irrelevant credit hour charges were used arbitrarily. They are certain that if the choice is made, the history program's quality will be severely harmed.

The request surprises the dean-elect, who attempts to reply equally despite his surprise. She is aware that her predecessor had to eliminate a number of employees due to a significant fiscal issue. She is also aware that the departing dean utilised a consultative method to make his final conclusions and that he has said he had difficulty persuading the budget advisory group to concentrate on the information regarding the difficult issues involving priority. Hence, the dean-elect believes it is appropriate to express sympathy for the department's predicament; she expresses her willingness to look into more effective measurement and governance systems and requests their participation. Also, she politely but firmly states that it would be uncomfortable and improper for her to discuss the matter with the president or the present dean during this interim time.

The tone abruptly shifts. Her coworkers start to look at her differently and give her sidelong looks. While there is a general air of politeness, mistrust, uncertainty, and doubt creep in. The historians express their disappointment as they leave since she is unable to address such a glaring instance of poor priorities and practises. The dean-elect is sitting by himself, confused by what has just transpired. A central query starts to emerge. How can leadership successfully resolve the disagreement by getting to the root of it? How we see leadership and the conflict that it strives to resolve will have a significant impact on how well we do this. To advance the dialogue about governance and decision-making on campus, a new idiom will need to be established since the language of leadership is not often used there.

As you may remember, the core of the leader's objective was conflict, according to our prior leadership profile. Leadership constantly emerges at the intersections of change,

rivalry, inconsistencies, and contested objectives. The nature of the conflict that leadership strives to resolve determines the exact form that leadership takes in a society or organisation more than anything else. We may offer many distinct ways that leadership might be understood and performed in terms of how the fundamental form of conflict is perceived by drawing on our prior discussion of structured anarchies, the frames of leadership, and shared governance. For instance, many would argue that the core of leadership is being able to resolve the competing interests of a college's or university's many constituents. Effective leadership seems to depend in certain situations—think of huge public institutions—on striking a balance between the needs of the complex web of campus interests and expectations and those of the general public. The leader's repertoire moves to the top, emphasising political savvy. Despite her natural ability to balance the interests of various groups and people, the dean-elect has already realised that she will need to hone her negotiating and dispute resolution abilities.

Some situations have elevated expectations for participatory governance—the tiny, selective college comes to mind. Everything is up for open faculty and administrative discussion, from the institutional running budget to the sporting teams' schedules. Redefining the processes and frameworks for cooperative decision-making is a necessary leadership duty if and when the shared governance protocols start to break down and conflict worsens. The institution may reevaluate the duties of its professors, the power of its administration, and the details of its board's bylaws in the name of collegial standards. As was already said, the goal is to give various kinds of power more clarity and legitimacy. The initiative is motivated by college constitutionalism, the idea that resolving disagreements through enhancing the structures and procedures of government. As an example, our dean-elect has already alerted her colleagues to the need for a review of the procedures for establishing financial priorities.

We've also seen how organised anarchies manage conflict. Tactical moves like delay and diversion may disarm conflict in the hands of skilled administrators. Tactical leaders achieve their goals by working against the system itself. For instance, they are aware that faculty interest in and involvement in governance is sporadic and variable. They allow participants the chance to reflect on significant subjects, such as strategic plans, which may not result in action but will make them feel important. When she attempts to divert attention from the core of the problem that her colleagues have presented to her, our dean-elect is well aware of the need for tactical acumen. Her leadership will need sensitivity to symbolic issues since she has been a part of the community for a long time and is aware of the need to integrate her work with the values and symbols that define the organization's identity and traditions.

To be sure, it is suitable and beneficial to comprehend distinct aspects of conflict and how they might be resolved by using a variety of information sources and analytical frameworks. All of these aspects of a complicated system of decision-making must be constantly attended to by any academic officer, whether new to the position or not. The trouble is that none of these diagnosis or suggested fixes go to the root of the problem. Conflict remains no matter how adept the constituency leader, the skillful drafter of collegial bylaws, the skillful storyteller, or the cunning strategist. These leadership philosophies have not yet identified the underlying conflict they must resolve [4], [5].

II. DISCUSSION

We must understand structural conflict in terms of the meta-culture or decision-making culture of colleges and universities if we are to fully comprehend its complexity. The term "culture" has a wide range of meanings, but in this context, it refers to the common paradigms, values, and standards upon which institutions of higher learning base their decision-making processes. They are extensively applicable, even globally. We discover the point at which individuals perceive themselves to be practising their moral commitments and professional obligations in academic communities by accessing the level of culture as a system of beliefs and behaviours. We connect with them when they commit to a set of principles and procedures that form the basis of a culture of decision-making. Instead of trying to understand academic professionals by their conduct or rules, we should first try to understand them as partners in creating a culture [6], [7].

Of all, every business has a unique culture that is all its own. The tone, focus, and substance of practises like shared governance vary noticeably from one institution to the next. The definition of a group's culture by one of the most influential authors in the field, Edgar Schein, is "a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that have worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems." Numerous modern researchers of higher education have discussed the value of campus climate and culture, including racial and gender concerns, in comparable ways in their writing. Understanding and using cultural norms and traditions to solve issues and establish future course is one of the responsibilities of good leadership. According to Schein, it's probable that leaders only have control over creating and managing cultures.

Deeply ingrained attitudes and views of academic professionals are shaped by the shared culture of academic decision-making. The pursuit of an integrated understanding and leadership process will be thwarted until that level is attained. The solution to these issues of academic decision-making is to identify a fundamental conflict of values.

Autonomy and Power

By combining the academic value of autonomy with the institutional value of authority, colleges and universities attempt to combine autonomy and authority like oil and water. The university takes its first breath from the freedom of enquiry, and it bases its very existence on the faculty members' individual and collective academic autonomy. Academic independence for each person is essential to the originality of intellectual endeavour and its immeasurable worth to society. Nevertheless collectives are also entitled to independence and autonomy. Only individuals who are familiar with the unique terminology, procedures, and substance of an academic subject, which are initially instilled in the graduate studies rites of passage, are qualified to evaluate the work of others in the same area. Each academic department's autonomy and prerogatives have a long history of professional and cultural development. But, when academic professionals join formal organisations, they become aware of the structural conflict between value systems. Institutions place a strong emphasis on authority, order, and responsibility, ideals that are implemented via control mechanisms, much as how professionals appreciate autonomy. Organizations are required to define, codify, regulate, and justify what would otherwise be the chaos of unrestrained freedom. Many restrictions, such as finances and class schedules, are ignored as minor irritations until they start to impede on the demands of autonomy. If they ever discuss the academic core of things—teaching or research—the conflict escalates into a serious crisis of basic principles. Academic authority therefore has an uncomfortable effect on the organisation.

Assessing the Inmeasurable: Intrinsic and Instrumental Values

The competing ways that knowledge professionals and their institutions define and assess merit exhibit the same basic contradiction in opposing forms. Faculty members are motivated by a belief in the inherent worth of teaching and doing research. The discovery and dissemination of information are fundamentally valuable because they are self-authenticating. Measurement is not used to determine it. Academic institutions respect these fundamental principles, yet they must nonetheless define and quantify value in order to balance conflicting demands on their resources and duties. The methods used in management decision-making and the standards set by the market are always working to assess the importance of knowledge acquisition. Even though the majority of academics have little faith in any system's capacity to quantify what matters most to them, judgement has been quantified in terms of prices and credit hours, and measurement techniques have become normative. In methods and by means that offend the academic principles and sensitivities of academics and instructors devoted to their disciplines, courses and programmes are eliminated or expanded, and new projects are pursued or abandoned. The culture of academic decision-making, which is seen as a system of values, beliefs, and practises, is permeated with

these opposites.

Identity in the Workplace and the Home: Self and Role

Academic life is a real calling when it's at its finest. The academic professional's identity and sense of self are intertwined. While faculty members are like other people in that they crave money and power, the profession's self-definition entails a feeling of devotion to the cause of learning that transcends mere self-interest. The academic professional may readily claim, "I am what I do." It is accountable for addressing essential and enabling facets of human growth and experience. Decisions that affect the academic status, productivity, and reputation of faculty members thus have an impact on their personal identity and career goals. This manifests itself in several ways, particularly in choices made about academic programmes and decisions regarding appointment, promotion, and tenure. A person's sense of identity and self-worth is severely damaged if a bad judgement is made in matters that determine professional position, particularly when it comes to tenure. We encounter the issue of unfairness in the standards of value while making academic decisions in a different way. Once again, integrating the identities of academic professionals with the functional characteristics of organisations proves to be a difficult undertaking.

Anybody, even our new dean, who has a greater knowledge of the roots of conflict in our cultural system does not have have a ready solution for how to handle conflicts over priority. Nonetheless, it leads to revelations about the actual scope of the world of judgement in which all academic men and women engage in their work. With this new starting point, we may reframe the problems and look for solutions to resolve the disagreement using integrative strategic leadership techniques.

Governance Shared and Its Discontents

Many additional elements become apparent if we reexamine the problems with shared governance through the prism of the fundamental conflict in values. Many members of academic communities would argue that although value conflicts do exist in academic decision-making, they may be precisely handled via shared governance practises. Some institutions seem to have developed useful strategies for balancing competing ideals. To address institutional challenges, they have established a number of councils and committees throughout the years, often more by need than design. A manageable balance in university governance is feasible if this strategy is followed.

Other widely held misconceptions about the use of academic decision-making are revealed through observation of shared governance in a number of circumstances, and these misconceptions are crucial for our creation of a model of strategic leadership. Academic professionals understand shared governance to include, among other things, both formal procedures and moral requirements. Individuals who attempt to exert leadership in purely political terms by winning friends or putting together mutable coalitions of

convenience are swiftly despised by the academic community. Administrative officials are seen as weak or ineffective if they fail to assert their rightful claims of collegial power. On the other side, judgements taken unilaterally go against ethically binding rules. They pose a danger to legitimate standards that have their foundations in the faculty's self-awareness and respect for themselves. These canons also have the symbolic weight of tradition, the administrative and legal weight of formal codification in bylaws, and the administrative weight of tradition. Anybody who disobeys these standards in the academic community does so at tremendous risk since they always result in repercussions of suspicion, protest, and reprimand against those who are seen to have done so. The Harvard Faculty of Arts and Sciences' historic vote of no confidence in President Lawrence Summers in 2005—and Summers' subsequent resignation in 2006—centered on the principles of respect for one another and cooperation. Professors at Harvard were furious with Summers for what they saw as his disrespect for their knowledge and for the "basic politeness" that is expected of them both morally and culturally.

Academic leaders at all levels must comprehend the shared governance process' limitations as well as the standards of ethical legitimacy it embodies. When leadership is effective and circumstances are stable, the system functions tolerably well on many campuses, according to the 1996 Association of Governing Boards of Universities and Colleges commission. Nonetheless, the system soon develops fault lines as demand for change grows. If major modifications to academic programmes themselves are at issue, the fuzziness of the delineations of shared accountability becomes starkly apparent and the conflicts in values are tangible.

The failure of shared governance to methodically and coherently handle the deepest and most extensive strategic difficulties that an organisation faces may be its greatest weakness. The structure of faculty committees is generally fragmented, complicated, and burdensome, but deep strategic problems of identity and purpose are always systematic and interwoven. Paradoxically and dangerously, a system of academic decision-making designed to give the faculty's voice weight instead weakens it via fragmentation and complexity. Equally upset are those in positions of academic authority who lack the tools necessary to confront the basic organisational and instructional concerns that will determine the institution's destiny. We have discovered that the theme of strategic leadership and the problem of strategic governance are closely intertwined.

The reconciliation of the conflict between values and leadership

For a number of reasons, we have considered our principles in order to better comprehend the culture of decision-making at colleges and universities. To offer a more comprehensive explanation of a complex organisational culture, one is to complement and enrich previous views of decision-making. Our knowledge of college decision-making

is improved by delving further into the decisions of individuals as agents, as participants who implement values via their choices.

Several exciting opportunities are made possible by this perspective. It supports all parties involved in higher education in formally expressing what they already know tacitly, which is intellectually fulfilling in and of itself. But, for many people who are caught up in the system's frustrations—remember our new dean—the insights also act as a kind of cognitive therapy. When conflict is seen as structural, it becomes less personal, and it becomes possible to overcome the ingrained urge to assign blame to either oneself or another. More significantly, these kinds of discoveries liberate energy and provide opportunities for action. The intellect is free to come up with fresh solutions to the issue and original theories for comprehending and resolving structural conflict. Designing new strategies requires all the knowledge and resources that can be mustered, especially when the field of endeavour is as complicated and demanding as leadership at a university. Even though the process will never be finished, investing intellectual resources in rethinking the problems is beneficial [8], [9].

Our investigations highlight some of the prerequisites that must be addressed for a strategic leadership approach to successfully manage structural conflict. It would be illusory to believe that the conflict between professional autonomy and organisational authority can ever be resolved, even if shared governance has to be rethought. Both parties to the interaction must confront the facts that academic decision-making must deal with since it is a genuine polarity. Instead of resolving the problem, an effective strategy approach might moderate it. Finding and articulating agreed values that go beyond the structural conflict in the culture of academic decision-making is another substantive goal of strategic leadership. Weick argues that one worthwhile goal of study is to comprehend how individuals make sense of their experience in such unexpected and confusing organisational situations in his very famous work on the loose coupling of decision making in schools. He points out that it makes sense for members of educational organisations to utilise the tools of language to develop organisational myths and tales in order to build their social reality.

Since they express broader meaning and the shared ideals that have defined an organization's identity, narratives are essential for making sense. A shared set of commitments may be brought to light, given voice, and celebrated via the investigation of how these defining values are applied to the organization's activity [10], [11]. As a result, the distance between autonomy and authority becomes smaller as members of the campus community from different backgrounds discover important ideals that serve as legitimate sources of agreement for their commitment. The shared values serve as an example of the particular ways in which the company has worked to uphold its dedication to

quality, learning, service, innovation, diversity, and other core principles. The components for a vision—a cogent declaration of the institution's greatest future possibilities—can be formed by giving these ideals strong expression and unique meaning.

III. CONCLUSION

To support a "absorbing errand," such as intellectual quality, which needs teamwork and effective institutionalisation in order to be reached and perpetuated, academic professionals will give up part of their autonomy. The need for independence will always be there, but common principles that are clearly defined and that are in line with the real prospects of building a fantastic academic institution may overcome it. These duties' power and attractiveness are what first drew academics into the field, despite the fact that they are sometimes obscured by routine and warped by conflict. The role of leadership in academic communities is to mobilise a commitment to shared intellectual and pedagogical ideals as well as to the institutions that represent them in order to resolve structural conflict. Conflict occurs when individuals disagree or hold different viewpoints, which has the potential to be detrimental to any company. It frequently concerns personal agendas, insights, or objectives vs collective or team agendas, insights, or goals in the workplace.

REFERENCES

[1] . Laub, "Assessing the servant organization; Development of the Organizational Leadership Assessment (OLA) model. Dissertation Abstracts International," Procedia - Soc. Behav. Sci., 1999.

[2] H. Gu et al., "Rapid adaptation of SARS-CoV-2 in BALB/c mice: Novel mouse model for vaccine efficacy Short," Hum. Relations, 2020.

[3] M. Masduqi, "Jurnal Studi Islam," Hum. Relations, 2020.

[4] M. K. Wahab Ali, "Mediating Educational Challenges Amidst Covid-19 Pandemic," Asia Pacific Inst. Adv. Res., 2020.

[5] J. P. Paquin et al., Maria Bonnafous-Boucher Jacob Dahl Rendtor. 2016.

[6] Sukirwan, "Pembelajaran dari Rumah: dari Klasikal ke Digital," Hum. Relations, 2020.

[7] J. A. Laub, "Assessing the servant organization; Development of the Organizational Leadership Assessment (OLA) model," Diss. Abstr. Int., 1999.

[8] D. A. Acosta and G. E. J. Leguizamo, "Métodos y técnicas de cuantificación microbiana empelados en la industria de alimentos, farmacéutica, agrícola y ambiental. Revisión sistematica de la literatura," Hum. Relations, 2020.

[9] D. M. Sembiring, "Menghadapi Stress Di Masa Pandemi Covid-19 Dengan Manajemen Stress," Hum. Relations, 2020.

[10] R. Salengo, "Pengaruh Kualitas Pelayanan Dan Harga Terhadap Kepuasan Konsumen Go - Food Pada Pt Gojek," Hum. Relations, 2020.

[11] C. Philippot, "A Bit Pricey: Youngs Adults' Financial Literacy, Financial Decision-Making Process, and Spending Habits," Hum. Relations, 2020.

Integrated Strategy Development in Strategic Leadership

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Abstract— Integration tactics are a crucial element in creating a successful company. Companies can reduce competition or improve their influence in supply and distribution by using a variety of integration tactics. They may be able to extend and consolidate their position in the market as a result, improving their competitiveness. In this article, we examine the many forms of integration techniques used by corporations, their benefits and drawbacks, and some instances of each. This chapter covers the topics of higher learning strategy in the business world, thoughtful evaluation of strategy development, integration and leadership, and new directions in strategy..

Index Terms— Development, Integration, Integrated Strategy, Strategic Leadership, Strategy

I. INTRODUCTION

A new strategy must be properly positioned inside the thinking and responsibility models of educational communities if it is to be effective, particularly in light of what we now know about the complexity and value conflicts of academic decision-making. Since assumptions concerning the employment of strategy in college contexts have not been clarified beforehand, strategy procedures often produce less than they would or fail. For academics, the ideas and methods of strategic planning can ring uncomfortably true with the vocabulary of marketing and commerce. It is worthwhile to take the time to clarify and translate the meaning of strategy.

Its four major themes that set up the job of strategy help discover the best location for it. Trace many types of strategy and present developing patterns that suggest a way of strategic leadership by beginning with a short review of the development of strategic planning in higher education and the business sector. Then, investigate some of the more complex situating strategy difficulties by contrasting several opposing perspectives that highlight the contradictions present in current academic decision-making. Next comes a comprehensive framework for an integrated strategy process that brings together often implicit or disjointed approaches and meanings and that centres identity and vision. Provide a succinct taxonomy of different strategic decision-making patterns to help academic institutions situate and evaluate their own usage of strategy [1]–[3].

Higher education strategy and corporate world

It was evident by the end of the 1970s that the lengthy cycle of expansion and success in American higher education was coming to an end. An era of economic instability marked by stagflation and skyrocketing interest rates was brought on by the conclusion of the Vietnam War and the oil shocks of the 1970s. Both public and private funding for higher education began to become gruelling, inconsistent, and more

closely associated with limitations on usage. The first signs of increasingly invasive external supervision also started to appear at universities, both in terms of federal regulation and responsibility to state and accrediting authorities.

George Keller described how strategic planning should react to these ominous changes in the environment in his book Academic Strategy, published in 1983, and this description hit a crucial chord for a sizable readership. Strategic planning, which has been around for a while in the military and business, was just starting to catch on at schools and institutions. Keller positioned and articulated a fresh prospect at the ideal time rather than going into great detail about the process.

Indeed, universities have been and continue to be engaged in planning for many years. Long before, larger institutions established planning teams to aid in managing their expansion. Almost all institutions had a master plan for their physical space, and formal planning had been used to manage budgets, enrollment, and human resources. These planning methods were often one-dimensional linear projections, however. The institution itself controlled the sole variables in the equation. Themes of flexibility, adaptability to change, and accepting an unstable environment have been mostly missing.

On the opposite end of the scale, many institutions were used to reacting to internal and external political forces as well as the dynamics of organisational culture by making choices piecemeal. No matter how much data they gathered or how many predictions they created, their decision-making was mostly influenced by an opportunistic model that was characterised by the art of the feasible and motivated by growth.

Strategic planning, which mostly adopted commercial terminology and procedures, started to develop on campuses in opposition to "ad hocracy" and static paradigms of linear thinking. Whatever its shape, strategic planning, whether acknowledged or not, brought with it a new paradigm of

self-understanding for academic institutions. Their identities were now beginning to be seen as taking shape at the point where they intersected with the dynamic and competitive environment outside of them. This new contextual paradigm completely altered the way college students plan and make decisions. The premise that successful institutions would need to successfully adapt to the forces driving change and be in sync with them was at the core of the new way of thinking. This fundamental premise ran afoul of how schools and universities have traditionally seen themselves: as intellectual fortresses dedicated to scholarly objectives for their own sake.

The demands of accreditors, state authorities, governing boards, and foundations over the course of the next two decades led to a shift in the importance of strategic planning in many campuses' management structures. College strategic planning gained popularity, generating a huge variety of favourable and negative assessments of its value. Some saw it as a colossal waste of time that by nature results in little more than wish lists, while other college officials hailed its advantages and connected their institutions' vitality to "the plan." R. This feeling is well expressed by Williams' vivid metaphor: "Strategic planning sits inert and vacuous like a worn-out old fox terrier on the sofa. Sometimes barking but never biting. Also, strategic planning was and still is often seen as posing a challenge to existing forms of governance by removing power from the faculty or the administration.

These divergent views of strategic planning's utility are more than matched by the variety of methods it is carried out. The famed SWOT analysis is a required phase in the process, as most experts in the field have discovered. It seems to have become practically ubiquitous to develop some kind of purpose and vision statement as well as a list of variably defined objectives. Strategic planning often involves a cross-section of the academic community in its work in order to meet collegial standards around the process. Yet, outside of these formally shared characteristics, there is no conventional version of strategic planning in higher education. Many issues related to strategy in higher education are touched upon by the enormous variations in how institutions conduct environmental scans, if they conduct them at all; set goals, if they are actually goals; develop narratives, if they do so; develop financial models, if they do so; or incorporate a vision, if they do so [4]–[6].

II. DISCUSSION

Several of these traits and current developments in strategic planning and management lead to the conclusion that the effectiveness of its application determines its worth. They highlight current initiatives to include more flexible and original planning approaches as well as those that place a strong emphasis on plan execution. Although Peterson distinguishes what he refers to as "contextual" or more proactive planning from other types of strategy, Keller also studies current trends and emphasises the value of

communication. In Management Fads in Higher Education, Birnbaum describes and strongly critiques many methods to strategic planning, albeit by equating strategic planning with all types of strategy, he somewhat builds a straw man. Rowley, Lujan, and Dolence evaluate the research and talk about their personal struggles with attempting to establish a process at the University of Northern Colorado as they also trace the many political hazards in planning in higher education. Wilson describes an unsuccessful academic planning project at Cal Poly Pomona in a similar way. Chait, Ryan, and Taylor observe that many plans lack traction, pattern, realism, and involvement from the governing board in their analysis of some of the shortcomings of strategic planning in the nonprofit sector, particularly from the governing board's viewpoint. However, the velocity of change and unexpected consequences are frequently too much for strategic planning to handle [7]–[9].

The usage of the word "strategic planning" itself presents one of the difficulties in comprehending the procedure. The word automatically conjures up the logical process of first planning and then independently carrying out a series of actions in order to accomplish a desired objective. We plan a home by first creating a design for it, and then we carry out the plans and instructions by coordinating the supply of materials and the efforts of several trades. Yet if planning is genuinely strategic, it defines itself in terms of the dynamic realities of the market. This adds flexibility, adaptability, and the need for ingenuity and imagination into the methods we both develop and implement plans. That is the exact definition of "strategic." Strategic planning is sometimes defined as a rigorous set of sequential stages and timelines, which always results in dissatisfaction.

While the term "planning" is still often used to refer to the strategy process in higher education, it has evolved to serve as a figure of speech or an artistic phrase that is more defined by use than by a formal definition. While we feel the latter three phrases are more appropriate, we often use the terms "strategic planning," "strategy," "strategy process," and "strategic decision making" interchangeably in this article.

It's time to reevaluate the opportunities for applying the process of strategy in higher education given the considerable variation in both its usage and success. It's become a little monotonous and routine after many decades, or stiff and burdensome. It often becomes political and is uncertain of itself. It makes sense at this time to try to revitalise and redefine strategic management and planning in terms of strategic leadership.

Ideas of Corporate Strategy That Are Changing

Due to the rigidities that strategic planning was subjected to in prior decades, many business executives and management students have also questioned its value. Beginning in the 1960s, a lot of big businesses developed central planning systems that worked alongside operational management for a while. All aspects of the financial, marketing, sales, and manufacturing cycles for all goods and

services were determined in advance by a wide range of planners. With the intricate programming of sequences of events around fixed objectives, activities, and timelines, strategic planning systems acquired a life of their own. Even before they were finished, much alone put into action, the specific plans were often out of date.

Events did not play out as expected, or crises rendered the plans useless. In The Rise and Fall of Strategic Planning and other works, such the jointly written book Strategy Safari, Henry Mintzberg delves deeply into many of the issues with strategic planning as it is used in various ways. Strategic planning, according to him, is based on a number of misconceptions, such as the notions that it is possible to predict the future, that thinking can be separated from action, and that formal systems of data collection and analytical thinking can take the place of human experience and intelligence's intuitive and synthesising abilities. All of these issues combine to form one major mistake: "Since analysis is not synthesis, strategic planning has never been strategy creating should have been named strategic programming."

Of course, programmatic planning excesses do not undermine the more fundamental ideas of strategy, such as strategic reasoning and decision-making. Strategic planning and its variations are among the several "schools" or approaches to strategy that Mintzberg and his colleagues list. One of these schools places a strong emphasis on the analytical positioning of goods in a market, while another views strategy as a social process of group decision-making. Some perceive it as a strategy for power negotiation, while others see it as creating a vision. Some approaches see strategy as essentially a kind of cognition or, conversely, as a means of implementing an organisational transformation process.

Mintzberg provides "emergent" strategy as a kind of learning substantial attention in a variety of circumstances. In emergent strategy, what we decide to do is determined by what we realise we are currently doing rather than by what we logically compute in advance. Our approach could have evolved from a blend of rigorous study and intuitive knowledge of prospective developments that occur naturally in business. In the world of thought and in university practises, especially as places that house many autonomous spheres of activity, the ideas that strategy is discovered as much as it is invented, that it emerges from practise as much as it is designed, and that it is grasped by intuition as well as reason are all eminently relevant.

Integration and leadership: New Directions in Strategy

The classification of various schools for what often seem to be just different facets of a potentially integrated approach to the strategy process strikes me as peculiar in Mintzberg's research. It's possible that distinctions are made into differences that are simple to reconcile for the purpose of discussion, particularly in the field of practise. Mintzberg and his coauthors outline an integrative approach to strategy development while tacitly acknowledging the schools and

criticisms of them: "Strategy formation is judgmental designing, intuitive visioning, and emergent learning: it is about transformation and perpetuation; it must involve individual cognition and social interaction, cooperation and conflict; it has to include analysing before an action is taken.

Richard Alfred categorizes several approaches to strategic management with a view to synthesizing their significance for higher education, using different nomenclature but covering much of the same intellectual material as Mintzberg. He asserts that the accomplishment of competitive advantage in the marketplace via the production of distinctive and long-lasting value for stakeholders is the common strategic theme. The ultimate objective of all strategic viewpoints is advantage.

While this terminology sounds appropriate, putting it into the higher education thinking environment poses difficulties. The definition of "value" and the standard by which worth is measured are crucial to the translation process. The generation of shareholder value, as determined by shareholder economic returns and the link between supply and demand for the company's shares on the financial market, is a key objective in corporate strategy. The company benefits when it offers clients high-quality goods and services at competitive prices, therefore generating economic value for them. Yet, the definition of these words varies in higher education. The major words used to describe the inherent forms of value generated in the discovery and dissemination of information became "quality" and "excellence." The value of education is not first defined by market pressures but rather is an aim in and of itself, a fundamental intellectual and social benefit. While "advantage" is still a helpful notion for considering the tactics of academic organisations, its link to educational value is complicated by the vast array of various educational institutions, each of which has a unique set of programmes, sponsors, goals, and costs. The market for higher education is thus shown to be peculiar: "the connection between price, product, and demand is different for various customers in different sections of the higher education market." When convenience or qualifications define value, price becomes more significant. Nevertheless, when academic reputation is the primary value in a market sector, there is no price discipline [10], [11].

According to recent analyses, strategy in higher education is still evolving, both in theory and in practise, often in the pursuit of more integrated models. In contrast to strategic planning, Peterson has described an approach for contextual planning that is more proactive, integrative, and meaning-focused. He presents interpretations that are roughly similar to some of those offered in this book, but he focuses more on extremely large macro-level changes in the system or "business" of higher education. He only uses the word "strategic leadership" in parentheses. A fresh form of planning centred on vision and the drive to alter institutional cultures has been explored by Ellen Earle Chaffee and Sarah

Williams Jacobson, making it effectively the primary strategy of leadership. They support "transformational planning," which means that planning itself is a tool for changing and developing cultures inside enterprises. In all three instances, higher education students studying leadership and management are drawing both implicit and explicit linkages between strategy and leadership as a method of inspiring change [12], [13].

III. CONCLUSION

The authors of "Enhancing the Leadership Component in Planning," R. Planning must be used as a tool of leadership, according to Sam Larson, who defines it as "the process of envisioning different ways of thinking about our organizations." Planning may be based on a "process of institution wide dialogue and interpretation" that spans administrative and academic divisions and emphasizes present actions as the sources of a vision for the future when leadership is not defined in linear and hierarchical terms. Integration tactics are a crucial element in creating a successful company. Companies can reduce competition or improve their influence in supply and distribution by using a variety of integration tactics. They can do this to strengthen and broaden their position in the market and to become more competitive

REFERENCES

[1] [1] L. Borgermans and D. Devroey, "A Policy guide on integrated care (PGIC): lessons learned from EU project INTEGRATE and beyond," Int. J. Integr. Care, 2017, doi: 10.5334/ijic.3295.

[2] [2] J. A. Parnell, "Nonmarket and market strategies, strategic uncertainty and strategic capabilities: Evidence from the USA," Manag. Res. Rev., 2018, doi: 10.1108/MRR-05-2017-0151.

[3] [3] N. M. Rachman and R. Hidayati, "Mewujudkan SDM Unggul di Bidang Perdagangan melalui Corporate University," Cendekia Niaga, 2020, doi: 10.52391/jcn.v4i1.472.

[4] [4] S. L. Leskiw and P. Singh, "Leadership development: Learning from best practices," Leadership and Organization Development Journal. 2007. doi: 10.1108/01437730710761742.

[5] [5] L. A. Migliore, "Leadership, governance, and perceptions of trust in the higher education industry," J. Leadersh. Stud., 2012, doi: 10.1002/jls.20241.

[6] [6] A. Krendyukov and D. Nasy, "Medical Affairs and Innovative Medicinal Product Strategy Development," Pharmaceut. Med., 2022, doi: 10.1007/s40290-022-00424-0.

[7] [7] S. Gagnon, "Resource-based competition and the new operations strategy," International Journal of Operations and Production Management. 1999. doi: 10.1108/01443579910247392.

[8] [8] H. M. M. Yousfi, B. H. Din, and R. Bin Omar, "The role of strategic leaders, in building smart sustainable cities in the united arab emirates," Int. J. Entrep., 2021.

[9] [9] "Management Support and Strategies Integration in County Governments in Kenya: A Case of County Government of Kirinyaga," Res. J. Financ. Account., 2020, doi: 10.7176/rjfa/11-18-17.

[10] [10] D. Weiss and V. Molinaro, "Integrated leadership development," Ind. Commer. Train., 2006, doi: 10.1108/00197850610700763.

[11] [11] T. J. Collins, "Review of the twenty-three year evolution of the first university course in green chemistry: teaching future leaders how to create sustainable societies," Journal of Cleaner Production. 2017. doi: 10.1016/j.jclepro.2015.06.136.

[12] [12] K. E. Garett, "An Approach to Aligning Leadership Development With Organizational Strategy Management (Doctoral Dissertation)," ProQuest LLC, 2017.

[13] [13] L. B. Nissen, D. M. Merrigan, and M. K. Kraft, "Moving mountains together: Strategic community leadership and systems change," Child Welfare, 2005.

Exploring the Concept of Strategic Thinking

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Abstract— Planning for the future requires the capacity to think strategically. It is the ability to plan plans and come up with concepts that will take into account the numerous obstacles that lie ahead while also coping with changing situations. This chapter's discussion of strategic management and planning strategically. The main obstacles, challenges, and fundamental conflicts that academic organizations face while constructing their value systems and academic decision-making processes. Considering what we now know about academic culture as well as the assumptions and tactics of strategy, it is obvious that a lot of groundwork is needed before combining two quite distinct ways of thinking. The task of strategy must be theoretically and practically positioned in the academic thought-world and the culture of each institution if it is to be effective.

Index Terms— Academic, Decision, organizations, Planning, Strategic Thinking

I. INTRODUCTION

The declarative statement "The first task of a leader is to define reality" is found in the book Leadership Is an Art. The "world" he envisions is entirely based on values, ideas, and people rather than output quotas or corporate politics. Peter Senge draws findings that are consistent with DePree's assertion in The Fifth Discipline, one of the most important works on management philosophy of the 1990s. He focuses on the potent effect of what he terms "mental models," the unspoken patterns and presuppositions that underlie our thinking and affect how we understand and act in organisational life. The attitudes and presumptions may be used to a wide range of judgements, from methods of interpreting statistics to a vision statement. We could read some statistics or hear a few comments about a situation or a person, and we might also unintentionally interpret the information in terms of a predetermined mental model.

As a result, when questioned about dropping applications for admissions, we can retort that "numbers are wrong everywhere," utilising a pattern of fixed thinking that prevents us from arriving at alternate possibilities, possibly because of a protective or haughty mentality. Senge describes the "learning organisation" as one that has developed strategies for thinking about its own thinking, forging beyond rigid paradigms with self-awareness, conceptual receptivity, and ongoing evaluation of its own efficacy. Once again, the concept of reality is critical and directly relates to questions of strategy and leadership [1]–[3].

We have seen that higher education institutions have several facets to their identities, including value systems that are fundamentally divided between organisational and academic commitments. These value systems are intertwined with identity narratives, belief patterns, and methods of reality construction that filter experience to determine what is important, true, and worthwhile; as a result, the tasks of strategic self-discovery, decision-making, and leadership come up against paradigms that come before them. We choose and prioritise the aspects of our experience that are compatible with the things we value and convey in our tales using our thinking and judgement models as part of a multi-layered, integrated process of sense creation. These fundamental assumptions of cognition, which often go unnoticed and unchallenged, influence every aspect of judgement and decision-making in academic institutions. These provide the unspoken standards for how we consider purpose and vision. They also outline the standards for judging programmes and performance, as well as the high moral requirements for authority. The intricate workings of each person's and institution's enacted culture and thought world serve as an expression for all these presuppositions, creating a thick and complicated web of local reality.

Academic leaders and planners who are familiar with paradigms and how they relate to values and stories will be far better able to convey strategy as a discipline of change and sense making into a society where it is often not accepted or valued. They will be able to promote strategic thinking as well as an ongoing learning process about the realities of college life as the first stages towards a successful method of making strategic decisions. By the examination of multiple pictures that demonstrate various patterns of thinking about the aims of higher education, one might start to locate a space for strategy. We'll provide three examples of these representations, each of which links a group of presumptions, ideals, and stories to create a paradigm or model of reality. The models, which are primarily presented as tales, are exaggerated and fantastical renditions of various educational organisations. These are meant to convey ideals and attitudes that have a significant influence on both conventional and modern higher education, despite their quirkiness. These illustrations mirror a lot of the contemporary discussions over the value, importance, and future of higher education in a cutthroat global environment. Let's start by looking at the paradigms of the academic institution, the business school, and the educational mall. The theme of the responsive and responsible university—or, to be more exact, the paradigm of responsibility—will then be further theoretically explored.

I was discussing a significant financial issue with the

governing board as a young faculty member speaking for my peers. insistently and righteously stressed that any planned changes, notably the elimination of teaching posts, should not affect the academic programme. It appears that the faculty wants the board to construct a little white picket fence around the school to protect it from danger and evil. The board chairman provided a kind but sharp retort as the argument started to go south. We are unable to do it.

The image of the white picket fence conjures up a whole slew of associations and symbols for one of the traditional conceptions of the academy as a protected domain, a place apart from the acquiring and disseminating of the world, and one that upholds fundamental values, the good of which is rational enquiry. A potent paradigm may be found behind the images. It may be mythical, but despite that, it has a structural quality that taps on profound sources of meaning since it outlines the goals of academic societies. The institution appears to have timeless aims as soon as we enter it. We see instructors deeply involved in their studies or having meaningful dialogues with their pupils or other teachers. These are elegantly developing concepts. Despite the fact that its application to the larger world is of little significance, everyone expects that logical inquiry and dialogue will result in virtue and knowledge. Academicians have a strong sense of scepticism about all conventional wisdom and are energically involved in dissecting every concept and literary work they come across. Despite this, they nevertheless hold the view that their own ideas are worthwhile in and of itself. The school does not collect admission fees, and no one is paid to join or leave. Nothing is assessed other than by the norms of rigour and originality since no accrediting body has yet located it. Anybody who uses the phrase "strategy" is referring to military operations. Some instructors start to worry about the location as the generations pass one another. In order to deter individuals from leaving their intellectual comfort zones and to keep out students who are not serious about the dialogues or who are searching for employment, a number of little white gates have started to appear around the terrain.

The Corporate College

The school undergoes a succession of cultural upheavals and eventually vanishes for unknown causes. It has been replaced with a large university on a campus with wide lawns and tall structures that house labs, classrooms, studios, and offices. These buildings are all stocked with manuals of regulations and procedures and have endless rows of computers. Hundreds of students, instructors, and staff members are circling the campus in their cars or hurrying back and forth seeking for a spot to park. There are several different schools, colleges, programmes, institutions, and institutes. Each of them is required to increase income through soliciting donations, increasing enrolment, boosting pricing, controlling expenses, and pursuing contracts with the public and private sectors for research and expert services. Some of the more recent contracts hold particular promise

since they might result in the university owning start-up businesses or licencing procedures, both of which have the potential to generate large income flows. While many people cringe at the expense and worry about the influence of corporate sponsorship that it involves, a sizable new sports stadium is anticipated to be another source of income. Obviously, the institution is driven by an entrepreneurial paradigm of choice.

With all these changes, individuals often and out loud ask whether the institution has not evolved into a different kind of business—University, Inc. Has it evolved into a product of the market, a business offering information and pleasure for everyone willing to pay for it? According to many, the university has come to the point where it must compromise its most fundamental principles of free inquiry in order to meet the private interests of its research clients. It seems to have lost the ability to think coherently about itself and its goals. Its goals are fragmented and incoherent, and its values are quick-fixes and vulgar. Plans and strategies are commonplace, although they represent a wide range of unfocused goals and ambitions. These very questions demonstrate that many of the academy's university offspring still use the paradigm of the academy as a reference point for their values and views, despite the institution's strange departure. Both in memory and in aspiration, the golden era endures.

The Learning Center Shopping Mall

The language and ideals used in the paradigm of the educational shopping mall are openly taken from the world of business, thus there is no room for interpretation. The logic of strategy, markets, consumers, price, and branding shapes its conceptual framework. The fundamental tenet of the mall is that a successful business finds its market niche by luring and satisfying consumers. The management discipline of strategic planning directs the branding and marketing process. As long as the consumers are happy and continue to visit, it doesn't matter whether they ever experience the academy's love of knowledge for its own reason. Here, value is contingent and instrumental, and it is calculated using the theory of marginal consumer advantage.

This pattern of pragmatic presuppositions is accompanied with imagery that presents education as a type of business. When we think of a mall, we see it filled with students making selections from the academic counterparts of boutiques, speciality stores, and department stores. The businesses promote with enticing slogans like "Learn more, pay less" and "Useful education for today's world," charging noticeably different costs, and are supported by considerable market research that demonstrates that clients seek job training and are more likely to haggle over pricing. In order to serve the demands of the consumers rather than the professors, they also want the businesses to remain open 24/7. The mall provides courses and certifications that can be finished quickly to accommodate the students' hectic schedules—the majority of them work full-time and have

responsibilities to their families. Customers yell loudly as a consequence if they feel that they are being asked to do too much or too little.

The shops are all tastefully furnished and have easy access to the most cutting-edge information technology, and some of them offer an extraordinary range of Internet, audio-visual, and telecommunications capabilities, including online courses with quality courseware. No instructors are present on the website since all the offers are available online and are backed up by substantial Internet resources, other information sources, and study aids [4]–[6].

II. DISCUSSION

Everyone acknowledges that the mall is lively since visitors of all ages and socioeconomic classes frequent the educational retailers. The majority of the patrons say they want to come more often and later even though many just remain for a little period of time. The businesses only provide well-liked and useful programmes that need little payments for part-time instructors' salaries and avoid incurring overhead expenditures for labs, libraries, art facilities, and the like in order to cover their costs. As a consequence, majors in the fundamental fields of the arts and sciences are not available, nor are the stores expected to support any academic research.

These three fantastical narratives of learning in the academy, business university, and mall create contrasting images. Even yet, they depict competing paradigms of thinking and value that are influencing how higher education will develop. They all base their value systems on various points of reference. It is wise for leaders and strategists to take into account how the university or university interprets and puts into practise the meaning of its own business. If the strategy process does not address beliefs at this core level, it will significantly reduce its ability to win support, credibility, and influence, particularly when used as a leadership tool.

University that is responsive and responsible

As we've seen previously, and as the three models blatantly demonstrate, strategic thinking at colleges and universities must reconcile two opposing perspectives on reality. It must maintain a commitment to both organisational sustainability and core academic values at the same time. This may be what Zemsky, Wegner, and Massy refer to as being "mission-centered" and "market-smart," but to resolve the value conflicts in these two terms, we need a range of conceptual resources. The answer must take into account each component of the problem if we are to accomplish a lasting reconciliation of these mindsets. If we don't, we'll wind up seeing higher education as either a solitary place of reflection or a place for business rather than ideas. There are several elements needed to complete the reconciliation, including the right methods of conceptualising institutional identity.

The very nature of strategic thinking is that the identity of an academic institution is contextual, not abstract, and responsive, not set. At the moment of engagement with the outside world, a responsive and responsible institution assumes its unique shape. It applies its core intellectual principles to particular formative interactions with particular situations, and influence spreads both ways. Similar to how a person's identity is formed by integrating fundamental aspects of who they are with their environment, colleges and universities' academic values both shape and bear the stamp of the numerous social goals and practical realities that set them apart from one another. The pattern of assumptions most conducive to the job of strategy is offered by the paradigm of responsibility [7]–[9].

The constituencies and social structures that support colleges—whether they are the government, alumni, foundations, local communities and companies, donors and board members—as well as their beliefs and purposes—give them life. Several universities are the offspring of certain religious groups, and as they adjust to different types of change, they exhibit varied signs of that link in their identities. The majority of universities are products of state governments, perhaps created in the land-grant tradition to teach the "mechanical and practical arts," to give priority in admission to residents of the state, and to support the state's agricultural and business enterprises through teaching and research, all within the context of a changing economic and social environment.

Leaders, as agents, must first assess the strategic problem at hand and ask, "What is going on? " in order to react appropriately and consistently to the many fields of forces in which they exist and to which they must respond. They often achieve this in conversation with others and by using a broad range of methods to think and know, from storytelling to empirical investigation. As agents, we react by interpreting what has been done to us as well as by anticipating what will be said in return, and "all of this is in an ongoing community of agents." The concept of response-ability as open, inventive, and anticipatory answers to the problems and possibilities that the world brings our way is suggested by the paradigm of responsibility, which moves us beyond the concepts of legal and moral accountability.

Responsibility as a paradigm looks for an integrated, true, and appropriate response to the flow of life in which it finds itself. In contrast to what the traditional academic paradigm is prone to accomplish, it attempts to make sense of instrumental values via a consistent pattern of interpretation and response. Also, unlike the educational shopping mall, it does not degrade its sense of worth to market standards. In contrast to the corporate university's shattered identity, responsibility pursues authenticity and integrity via contact and discussion with the outside world. The accountability paradigm is pluralistic, with several legitimate patterns and synthesises of values, as opposed to relativistic, where every value is equally acceptable. In order to integrate values, effective leadership must maintain a laser-like focus on both the overarching goals of the business and the significance of

change.

Academic Contextual Identity

The absence of concepts and language needed to describe the institution's essential strategic identity causes many strategic planning projects to stagnate. As a consequence, they alternate between having a mission-focused approach to certain difficulties and a business-savvy one to others. The strategic comprehension of the academic programme itself is where the difficulty of conceptual presuppositions becomes most challenging. The development of the changing professional canon of each subject is the natural academic trend to improve quality and programmes; the addition of additional specialisations and brighter students is the most certain approach to add value and raise a department to a new level of excellence. This ingrained way of thinking is perfectly acceptable and often even necessary. The issue is that it is usually misdirected since it lacks a crucial relationship to the institutional or academic field's strategic prospects.

A responsive and responsible institution contextually differentiates its capabilities and goals to place its academic programmes in various ways. The academic programmes of an institution have a contextual identity, too. As a result, they include a set of academic tools and skills that the college or university may use to adapt in a special way to a demanding and shifting environment. The academic programme encompasses more than just various sets of course offerings, however comprehensive or sophisticated, and also a number of organisational and faculty competencies in programme design and implementation, as well as differentiated methods of instruction, student learning, and research. One might think about the value of education in context by seeing academic programmes and faculty abilities in this strategic light. From a strategic standpoint, links to education's bigger goals and value become clearer more rapidly, self-understanding connections open up new opportunities, and the idea of a shared, community effort becomes tangible and essential. The institution's individuality results from the way its institutional body and academic spirit interact to form a singular character [10], [11].

An Integrated Strategy Process Framework

Our objective in the framework that follows is to outline the crucial elements of an integrated strategy process that reflects the paradigm of responsibility. The procedures listed here don't include anything particularly complex or ground-breaking, and they aren't portrayed as the only valid or conventional form of approach. It will be familiar to decision makers who have prior expertise with strategic planning, but those without that background may use it as a point of reference for part 3. It's important to highlight that, in comparison to most textbook models, this model proposes a more thorough and integrated approach to strategy. This is accomplished by putting values and vision at the centre of the process and by explicitly including the duties of strategy execution, financial concerns, and quantitative strategic indicators. Developing and implementing strategy is a systemic process, as we will repeatedly see, particularly when used as a tool for leadership.

While the suggested relevance of identity and vision in the work of strategy may seem clear, many institutions fail to take advantage of its significance as a method to turn the process into a tool for strategic leadership. It has been shown in the previous argument and the following sections that for the power of identity and vision to be effective, strategy must be situated within the proper conceptual framework. To be genuine and inspiring, they must resonate with the ideals, stories, and opportunities of a location. A vision is, more specifically, a story of ambition. The cognitive form of a vision is the same as that of a story because it proclaims meanings that are to be experienced, not only thought. The capacity of a strategy to establish a shared vision of the future that inspires a group to make commitments, define priorities, and take actions is another crucial factor in the transition from management to leadership. Strategy must be a kind of leadership if it is about purpose and vision.

Understanding the Strategy Work

Effective strategy programmes frequently suggest a link to leadership that is fairly genuine, even when it is not stated or systemic. Colleges and universities that are successful at setting new paths may often be linked back to the considerations and conclusions of a strategic plan or to the less formal but no less significant impacts of a persistent pattern of strategic thinking. When strategic planning serves as a benchmark for successful communication and decision-making across campus constituents, intentional strategic change may occur from both the process and the content of strategic planning.

Of fact, there are a number of reasons why strategic planning often fails in these ways. Our focus is on identifying, defining, and systematising the traits of successful, though sometimes implicit, syntheses of leadership and strategy. By integrating strategy into a wider conceptual framework, we attempt to bring out its implications for leadership. To achieve this, we start with strategy as a given collection of both implicit orientations and explicit behaviours. As we achieve this, we shall follow the paradigm of participative leadership. Like with a lot of academic work, our goal is to interpret commonplace behaviours, ongoing dialogues, and emerging practises in a fresh way in order to uncover hidden meanings and possibilities. If we are able to identify the characteristics of what may be a formal procedure and discipline, it can be used intentionally, methodically, and successfully in a variety of situations within an academic institution.

The systematisation and communication of the method's operations provide the groundwork for a cogent decision-making process that engages all of the parties involved in the governance system. When strategy processes are influential and effective, they serve a variety of purposes,

including fostering cognitive learning, transforming the organisation by developing a shared vision of quality, positioning the organisation and its services in a competitive market, and serving as a tool for management and leadership. In a word, the procedure is conceptually and procedurally integrative. At its finest, the university will become a hub for leadership, initiative, and strategic decision-making, incorporating strategic leadership into the continuous collaborative work at every level and unit.

Relying once again on the relational model of leadership, we develop an awareness of aspects of strategic leadership that we may not have otherwise. The spirit of collegiality and procedural fairness that develops trust and mutual commitment among and between participants and the official leaders of the process and of the organisation may be found within a successful strategy process itself. We can comprehend how the task of strategy transforms into leadership as it creates background circumstances that empower and drive participants when it is projected against the demands and values of people.

The strategy process is inherently integrative when used methodically as an applied discipline. It links the internal and external settings, as well as history and change, intentions and deeds, and resource demands and justifications for obtaining and using them. It combines goal-setting with measurement, data with context, and planning with budgeting. The term "strategies" as it is used in this context refers to an integrated and cooperative process of sense-making and direction-setting that develops and implements initiatives, goals, and actions based on an analysis of organisational strengths and weaknesses as well as threats and opportunities in the broader context. It develops a vision of the finest opportunities for future institutional advantage and the creation of educational value. The framework offers a thorough model of strategy that covers both the preparatory activities and the main milestones and processes of the process. The material becomes integrated, the approach is adaptable, and the execution is methodical when it is carried out using an engaging leadership method.

Each organisation will find a way to modify the procedure to suit its requirements, giving a passing mention to certain procedures when appropriate and highlighting others. The investigation of identity and vision will be at the centre of the work in some instances, while the environmental scan may be the work's most prominent aspect in others. Sometimes the academic programme will get the majority of attention, while other times it can be financial concerns that are the main emphasis. Instead of the other way around, strategy is meant to benefit the institution.

Institutions will always pick carefully how many strategic initiatives and projects to create throughout each of the intense planning stages to avoid the process getting out of hand. The framework may be used as a rough checklist to identify the issues that need to be addressed in the next stage

of planning. The concerns, regulations, and initiatives that are or may be of strategic importance in that field should be considered for each entry.

Placing The Strategic Elements

When leaders bring a strategy process to a campus, they discover that it calls for more staff participation than just a handful who are familiar with strategic planning methods. It cannot simply be thrown into an organization's work from above if it is to be useful. The process's creators must comprehend how strategy has functioned inside the institution's decision-making history, politics, and culture and must explain how they want the task to be carried out. The majority of the teachers and staff will associate strategy with any successful or unsuccessful earlier instances of strategic planning on campus. One of the most important aspects of the job of situating strategy is outlining and delineating the features of the strategy process with campus decision-making authorities. Every campus has a governance structure that has been differently documented in contracts, agreements, and bylaws that have been negotiated through time. Designing the specifics of a strategy process while ignoring campus procedures and expectations for governance is foolish.

A complicated process never operates on its own; instead, it depends on the efforts of many individuals in several ways. The work of strategy draws on discussions, ideas, and suggestions that take place inside the process-using unit or across the institution. Nonetheless, selected administrative officers and faculty members, beginning with the president or top administrative officer of a unit, shall carry out the task of directing, coordinating, and creating the process and its outputs. The ideas and strategies put forward in this book are directed first at people who will define, characterise, start, and take responsibility for the process, then at those who will engage in it in different capacities. It is crucial to have an idea of how people will be engaged while discussing the strategy in its early phases.

Parts of a Strategy

The literature and my own experience as a consultant and practitioner demonstrate that the job of strategy tends to sort itself out along a spectrum of methods distinguished by varying degrees of systematisation and comprehensiveness, as well as by distinct aims and conceptual models. We propose a diagnostic analysis of the strategy to prepare for the duties of strategy. While setting and communicating objectives for what they intend to accomplish, the categories assist individuals in charge of the process in making their intentions clear.

Thinking strategically and tacitly

While it has been on the rise for two decades, certain organisations may be considered to have a tactical orientation since they do not heavily depend on strategy, either explicitly or informally. Making decisions more in response to

challenges, problems, and crises than than anticipating them is a common pre-strategic approach. The model of choice is more extemporaneous and political than intentional. It is difficult to determine the strategy's design, despite the fact that significant tactical ability and understanding may be present. In situations like this, people sometimes lament that they don't know where the institution is going as it deals with a never-ending stream of issues and crises. Ad hoc orientation often reflects the inevitable realities of a turbulent environment, such as when financial issues overtake an institution's goals or when other disasters afflict an organisation. In other cases, the avoidance of strategic planning may be attributed to administrators and faculty members' unwillingness to hand up power and influence to a procedure they dislike and worry could take a turn they cannot predict.

The perspective of tacit strategy is supported by a number of institutions, according to experience. Despite not using a formal planning process, they exhibit a tacit pattern of cohesive strategic thinking and decision-making. It may very well have its roots in a vivid institutional narrative that directs the organization's activities. Smaller institutions and academic divisions of bigger ones often have extremely unique objectives and values that are motivated by a vision or by a story of notable accomplishment. The difficulties tacit strategy has in adapting systematically to change in the external environment or inside the institution itself is only one of several issues it has. A strategy loses its effectiveness in giving direction for consistent decision making through time and across the institution if it is not made clear. Moreover, it fails to provide a framework for methodically articulating objectives and priorities to the institution's ongoing influx of new teachers, staff, and students.

Planning Strategically

We get into the most crowded part of the spectrum as we approach strategic planning. However, as we have discovered, the approach cannot be precisely defined in higher education, as a concept it distinguishes between goal-setting and goal-accomplishing. Despite the way it is used often closes the conceptual gap, it frequently nevertheless functions as a projection strategy.

The technique often entails episodic or recurring planning processes, which are frequently initiated by a change in the president, an accreditation review, or the planning of a capital campaign. Usually, a special committee or commission made up of individuals representing various interests is tasked with developing a plan. After the commission has produced its report, it is disbanded. The strategic plan may have a significant impact if the time is appropriate and it has strong support from the governing board, the administration, and a sizeable portion of the faculty. Another way to practise strategic planning is as a continuous discipline, where objectives are regularly amended and communicated extensively throughout the campus while strategies are continually being reviewed or developed. Planning is far

more likely to be more than just projecting objectives as it develops into a discipline since implementation ideas will be often put forward. Yet conceptually, there is still a disconnect between setting objectives and actually accomplishing them.

Strategic Planning

At this point on the spectrum, strategic planning has been institutionalised via ties to the operational decision-making processes inside the company. The aims of strategy are converted into administrative duties and integrated with ongoing techniques of assessment that are given back into the system of strategic management. In the last ten years, as institutions have become frustrated with planning as a projection tool, the profile of strategic management has been more pronounced. At many institutions, the duties associated with strategic management follow an uneven and divided pattern. Several departments and programmes fail to create strategies for ensuring that objectives are realised because they disregard or avoid the process. As important administrative executives create control mechanisms and procedures to combine operational and strategic decision-making, the strategy is fully integrated into the management system.

Strategic Management

For organisations that apply strategy consistently and constantly, it frequently operates as a vehicle of reciprocal leadership—as a participatory direction- establishing process, not merely as a system of control. The planning process is clearly and truly focused on a future vision at this point on the spectrum. The president's dedication, that of the other senior officers, and the efficiency of a central committee or council are all crucial to strategic leadership, which is often comparatively concentrated. The institution's methods of assessment, decision-making, and communication at all levels, including the work of the governing board, are driven by a continuous process known as strategic leadership.

Strategic leadership seems to be established in certain organisations as an organisational disposition and part of the culture, rather than just as a set of formal discussion processes. When this happens, the company has achieved a position that is evident in how leadership is distributed across the board. As leaders and followers are always shifting positions, it is difficult to describe the distinctions between them. Fresh ideas emerge everywhere, initiatives are made by a wide variety of organisations and people. People in positions of power follow those who have the most appealing ideas and take the initiative by organising people and resources around the most promising prospects. A lot of people have internalised the narrative and the goal, and leadership is a transparent process and presence in the ways choices are made and carried out.

These positions provide a set of benchmarks for mapping an institution's experience and objectives for strategy-related activities, even as mere assumptions. A university or

university greatly benefits from locating its method and clarifying its aims when it chooses to launch or restructure a strategy programme. It should ask itself two fundamental questions: How have we previously applied the strategy process? Now, how should we use it? It is important for individuals in charge of the process to be clear about their goals and expectations for it, for themselves, and for the people who will devote their time and effort to it. The chances of success are greatly increased by thorough study of the organisational dynamics and models of thinking that define the environment, regardless of the options for the implementation of strategy, many of which may be constrained by circumstance [12], [13].

III. CONCLUSION

The main forces behind success in organizations continue to be leadership and strategic thinking. To this goal, several schools of thought have been promoted. Both teaching methods and classic theories are categories for these ideas. Creativity, transformation, and the policy itself are closely related during the creation of a strategy

REFERENCES

[1] [1] S. Pattinson, "Strategic thinking: Intelligent opportunism and emergent strategy - the case of Strategic Engineering Services," Int. J. Entrep. Innov., 2016, doi: 10.5367/ijei.2015.0212.

[2] [2] A. Batra, P. Kaushik, and L. Kalia, "System Thinking: Strategic Planning.," SCMS J. Indian Manag., 2010.

[3] [3] D. F. J. Schraven, P. Arghandeh Jouneghani, H. M. Jonkers, and M. J. C. M. Hertogh, "Design to market thinking: exploring the merits of strategic niche management in design thinking," Technol. Anal. Strateg. Manag., 2021, doi: 10.1080/09537325.2021.1986211.

[4] [4] P. S. Moyer and E. Mailley, "Inchworm and a Half: Developing Fraction and Measurement Concepts Using Mathematical Representations," Teach. Child. Math., 2020, doi: 10.5951/tcm.10.5.0244.

[5] [5] P. R. Dempsey and H. Jagman, "'I felt like such a freshman': First-year students crossing the library threshold," Portal, 2016, doi: 10.1353/pla.2016.0011.

[6] [6] R. Massingham, P. R. Massingham, and J. Dumay, "Improving integrated reporting: A new learning and growth perspective for the balanced scorecard," J. Intellect. Cap., 2019, doi: 10.1108/JIC-06-2018-0095.

[7] [7] W. Q. Judge and C. P. Blocker, "Organizational capacity for change and strategic ambidexterity: Flying the plane while rewiring it," Eur. J. Mark., 2008, doi: 10.1108/03090560810891073.

[8] [8] H. Asenbaum, "Cyborg activism: Exploring the reconfigurations of democratic subjectivity in Anonymous," New Media Soc., 2018, doi: 10.1177/1461444817699994.

[9] [9] M. Barak and L. Shakhman, "Fostering higher-order thinking in science class: Teachers' reflections," Teach. Teach. Theory Pract., 2008, doi: 10.1080/13540600802006079.

[10] [10] I. Tichá and J. Hron, "Knowledge in the business strategy context," Agric. Econ. (Zemědělská Ekon., 2006, doi: 10.17221/4991-agricecon.

[11] [11] C. P. Seneviratne and A. L. Martino, "Budgeting as practice and knowing in action: experimenting with Bourdieu's theory of practice: an empirical evidence from a public university," Asian J. Account. Res., 2021, doi: 10.1108/AJAR-08-2020-0075.

[12] [12] J. Pänke, "Liberal Empire, Geopolitics and EU Strategy: Norms and Interests in European Foreign Policy Making," Geopolitics, 2019, doi: 10.1080/14650045.2018.1528545.

[13] [13] R. Massingham, P. R. Massingham, and J. Dumay, "Improving integrated reporting," J. Intellect. Cap., 2019, doi: 10.1108/jic-06-2018-0095.

Processes of Strategy in Strategic Governance

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Abstract— Even the best-designed tactics will fall short if they are not carried out correctly. It is also crucial to keep in mind that strategy execution is impossible without stability between the strategy and every aspect of the company, including the organizational structure, compensation system, resource-allocation procedure, etc. Collegiate decision making: simplicity and decentralization, complexity and segmentation in college decision making in this chapter..

Index Terms— Academic, Decision Making, Governance, Strategy, Strategic

I. INTRODUCTION

Some of the theoretical and practical pillars that strategy as a type of leadership hinges on. Yet they are not enough to complete the job on their own. A college or university's structures of governance, daily decision-making processes, methods for gathering and using self-reported data, and cultural norms, expectations, and connections must all reflect strategic leadership. Its work will be carried out by a variety of decision-making organisations, including commissions, committees, teams, and task forces. The potential of strategic leadership will not be achieved unless strategic practise is managed ethically and effectively. Many significant techniques and instruments, including strategic indicators, are used in this governance to carry out the function of strategy [1]–[3].

Complexity And Fragmentation in Collegiate Decision Making

We must once again face the challenges of governance in higher education as we move towards designing the decision-making mechanisms for strategy. As we've seen, academic activity takes place collegially whereas administrative activities at colleges and universities are structured hierarchically. At the same institution, the two systems function separately as management and governance systems. Bringing these divided systems of power together is one of the main goals of strategic leadership.

We have also looked at how the complex elements of shared governance coexist in a precarious equilibrium, often leading to heated disagreements over both the subject matter and the norms of academic decision-making. But, despite the system's ongoing clumsiness and sometimes malfunction, we shouldn't believe that academic groups might somehow undermine or undermine the collegial model. The main purpose of the organisation must be driven by academic competence.

Strategic leadership views shared academic governance as a secondary issue to the manner in which it is normally applied. Its structural complexity and fragmentation are its main strategic flaws. The problem isn't so much with what the system sometimes can't accomplish, but rather with what it can't do under regular circumstances. Studies from the past and the present both concentrate on these ongoing issues.

Shared governance as it is often implemented is unable to handle the whole of the institution and the demands placed upon it in a systematic and cohesive manner because it lacks mechanisms for integrative decision-making. Although a college or university's strategic identity is rooted in a network of interrelated links with the outside world, shared governance mechanisms address problems via fragmented and time-consuming decision-making procedures. The concerns are divided into sections and sent to several administrative and academic groups. There are groups that focus on different aspects of education, such as general education, retention, educational policy, teaching and learning, financial assistance, the budget, and so on. At research institutes, centres, and programmes that have major financial control but may only be tenuously linked to the academic core of the university, significant choices are increasingly taken at the periphery or outside of the faculty governance structure. Complicated processes and fragmentary frames of view obscure the strategic totality. The typical decision-making processes in academic settings frustrate rather than facilitate successful leadership.

Vertical complexity follows fragmentation on the horizontal axis. With a variety of committees and academic officials participating in the process, decisions regarding academic problems move slowly up and down a laborious chain of reviews that encompass departments, divisions, schools, colleges, and the university. Decisions made for operations often go smoothly in the system. But, because of its fragmented, laborious, and slow decision-making processes, the system is unable to react cogently or rapidly when faced with concerns of strategic and academic change.

Based on my own experience in a variety of settings to show the problems with academic decision-making. With 24,000 students, Flagship University is a well-known comprehensive institution that grants a complete range of undergraduate and graduate degrees and supports several productive programmes, institutes, and centres for fundamental and applied research. According to a recently completed research, the university's attrition rate for first- and

second-year students is much higher than would be expected based on the study population's academic aptitude. The university employs a professional team in its office of planning and budget to routinely assess significant challenges of this nature since it is a big and complex institution. A report has been delivered to all relevant offices after data from leaving and enrolled students was gathered and examined.

The new general education programme, according to the research, has a detrimental impact on student retention. Students complain that the programme gives too many lecture lectures, duplicates material from high school, and compels them to complete prerequisites drawn from a narrow range of options. Students sometimes have to postpone enrolling in courses that are required for a major or in subjects where a delay might result in their losing abilities, such foreign languages, due to the restricted number of sections in many professions. A lack of personal interest in the academic programme is thought to be associated with high attrition after the first and second years.

After the report is received by the different vice presidents, they make sure that the president is informed of it and that it is placed on the agenda for the weekly meeting of the president's executive staff. The report's conclusions have the president and his top colleagues very worried, and the senior business officer mentions the state subsidies and the loss of tuition income. The faculty senate chairman and the chairperson of the senate's curriculum committee will be asked to study the report and discuss its findings, it is decided during the staff meeting. What suggestions and thoughts do they have?

The report makes many mentions of issues with residential life, excessive drinking, and accusations that fraternity and sorority pledging rituals take up too much time for first-year students and contribute to the high attrition rate, according to the vice president for student affairs. He talks about the problems with his personnel and solicits suggestions.

The report will be discussed at the next meeting of the curriculum committee of the senate. A number of statisticians on the faculty disagree with the report's methodology and findings. Some express sincere sympathy but make remarks about the delicate political nature and complexity of the situation. An excellent political compromise that introduced a number of new courses to internationalise and diversify the offerings resulted in the creation of the new general education programme. Also, it managed to enrol students evenly throughout a number of disciplines. The committee chooses to send the report to the dean of arts and sciences in order to avoid going through all of these topics again. The committee urges the president, provost, and dean of arts and sciences to find more funding to make up for the fact that departments in the arts and sciences are not getting enough assistance to establish the new programme as intended.

The dean of arts and sciences meets with department chairmen in a series of meetings after receiving the senate committee's findings and asks that important departments debate the matter. The discussions highlight several questions and difficulties that are not directly relevant to the issue of high attrition, hence the outcomes of these sessions are unclear. There are several concerns that there are not enough financial resources to properly support the new programme, and there are many conflicts amongst departments over the topics and teaching styles of the general education courses. After their talks, the vice president for students' staff suggests a plan to combine first-year courses with fresh residential hall initiatives that would engage the general education faculty. They advise that money be sought to help the new project. They submit their report to the vice president, who then distributes it to the provost, the president, and the dean of arts and sciences [4]–[6].

II. DISCUSSION

The president meets with the dean of arts and sciences, the vice president for students, and the provost after reading about the senate committee's response and reviewing the other reports. As his aggravation mounts, he expresses it bluntly: "We have a very major retention problem tied to a fundamental academic programme, and no one is willing to do anything about it. He discovers that numerous departments and the curriculum committee in the arts and sciences are still researching the issue. Everyone wants to deflect responsibility for the problem and spend money on it.

Making Decisions at Flagship

This instance demonstrates a variety of points, one of which is that the institution's issues predated its high turnover rate. These issues are ingrained in the university's decision-making process. It lacks a method for defining and addressing strategic and educational concerns that cut across many segmented decision-making processes. It can only attempt to create links after the fact, which is the best it can do. Its governance structure is operating well, and protocols are being observed. Nobody is complaining about arbitrary choices, lack of consultation, or poor communication. The systems that are in use are also functioning. Studies are being finished, talks are being conducted, and proposals for actions that will shift the governance system up and down are being made.

The university's inability to foresee strategic concerns and how they relate to one another is the problem. The senate committee is now attempting to address curriculum and retention challenges from a university-wide perspective, but it lacks the knowledge, power, time, or resources to carry out its goal. The discussion produces a complex mixture of conflicts over professional and academic issues, priorities, and resources that are reminiscent of the garbage-can model of decision-making because the dean, department chairs, and faculty in the arts and sciences all approach the problem from different directions and with multiple interests. The provost and vice president for students have the power necessary to assess the concerns, but not to put into effect any

recommendations that call for faculty involvement. The university's inability to conceptualise itself as an integrated system in a strategic manner is the root of the issue. It also lacks a framework for making decisions that would establish priorities, determine agendas, and allocate resources in response to the most urgent problems influencing its future [7], [8].

Admin and faculty positions that are undervalued

In this instance, many of the organisational and structural challenges that make leadership at colleges and universities so challenging are once again evident. The clear division between "academic" and "administrative" matters has become flimsier. In this illustration, the issues with general education lead to reduced enrolment, higher admissions demands and expenditures, and a decrease in tuition income. This issue has a huge impact on other issues within the company. Yet, general education is researched separately rather than as a component of an organisational system since it is thought of as an academic issue. The president's statement made it evident that he is upset in his role as an academic leader. He is a reputable teacher who has researched several effective general education methods. But, he is also aware that excellent suggestions for educational policies and procedures sometimes don't matter much. The majority of campuses, including his, include committees and organisations that make decisions about academic problems according to their own set of norms, expectations, and proprieties. He feels left out despite the fact that the institution has a lot on the line. But, this instance and others like it point to something different. The forces that are reshaping higher education and society at large do not halt to distinguish themselves in light of the haphazard decision-making procedures used by academic institutions. Technological advancement, market pressures, demographic changes, social change, economic cycles, globalisation, and political tendencies are powerful, overarching realities that occur as they will. In the past 25 years, these shifts have raced through the corridors of higher education, transforming the identities of schools and universities into something more contextual. The internal reality has been strongly influenced by the external one. Certain educational institutions are becoming more like the market-driven reality of corporate decision making, as we have seen in the pictures and models that we looked at previously. These tendencies have, among other things, increased the depth and intensity of administrative decision-making. It has by necessity taken on duties that belonged to the faculty as it becomes more specialised and professionalised.

Administrative decision-making is dominant in many areas, including the creation of new academic divisions and institutions, the execution of governmental laws, the development of infrastructure, and the administration of financial resources. While there are exceptions, faculty members are often relieved that they no longer have a major say in choices about student life regulations, admissions, or

financial aid, particularly because these decisions are now mostly influenced by marketing strategies and computer models. Many faculty members have a sense of marginalisation in their organisational responsibilities, similar to how academic administrators and trustees sometimes feel frustrated by their inability to advance the academic agenda. Yet, they struggle to come up with solutions since doing so would require additional time and effort, which they find difficult to commit to. They no longer have access to most of the university due to the changing globe.

Strategic leadership

It is not enough to merely clarify the roles of shared governance in ever-more-detailed ways to allay the tensions that exist on both sides of the administrative and academic divide. New methods of thinking and decision-making processes are required. We now want to provide concepts for fresh models of strategic governance using certain components of an integrated conceptual framework for strategic leadership.

It has been more evident over the last several decades that there are three main types of organisational decision-making, all of which are linked in actuality. These levels may be divided into governance, management, and strategy. The purpose of governance is to establish and assign formal authority and responsibility inside an organisation that derives from the governing board's legal authority and fiduciary duties. Yet, the formal governance system can only function via the many systems of management and decision-making that have been assigned to the institution's administrative and academic operational systems. Yet, without a strategic connection between them, the operational and governance systems cannot work successfully. Whether explicit or implicit, the strategy system distributes resources, establishes priorities and objectives, all in the name of a general future course. At all three levels, official tasks and the power invested in posts serve as the primary lenses through which leadership is now perceived. The formal academic decision-making process does not have a distinguishing trait of leadership as an engaging relational process of mobilising meaning and commitment to shared goals.

While touring campuses for accreditation, visiting teams come to the conclusion that whichever aspect of the governance structure has the most influence on the local institutional culture often dominates major strategic choices concerning programmes, policies, buildings, and budgets. One or more faculty committees or advisory councils may covertly take up portions of the strategy portfolio at research institutions and small schools, collaborating in a variety of ways with administrative officials. They often delegate power both formally and by tradition. Conversely, more often, as was the case at Flagship, there isn't a continuous integrative strategy process of leadership or governance to address issues that span across several domains, which is exactly how the majority of organisational problems manifest

themselves. While it takes many different forms in higher education, strategic decision-making is not a fundamental, defining, or structural aspect of the shared governance system.

Considering these significant obstacles, it is crucial that strategic governance, strategic leadership, and strategic management become more closely and clearly connected. A technique to connect governance and management processes so that you can react to the harsh realities of the world effectively is provided by the approach and discipline of strategic leadership. The establishment of the deliberative bodies, processes, and procedures necessary to carry out an ongoing process of strategic decision making as part of a wider governance structure is referred to in this context as strategic governance. Since the strategy process and its vehicles need formal definition, legitimacy, and authority, the problems reach the level of governance. The governing board, which is the institution's highest governing body, will eventually be asked to approve a formal plan procedure on the president's advice after consultation with the faculty and administration.

The type of the deliberative body that will oversee the strategy process is one of the key considerations regarding strategic governance given the collaborative norms and modes of decision-making in higher education. Schuster, Smith, Corak, and Yamada explore the problems with institution-wide planning committees and councils at eight institutions in their book Strategic Governance.

They are doing this in response to George Keller's assertion in Academic Strategy that a "Joint Major Decision Committee" made up of top administrators and academic members is a useful tool for strategic planning. Despite the fact that the committees Schuster and his colleagues studied were remarkably different in terms of their makeup, objectives, and effectiveness, they discovered that one of their goals in creating each of them was to serve as a foundation for discussing the major strategic issues the institution was facing. The authors adopted the general phrase "Strategic Planning Council" to describe the function of these committees and to convey their apparent goal, even though none of the eight institutions used the precise word and the majority of them did not routinely perform thorough strategic planning. While the stated goal of these SPCs was to provide professors and staff a place to participate in significant economic and planning concerns, it is sometimes difficult to find a continuous emphasis on strategic issues in their activities. Despite this, these organisations often arose to address other significant institutional needs and were praised for their efforts. Members of the campus community and others involved in the process gave the SPC's efforts a good or very positive evaluation in half of the eight instances examined. The judgement was obviously divided and, in two cases, very unfavourable in the other half of the institutions. The SPC ultimately went out of business or underwent significant change in three institutions, usually with the

election of a new president.

Schuster and his coworkers examine four main elements that they think would help make SPCs successful as tools for strategic governance: The SPC must focus on the genuine strategic issues facing the institution and avoid getting entangled in arguments and controversies about operational matters or budgetary details. The SPC must be diligent and consistent in informing the campus community of its work and recommendations. The president and other university officials should also be informed of the SPC's recommendations.

Studying cases of strategic governance

It is obvious that institutions continue to struggle with the kind of governing body or bodies that can best establish a genuine strategic agenda when one examines the literature and the practise of strategic planning in a variety of situations. Some of the problems and disagreements in faculty governance and strategic planning in liberal arts schools are discussed by Larry Shinn. The formal counterpart of SPCs is now present at a large number of colleges and universities, however as we have seen, their duties and responsibilities differ greatly. They function in a range of institutional centralization and decentralisation with varying degrees of authority and responsibility. Participants and leaders often comment on how helpful a central advisory or steering group is.

The existence of a strategic "steering core" at each of the five entrepreneurial European universities was one of Burton Clark's key conclusions in his groundbreaking research. These major organisations, according to Clark, are dedicated to efficient planning, investing resources to maximise profits, and developing "a desired and durable institutional character." In conclusion, strategic thinking must be used effectively across the business, but particularly at its centre.

The Northern Colorado University

An ironic description of how the faculty senate and academic deans at the authors' own university, the University of Northern Colorado, never completely adopted the institution's strategic planning process can be found in a well-known book on college planning. Yet, certain aspects of the process were put into action thanks to the SPC's efforts and the president's power. The authors provide in-depth advice and practical lessons on how to create a successful SPC based on their own experiences with governance rules and procedures and research into the problems. The governance challenges faced by many colleges are both diverse and similar, and Brown University provides a comparable but distinct form of strategic decision-making. With the purpose of advising the president on academic and budgetary objectives, Brown has created a new faculty committee and updated an already existing one. The Academic Priorities Committee was created in an attempt to increase faculty input into the president's decisions about the wise use of educational resources. The complete spectrum of financial and fiscal concerns confronting the university will

be addressed by a parallel University Resources Committee, which will also provide recommendations. There isn't a central SPC or something like [9]–[11].

In this instance, there are a lot of questions as well. How and when are the faculty committee's discussions on the objectives for academic programmes merged with other university strategic initiatives? While important, the faculty's input on academic objectives and initiatives must ultimately be tied to the institution's bigger strategic requirements and its budgetary capacity. If it were heard continually at the main table of integrative strategic decision-making inside an SPC rather than in many advisory groups, it would have a stronger impact.

A Strategic Steering Core that Works

Each college and university have the task of developing regional networks and systems that effectively connect multiple areas of strategic decision-making via both informal and official channels. Without a methodical approach, an institution's strategic options and ongoing academic choices may rapidly become fragmented, redundant, and irritating, as we have seen at Flagship. It functions in fits and starts, sometimes squandering time and money on academic plans and initiatives that may fail because they are unrelated to more general educational challenges, other priorities, and available resources. All of these studies and situations demonstrate how crucial and urgent the creation of an effective vehicle for strategic governance and leadership has become for colleges and universities. The time has long ago come to update and reorganise the processes for group decision-making in order to respond cogently to strategic change. The live rail of campus politics is governance, but educational leaders who lack the courage or the knowledge to construct reliable cars for strategy may never arrive at their objectives safely.

Directives For Forms a Strategy Council

To provide recommendations for the formation of a strategy council, we may draw on the Flagship experience as well as insights from the literature and case studies. The analysis and suggestions are presented as a fictional report from a high-profile panel that was constituted by the governing board in response to the president's proposal. The study methodically highlights the strategic governance concerns and difficulties that must be resolved in order to establish an SPC. It accurately represents both the research on the subject and my personal work at several universities [12], [13].

III. CONCLUSION

Many managers and workers in a company are threatened by the implementation of a strategy. We foresee and accomplish new power dynamics. Both official and informal organisations are created, some of whose members may not be aware of their members' values, attitudes, views, or worries. Managers and workers may use confrontational behaviour as a result of changes in power and status positions.

REFERENCES

[1] [1] F. Maciá Pérez, J. V. Berna Martinez, and I. Lorenzo Fonseca, "Strategic IT alignment Projects. Towards Good Governance," Comput. Stand. Interfaces, 2021, doi: 10.1016/j.csi.2021.103514.

[2] [2] L. Parker, "Corporate governance," in The Routledge Companion to Critical Accounting, 2017. doi: 10.4324/9781315775203-16.

[3] [3] Z. Korachi and B. Bounabat, "General approach for formulating a digital transformation strategy," J. Comput. Sci., 2020, doi: 10.3844/JCSSP.2020.493.507.

[4] [4] J. Ratnatunga and M. Alam, "Strategic Governance and Management Accounting: Evidence From a Case Study," Abacus, 2011, doi: 10.1111/j.1467-6281.2011.00344.x.

[5] [5] M. Oliveira, M. Sousa, R. Silva, and T. Santos, "Strategy and human resources management in non-profit organizations: Its interaction with open innovation," J. Open Innov. Technol. Mark. Complex., 2021, doi: 10.3390/joitmc7010075.

[6] [6] Z. Korachi and B. Bounabat, "Integrated methodological framework for digital transformation strategy building (IMFDS)," Int. J. Adv. Comput. Sci. Appl., 2019, doi: 10.14569/ijacsa.2019.0101234.

[7] [7] M. J. B. Kabeyi, "Organizational strategic planning, implementation and evaluation with analysis of challenges and benefits for profit and nonprofit organizations," Int. J. Appl. Res., 2019, doi: 10.22271/allresearch.2019.v5.i6a.5870.

[8] [8] T. van Dijk, "Strategic spatial planning through pragmatic blueprints: Forms and levels of adaptivity in modernist planning of the Dutch IJsselmeerpolders," Futures, 2021, doi: 10.1016/j.futures.2020.102665.

[9] [9] M. Dairo, J. Adekola, C. Apostolopoulos, and G. Tsaramirsis, "Benchmarking strategic alignment of business and IT strategies: opportunities, risks, challenges and solutions," Int. J. Inf. Technol., 2021, doi: 10.1007/s41870-021-00815-7.

[10] [10] C. Wamsler et al., "Environmental and climate policy integration: Targeted strategies for overcoming barriers to nature-based solutions and climate change adaptation," J. Clean. Prod., 2020, doi: 10.1016/j.jclepro.2019.119154.

[11] [11] R. Diprose, N. I. Kurniawan, and K. Macdonald, "Transnational policy influence and the politics of legitimation," Governance, 2019, doi: 10.1111/gove.12370.

[12] [12] M. Oleskovicz, F. L. Oliva, and M. C. Pedroso, "Gestão de Riscos, Governança Corporativa e Alinhamento Estratégico: Um Estudo de Caso," Rev. Ibero-Americana Estratégia, 2018, doi: 10.5585/riae.v17i2.2513.

[13] [13] E. Magro and J. R. Wilson, "Policy-mix evaluation: Governance challenges from new place-based innovation policies," Res. Policy, 2019, doi: 10.1016/j.respol.2018.06.010..

The Metrics of Identity, Performance, and Aspiration as Strategic Indicators

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Abstract— The purpose of strategic process performance metrics is to demonstrate if the company is meeting the so-called strategic goals set by top management. The Balanced Scorecard is a commonly used tool to aid in identifying these objectives. Metrics for identification, proportionate actions based on important strategic indicators, evaluation and comparative evaluation indicators, in this chapter, strategic priorities and indicators are covered..

Index Terms— Identity, information, Leadership, performance, Strategic

I. INTRODUCTION

A collection of facts to serve as the institution's primary strategic indicators is another need for strategy to be effective. It wasn't created only to help the SPC, but it does become a fundamental and useful instrument in their discussions and activities. At this time, the majority of institutions have developed data profiles that they frequently provide on websites or in fact books. They ought to if they don't. Transparency regarding critical information promotes a common knowledge of the institution's relative position and strengthens the process' legitimacy. Accessible collections of measurable information are now considered to be the standard of good practise because institutional research and evaluation are required for accreditation. Its usage in strategy discussions is crucial and may even be pivotal in establishing an institution's identity and determining its course for the future [1]–[3].

The information that institutions gather, however, is often not presented in a manner that is beneficial from a strategic standpoint. Often, information is given in the form of lists or statistics with no obvious strategic meaning. Instead of inundating the reader with operational specifics, the statistics should aim to explain the organization's changing position in the world.

Identification Metrics

An organised collection of strategic indicators may reveal an institution's unique capabilities and traits in connection to its environment if they are carefully selected and correctly specified. Collins reminds us that exceptional institutions create measurements that go to the heart of what they do best; they highlight their unique skills, particularly in terms of their capacity to produce and manage resources. Both a place's narrative and its values may be found in its statistics, or, more accurately, a college or institution can examine its strategic data to find out about its unique values and capabilities. Identity stories are not developed or told in a hurry, and they must take into account both the institution's historical facts and present-day aspirations. An great illustration of the integrative thinking required in the subject of strategic leadership is the meticulous study of data. One characteristic of strategic thinking is the combination of the significance of values and facts, narratives and figures, and metaphoric language with quantification. To assess the link between various factors in the data, quantitative reasoning—such as regression analysis to identify and analyse significant strategic issues—becomes the norm. Studying the correlation between retention rates and SAT scores in a collection of schools that are comparable to one another, for example, is quite enlightening. The outcomes may provide a wealth of strategic considerations.

Quantitative indicators must be carefully chosen for their capacity to convey the institution's strategic identity and position if they are to be useful in strategic decision-making. The context provided by many publications and manuals that cover strategic indicators is useful for informing the strategy-making process. These publications generally advise developing indicators around a variety of important decision areas, including finances, admissions and enrollment, institutional advancement, human resources, academic affairs, student affairs, athletics, and facilities.

If one adopted all of their recommendations, there would be so many potential indications that a planning committee could never effectively consider them all. As its main and ongoing benchmarks, the central planning committee will often seek to use no more than fifty strategic indicators. A governing board normally receives 25 to 30 dashboard indications to provide them an instant picture of the institutional condition, while top administrators frequently analyse double that number. While a research and planning team may wish to keep tabs on a lot of indicators, strategy always aims to concentrate on facts that provide context. The goal is to interpret the indications strategically, and institutional leaders are responsible for managing such interpretations.

Significant Strategic Indicators

There is no quick cut to the effort that each organisation must do to create its own system of strategic measures, even with the assistance of competent manuals and sources. The list below is only one option created for a small college and was generously donated by President Thomas Kepple. It was inspired by and developed from an outstanding dashboard used at Juniata College. It has the benefit of incorporating various proportional metrics and trend lines as well as strategic objectives and comparative statistics and delivers a significant quantity of strategic information in a very cost-effective manner. This allows it to deal with identity, performance, and aspirational challenges all in one location. Much of the material, without a doubt, just initiates a strategic discussion that, as it develops, will call for several further statistical analysis and more comprehensive sources of data. A section on academic indicators, which are often absent from key indicators, was also introduced, it should be mentioned, just to draw attention to the problem of strategic academic evaluation.

This illustration shows how the indicators' growth is influenced by the institution's sense of identity and vice versa. When we see the metrics that a location uses to gauge its own success, we might infer what is important to it. Some decisions are unavoidable because they define overarching strategic challenges relating to budgetary resources and the reality of admissions and enrolment. They provide details about the global social and economic factors at play as well as the institution's place in respect to them.

The care with which they are defined in response to the strategic opportunities and challenges of the institution, regardless of the set that is selected, determines the validity and usefulness of the measures. The data must be gathered and examined thoroughly, regularly, and methodically if we are to learn anything important for making good strategic decisions. A retention rate, for instance, is difficult to quantify since it relies on a complicated model for categorising complicated patterns in student enrollment and ultimate graduation or leave, all of which vary greatly across different sorts of schools and universities and the units within them. A fundamental job of strategy itself is obtaining reliable data to answer the precise strategic questions that we should be asking of ourselves. For instance, there was a period when we just required information on the proportion of students receiving need-based help. The number by itself has little strategic relevance in the modern world. To do it correctly, you need to use both creativity and logic.

Proportional actions

The institution is able to create indicators that highlight the relevance of its unique qualities, including size and purpose, location, and performance, by combining two variables in the calculation. This is one of the first things to notice in table 5.1. It is inadequate and inaccurate to analyse the financial status in absolute terms without taking the institution's size and features into account. Now a common feature of the financial self-analysis of income and cost, as well as assets and liabilities, financial information that is relevant strategically is always based on ratios and percentages. The statistics reflect an institution's strategic position in relation to the competition and broader economic realities as we will see, proportional measurements are also readily compared to the standards of the higher education sector at large [4]–[6].

Although results for any individual year are often not strategically relevant yet recurrent patterns reveal obvious and conclusive implications, the data is sometimes also displayed in trend lines. Trends' accelerating or slowing rates of change are particularly important because they often indicate issues or opportunities with significant strategic ramifications. In conclusion, relative measures are well suited to provide strategic meaning since they may highlight the organization's unique traits in relation to its environment.

Comparative Evaluation

As our sample set of indicators shows, another key aspect of proportional measurements is that they make it possible to make relevant comparisons with other institutions. The majority of colleges and universities either depend on the IPEDS service of the United States or get data from a group of similar schools using a consortium like the Higher Education Data Service. Department of Education, sometimes aided by a federal agency that provides data services, such as the Association of Governing Boards of Universities and Colleges. Important strategic activities include choosing the comparison group and defining the information obtained. To build comparisons, one must first analyse a well selected collection of definitions and attributes.

Using comparative data may result in the creation of common standards, where particular measurements become connected to best practises and acquire the status of a norm. Nonetheless, even in the absence of a normative benchmark, institutions may still learn a lot about their identities and strategic positioning via analytical comparisons. Institutions learn about themselves in the same way that people do: by seeing themselves through the lens of another person's perspective.

When an institution looks at its tuition policy, for instance, it can be perplexed as to why a financially and academically comparable college in its comparison group has a tuition charge that is 18% higher. Both organisations have comparable cost and income structures and have sizable endowments. The conclusion of a thorough comparison research is that differing tuition discount rates—30% in one and 45% in the other—explain almost all of the variation in tuition price. The strategic ramifications of the discovery might significantly influence future overall resource levels by influencing financial aid policies, admissions tactics, and tuition pricing.

Comparative analysis may also highlight disparities in resource use that have a significant impact on how an organisation articulates its long-term goals. It will be particularly helpful in private institutions to establish the

expected horizon for the next cycle of projects and objectives by looking at five- and ten-year trends in fundraising from different sources. Colleges and universities may discover that a direct rival has a significant advantage that grows over time when comparing their per-student development figures. This realisation may lead to a number of outcomes, such as more realistic or nuanced goals or audacious initiatives to rouse a complacent constituency. According to the results of Good to Great, the success of organisations depends on their capacity to face the "brutal realities" about themselves.

Indicators and Evaluation

The evaluation of performance is a major area of organisational decision-making where strategic indicators are crucial. A large portion of the information that helps determine an organization's identity also reveals how well it accomplishes the objectives it sets for itself. Indeed, assessment needs its own systems and measuring subsystems, many of which will be operational in nature. Institutions have access to a far wider range of data sources and performance indicators than could possibly be included in a single set of key strategic indicators.

Yet, procedures are developed in an efficient strategic leadership process to link the ongoing outcomes of institution-wide evaluation to the achievement of the organisational objectives and long-term objectives. Strategic leaders at various levels within the organisation are able to understand findings in terms of their greater importance by being aware of the contours of institutional identity. The institution's managers and leaders started a chain reaction of strategic enquiry and decision-making across the organisation by seeing the work of strategic leadership as including a continuous integrative interpretation of performance information.

In order to fully understand the data generated by assessment, particularly in core academic activities, a significant degree of interpretation and expert judgement are often required. The data are used less for direct assessments and more as proxies or indicators. For instance, when it is discovered that 35% of graduating students enrol in graduate programmes the following year, both problems and solutions are offered. Before this knowledge becomes really important, much more has to be understood. How do these outcomes relate to the overall trend in graduate studies over the last five to ten years? What are the regional and broader trends in institutions like this? Which colleges and universities are taking graduates, and at what rates? What fellowships, scholarships, and other prizes have you won? How are the grads doing with their next coursework and careers? How do the facts relate to current or upcoming strategic objectives, or to ones that have already been established? The indicators are significant but incomplete kinds of data. They inspire queries, follow-up investigations, and the use of expert opinion. They have a lot to offer as the facts are gathered up into strategic thinking and ongoing self-improvement. They represent a questionable, if not malicious, venture if, on the

other hand, they are utilised as independent variables to rank order the accomplishment of institutions.

Strategic Objectives and Indicators

Strategic indicators may be essential in the process of setting quantifiable objectives as benchmarks for the ambitions specified in a strategic plan, as is implied in the remarks made above. In many circumstances, yearly indicators offer a reasonable point of reference for defining future objectives, particularly for those areas of the business that are readily quantifiable. The objectives of a strategic plan in fields like finance, admissions, and fund-raising should clearly be founded on a rigorous examination of past trend lines and not reflect an explosion of wishful thinking without a quantitative basis. The strategic objectives of the institution might also be based on verifiable findings and previous assessments if it has a history of using sound assessment procedures in the academic setting [7]–[9].

II. DISCUSSION

The institution becomes a potent strategic engine when a simple set of indicators is coupled with additional information and evaluation in a continuous process of examination and analysis. It assumes control over an important kind of quantifiable self-knowledge that mixes with and validates the metaphors, images, and values that characterise its identity and its mission. Making effective, cogent decisions is enabled by the integrated knowledge that it produces. The organisations and people participating in the whole institutional leadership and management process now have a shared language. New and more challenging ones can be set as milestones are reached. Operations changes can result in improvements where they don't already. There is now a shared language among the academic, administrative, and trustee participants in strategic decision-making. Despite having various accents and dialects, they can communicate with one another. They do not generate institution rankings using the combined metrics, despite what many would have them do. Instead, they highlight the institution's uniqueness and its accomplishment of the objectives it sets for itself. Indicators join a continuous chain of strategic perception, choice, and action when employed in this fashion, and the same disciplinary procedures are in play. The insights and choices are incorporated into a process and discipline of strategic leadership since its goal is to advance the institution towards its preferred future.

Even if they are crucial, the function of strategy as leadership demands more than simply efficient processes and careful planning. Lastly, collaborative leadership activities must be appropriate for the techniques and substance of strategy. We will now go into more depth about the elements of a strategy approach that is focused on the difficulties and opportunities of leadership [10]–[12].

III. CONCLUSION

Provide unbiased proof that you are getting closer to your goal. Take the measurements that are meant to be taken in order to make better decisions. Provide a contrast that identifies the degree to which performance has changed over time.

REFERENCES

[1]   W. Wu, D. Tao, H. Li, Z. Yang, and J. Cheng, "Deep features for person re-identification on metric learning," Pattern Recognit., 2021, doi: 10.1016/j.patcog.2020.107424.

[2]   C. A. Sun, A. Fu, P. L. Poon, X. Xie, H. Liu, and T. Y. Chen, "METRIC+: A metamorphic relation identification technique based on input plus output domains," IEEE Trans. Softw. Eng., 2021, doi: 10.1109/TSE.2019.2934848.

[3]   X. Wang et al., "ProgLIMI: Programmable LInk Metric Identification in Software-Defined Networks," IEEE/ACM Trans. Netw., 2018, doi: 10.1109/TNET.2018.2865892.

[4]   G. Zou, G. Fu, X. Peng, Y. Liu, M. Gao, and Z. Liu, "Person re-identification based on metric learning: a survey," Multimed. Tools Appl., 2021, doi: 10.1007/s11042-021-10953-6.

[5]   L. W. Sumner, Z. Lei, B. J. Nikolau, K. Saito, U. Roessner, and R. Trengove, "Proposed quantitative and alphanumeric metabolite identification metrics," Metabolomics. 2014. doi: 10.1007/s11306-014-0739-6.

[6]   S. Bai, Y. Li, Y. Zhou, Q. Li, and P. H. S. Torr, "Adversarial Metric Attack and Defense for Person Re-Identification," IEEE Trans. Pattern Anal. Mach. Intell., 2021, doi: 10.1109/TPAMI.2020.3031625.

[7]   S. Karanam, M. Gou, Z. Wu, A. Rates-Borras, O. Camps, and R. J. Radke, "A Systematic Evaluation and Benchmark for Person Re-Identification: Features, Metrics, and Datasets," IEEE Trans. Pattern Anal. Mach. Intell., 2019, doi: 10.1109/TPAMI.2018.2807450.

[8]   X. Yang, M. Wang, and D. Tao, "Person Re-Identification with Metric Learning Using Privileged Information," IEEE Trans. Image Process., 2018, doi: 10.1109/TIP.2017.2765836.

[9]   V. Miele, G. Dussert, B. Spataro, S. Chamaillé-Jammes, D. Allainé, and C. Bonenfant, "Revisiting animal photo-identification using deep metric learning and network analysis," Methods Ecol. Evol., 2021, doi: 10.1111/2041-210X.13577.

[10] A. Koszewnik, K. Lesniewski, and V. Pakrashi, "Numerical analysis and experimental verification of damage identification metrics for smart beam with mfc elements to support structural health monitoring," Sensors, 2021, doi: 10.3390/s21206796.

[11] H. X. Yu, A. Wu, and W. S. Zheng, "Unsupervised Person Re-Identification by Deep Asymmetric Metric Embedding," IEEE Trans. Pattern Anal. Mach. Intell., 2020, doi: 10.1109/TPAMI.2018.2886878.

[12] L. H. Suadaa, H. Kamigaito, M. Okumura, and H. Takamura, "Metric-type identification for multi-level header numerical tables in scientific papers," 2021. doi: 10.5715/jnlp.28.1247.

Strategic Leadership and Integral Strategy

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Abstract— The broad organizational backdrop for strategy's work and looked at some of the ideas and instruments necessary for it to develop into an integrated leadership process. Yet, in the end. Strategic leadership must unquestionably be practiced. It must carry out its plans and use its resources. A summary and overview of the components of strategic leadership. After that, we concentrate on the relevance and application of narratives of identity in strategic leadership before moving on to the heart of our conceptual model. Combining strategy and leadership the importance of stories in the formation of strategy, the prerequisites for strategic leadership, stories from groups, societies, and faiths. This chapter discusses stories from organizations, civilizations, and religions..

Index Terms— Strategic Leadership, Integral Strategy, Identity, Leadership, Strategic

I. INTRODUCTION

Developing a cooperative method and discipline of strategic leadership. It makes the false claim that it is neither a science nor a precise process of information acquisition. Instead, it is an applied, integrated discipline of decision-making. While being distinct from them, it has similarities with other decision-making disciplines like management, which tries to combine information with choices and actions. Also, it is quite related to disciplines like applied psychology, the performing and visual arts, and creative arts. In order to interact with human agency and experience, which they want to affect and enhance but cannot entirely objectify and control, these practical areas use rigorous ideas and methodical techniques. Strategic leadership is an integrative field that draws on multidisciplinary knowledge and ideas about leadership and the human condition. It employs a variety of empirical and conceptual enquiry techniques. It employs methodical approaches for formulating plans, making choices, and acting as an applied discipline. Strategic leadership is by nature collaborative; it involves participants in group processes and makes choices via a planned and organised set of discussions [1]–[3].

The links between strategy and leadership need to be carefully explained, as will become evident. In practise, each of the ideas has standards that will determine how it will relate to other concepts in strategic leadership. Strategy must start with leadership because it engages people at the deepest levels of their experience and drive. As the beginning point for strategy, the concept of integral strategy leads us to organisational self-definition via narratives. Strategic management is urged by leadership to explore its depths and widen its perspective. Moreover, the concept of "integral" strategy aims to encapsulate the idea that strategic leadership must be consistently self-reflective about its own mental models and standards of judgement. It must consider both its ties to authorised systems of author-ity and its ties to implementation strategies if it is to be up to the job.

A number of explicit expectations from the strategy side are also involved in the convergence of strategy and leadership. The strategy process calls for leadership to commit to a number of systematic actions and procedures as well as various types of information, analysis, and assessment. Leadership and strategy complement one another by providing each other with methodical approaches to problem-solving and decision-making as well as associated procedures that may mobilise an organization's resources and human capital.

Conditions for Strategic Leadership

To chart the road for a process of strategic leadership, we have combined numerous streams of thought on values, decision-making, and leadership. By defining a set of prerequisites or criteria that must be met for strategic leadership to be an effective practise in the decision-making environment of the academy, one may appropriate the rewards of this endeavour. What criteria must strategic leadership pass in light of what we've learned? Here are a few basic ideas that will be expanded upon, shown, and debated in later portions of the book. To provide the reader both a summary of the most important discoveries to date and an overview of the argument and suggested practises that will be developed throughout the work, these themes are offered here. Strategic management is:

1. Integral: It starts at the level of paradigms, values, and human agency.

2. Sense-making: Narrative is used to interpret experience and provide meaning to the future.

3. Motivating: It elicits vigour and dedication.

4. Applied: It manifests as choices and decisions.

5. Collaborative: Collegial deliberative techniques are used.

6. Systemic: It links several organisational decision-making processes.

7. Data-driven: Relies on sound metrics and tactical indications.

8. Integrative: It incorporates many data and information

sources to provide conclusions and insights.

9. Embedded: The organization's overall effectiveness relies on dispersed leadership.

10. Action-oriented: It calls for efficient implementation methods.

The Power of Stories in The Formation of Strategy:

Strategic planning discussions with college administrators rapidly highlight how differently individuals see the process. The discussion may begin with a discussion of what it means for a college to be the greatest in its field, or it may turn to the organization's unique skills and how it reacts to a dangerous situation. The focus of strategy discussions is often on issues related to finances and the college's position in the enrollment market, particularly its net tuition revenue after financial aid and scholarship deductions. Even though each of these concerns may be of utmost importance, they are all management strategies rather than leadership ones. How can leadership become the strategic focus? How may leadership jargon be created from the language of strategy? The first step in the solution is to identify the organization's distinctive identity—which is disclosed in its identity narrative, or story—as the basis of strategy. For our purposes, narrative refers to the shape that tales take as they describe events that develop over time, create dramatic tension around conflicts and problems, and eventually resolve those challenges and conflicts. The two are often interchangeable since stories are what we tell and narratives are how we tell them. One kind of tale that describes the distinctive qualities of an organisation or a culture is an identity narrative. This point of departure elevates strategy to a higher level of self-analysis and self-understanding, when we start to see that it is related to leadership since it has to do with sense-making and sense-giving.

The value of story in comprehending the human experience has captured the attention of the contemporary imagination over the last few centuries. The relevance of tales has intrigued, if not consumed, most modern humanities and social science departments. Stories are tales of the meaning of events as humans and groups live them rather than objectify them. The literature on the subject in each area is so extensive that it embodies the form of the contemporary sensibility. In light of this, we discover that case histories and case studies, authentic historical texts and documents, myths and sagas, songs and dances, paintings and sculptures, biographies and autobiographies, letters and diaries, as well as novels, poetry, and plays, are all potent sources of revelation of the meaning of the human project. There has never been a people without narratives, according to Roland Barthes, one of the most important story theorists: "Under this virtually limitless variety of forms, the narrative is present at all times, in all locations, in all civilizations. We get access to the participants' sense of meaning and human interiority via the experienced forms of self-awareness of the individual or the group through stories that individuals experience or conceive.

Narratives reveal ideals and commitments that matter firmly to individuals via the significance of the events they describe, often with an unequivocal feeling of importance. The complexity and ambiguity of human purpose and motivation, as well as the drama of personal meaning in both every day and remarkable occurrences, are often overlooked by objectified exterior assessments. The link to one's or the group's interest in and care for these events is broken off by objectification. The feeling of significance and importance with which people live their lives is communicated via stories, on the other hand. "Our brilliance rests in our power to generate meaning via the production of tales that give purpose to our labours, elevate our past, illuminate the present, and offer direction to our future," writes Neil Postman, capturing these themes well [4]–[6].

II. DISCUSSION

The dynamic of values as internalised standards of self-enactment is captured and conveyed via stories. Charles Taylor begins by reminding us that people are always seeking after what they believe to be just, and then he adds that when we decide the course of our life, "we must inescapably comprehend our lives in narrative form, as a 'quest' ". Abstractions cannot compare to how well human intelligence understands the realities of tales, connects with them, and remembers them. Each educator or speaker may tell you what their lectures are remembered for. It seems that stories have a unique cognitive construct. According to Dan McAdams, "This seems to be so universally true that many researchers have proposed that the human mind is first and primarily a vehicle for narrative." The quest for meaning in our life has shapes and patterns, just as there are structures to knowledge. According to renowned psychologist Jerome Bruner, the mind perceives the environment via the use of two distinct cognitive forms, each having a whole distinct mode of verification. Whereas the "paradigmatic" style is rational, empirical, and analytical, the "narrative mode" is more concerned with the desires, needs, and objectives of individuals over the course of time, or "the vicissitudes of human purpose." The common meanings of human endeavour, the ferocity of battle, and the unpredictable nature of experience are all conveyed via stories. We constantly find and lose our way since nothing in our finiteness is guaranteed, sometimes in unanticipated ways. Because they shed light on the shifting meanings of who we are and what we want to become, stories are appropriate to the underlying tension and ambiguity of human life in time. As Bruner puts it, "Memory and imagination provide and consume each other's products via story we create, reconstruct and in some ways remake yesterday and future [7]–[9]."

Tales from organisations, cultures, and religions

While important and potent narrative forms, works of creative fiction will not get the majority of our attention in this essay. Students of modern organisational culture have a

thorough understanding of the value of narratives. Polkinghorne said that "the narrative is a fundamental kind of coherence for an organization's sphere of meaning, just as it is for an individual's" and we agree with him on this point. Stories, together with conventions, beliefs, rituals, and symbols, have a significant impact on how an organization's leadership is shaped. Only in story form can significantly facets of institutional identity be expressed. The unwavering loyalty and impassioned vision of an organization's founders and leaders are handed down from one generation to the next and from one group to another as tales that define the present as well as the past. In Pursuit of Excellence by Peters and Waterman and The Fifth Discipline by Senge, two of the most well-known and important management books of the 1980s and 1990s, show a keen awareness of the importance of institutional values and narratives. Stephen Denning outlines the many ways that business organisations use tales to carry out many of the duties of leadership in The Leader's Guide to Storytelling. In Weick's interpretation of the idea, stories seem to be the pinnacle of organisational sense making. Tales serve as a basis for identification by eliciting thoughts on previous experiences, which are then performed and shared with others as a believable means of comprehending present-day reality.

Religious traditions are the only ones where the importance of tales is more obvious. Religions like Judaism, Christianity, and Islam provide stories about how the divine has shown itself in certain persons, places, and occasions. Jesus of Nazareth largely communicated his lessons via tales, parables, and prophecies about future events that would usher in God's Kingdom. The fundamental voice of the Bible is narrative. Stories are plentiful and essential in even the more philosophical books of ancient Buddhism and Hinduism, such as the Hindu devotional scripture Bhagavad Gita. The ways that religious leaders, such as prophets, teachers, and saviours, convey and embody narratives about ultimate meaning, predict the fundamental relevance of story for leadership. Colleges and universities are no different from other organisations and institutions in this regard. Tales abound on campus. Stories of bigger and smaller campus comedy and tragedies, intellectual struggle and success, academic success and failure, and closeness and conflict are frequently told. They invariably start with "Remember the time? in one of the fundamental styles of storytelling. "From athletic fields. Every institution develops a richness of narratives through which it expresses itself and its ideals, from the theatre to the library, from the office to the laboratory, in offices, classrooms, and studios. Legendary leaders are praised, eminent educators are recognised, notable graduates are lauded, and great coaches and teams are commemorated. Certain academic initiatives and successes gain iconic stature, establishing themselves as normative legacies and symbols of identity. Since they indicate shared ideas, meanings, commitments, and values that represent a particular identity, all the smaller and bigger tales may be

brought together and understood as a component of an inclusive narrative.

Never are narratives given as cold, hard facts or sterile history, but rather as the stories of the individuals. Success and failure, victory and loss, success and annoyance, loyalty and betrayal—they are all moulded by the drama and suspense of conflict.

The tale serves as a narrative of identity that highlights the institution's distinctive qualities, which it takes great pleasure in. Due to their shared participation in a narrative that connects the dots by referring to a bigger picture and a chronological order, the location may be recognised in the story's fragments. Each college views itself as a part of the complete story of specific traditions, norms, and practises of liberal and professional education as well as the ideals of academic discovery since narratives also reach out for bigger tales. Because they both share a story "that tells of origins and envisions a future, a story that constructs ideals, prescribes rules of conduct, provides a source of author- ity, and, above all, gives a sense of continuity and purpose," Postman once more enlightens us on the relationship between local stories and master narratives of education. But even though it is disclosed in history, the narrative is much more than just history. It exists in many memories, but it is defined in collective memory and by shared meanings and values. Its shared meanings as a tale of identity and its relevance to the future as a narrative of ambition may be rationally understood and broadly endorsed, despite the fact that they are not free from competing interpretations.

It is possible to show the effectiveness of the general notion of narrative in the study of higher education in a number of ways. Burton Clark, a renowned higher education sociologist, utilised the idea of an organisational tale to capture the potency of the cultural components of experience in formal organisations in his book The Unique College: Antioch, Reed, and Swarthmore. Hence, a "saga is a community sense of a special achievement based on past exploits of a formal organisation, giving strong normative linkages inside and beyond the organisation. Believers give the organisation their commitment and get pride and identity from it. Sagas are a powerful type of what we have previously referred to as stories.

While having many things in common, each of the three universities in Clark's research exhibits a distinct narrative pattern. A youthful president founded Reed College in 1920 as a brand-new institution in the Northwest of the United States with the goal of becoming a strictly academic community that valued nonconformity. Contrarily, Antioch was a historic organisation that had been slowly deteriorating when Arthur Morgan was elected president in 1919. The institution adopted a ground-breaking scheme to alternate periods of study and employment as part of general education under the leadership of this fearless and dynamic president. Swarthmore, a strong Quaker institution, reacted to the

visionary and charismatic leadership of Frank Aydelotte by developing an honours programme that was modelled after Oxford. Even if not all institutional tales have the breadth and significance of sagas, they all exhibit the traits of identity narratives. The institutional narrative serves as the foundation for strategy, whether it is present in strong or weak forms. The task of strategy and leadership will be repeatedly thwarted for those institutions that are unable to own their life stories. One aspect of what the report refers to as integral leadership, as stated in the Association of Governing Boards of Universities and Colleges' 2006 report on the college presidency, The Leadership Imperative, "Only by embracing and building on the institutional saga can a president span successfully the full range of leadership responsibilities." As we will see, the narrative enhances institutional self-definition via declarations of identity, purpose, vision, and stance. As a consequence, it energises leadership as a mutually reinforcing process.

The history of Centre College, a tiny liberal arts college established by Presbyterians in Danville, Kentucky, in 1819, serves as an example of the significance of narratives informing an institution's strategic planning procedures. Rick Nahm, the vice president of Centre College, phoned the president in the late summer of 1983. "We have reached 67 percent participation in alumni donations for previous year," he said with excitement. According to the strategic plan that was then being written, the Centre narrative describes a small institution with 725 students at the time that was solely dedicated to providing an education in the arts and sciences and had a disproportionate impact on Kentucky and the mid-South area of the nation. In an area that has historically lacked educational resources, the Centre stands as a symbol of distinction and a source of pride. Woodrow Wilson, Princeton's president at the time, made a statement regarding the difficulties in evaluating educational excellence. "There is a tiny institution down in Kentucky which in sixty years has graduated more men who have earned significance than has Princeton in her 150 years," he observed while discussing and challenging the percentage of graduates who attain distinction as a criterion. Wilson's concerns were incorporated into Centre's narrative of disproportionate influence, exclusive focus, leadership, devotion, and success. At that time, Centre had built a reputation for producing leaders for the ministry, the bench, and the bar, and had conferred degrees on dozens of state and federal lawmakers, two vice presidents of the United States, and numerous Kentucky governors. John Marshall Harlan, the Supreme Court judge who dissented from the separate but equal principle in Plessey v. Ferguson in 1896, was a graduate of Centre. He is known as the "great dissenter." Eventually, from 1946 until 1953, another graduate, Fred Vinson, would hold the position of Chief Justice of the Supreme Court.

The triumph for alumni donating was fully realised the next year. The narrative of a metaphorical David and Goliath became so vivid that Dartmouth presented a green-and-white button for alumni that said, "Go Big Green, Beat Centre." Not since Centre defeated Harvard 6-0 in football in the upset of the century in 1921. All of the ambitious strategic plan's objectives were quickly attained: enrolment rose by 100 students; new buildings were created; existing ones were refurbished; wages were significantly boosted; and a capital campaign's $40 million target was met a year early. When the Olin Foundation gave Centre its yearly grant in 1985 for the full construction of a new physical science building, the strength of Centre's narrative was unequivocally made clear. In its dealings with the college, the foundation was astounded by the steadfastness of Centre alumni and remarked on the institution's history of regional leadership. Strategic planning has helped the Center's track record of academic and financial success advance consistently ever since.

While the Center tale has some particularly rich aspects, it is representative of the identity narratives that may be presented at almost any higher education institution. As we've said, narratives do what all great tales aim to achieve, which is to convey significant truths about identity, morals, and life lessons to us as actors rather than as passive viewers of events. We are all affected by stories in some way, both mentally and emotionally. They speak in terms of metaphors, pictures, symbols, and idioms taken from daily speech that interpret the drama of experience in a manner that empirical description is unable to do. Simsek and Louis compare the features of symbolic and metaphoric language in their empirical research on the use of metaphors in planning and leadership at the University of Minnesota. Kuh, Kinzie, Schuh, Whitt, and their associates demonstrate the profound educational significance of campus culture, symbol, and story in their study of twenty highly diverse colleges and universities that have higher patterns of student engagement in learning and graduation rates than comparable institutions. Each campus has a compelling story of success and identity as well as a linked collection of strong symbolic connotations. We become participants in stories because we connect with the story that defines the identity of our community via memory and imagination.

We shouldn't continue to draw the conclusion that everything in identity tales is constant, effective, and upbeat since disruption and conflict pose difficult problems for communities and have the potential to split them apart. The Civil War tore a hole in the centre of Centre College, splitting the Presbyterians into two congregations and dividing families, students, teachers, alumni, and the Danville town into two antagonistic factions. It resulted in the establishment of a rival institution fifty miles distant. The college suffered as a consequence of the wounds taking over a century to mend. The institution had to put the shameful heritage of racial segregation behind it in the early 1960s, and under Thomas Spragens' competent presidential leadership, it did so with conviction and moral purpose [10], [11].

It becomes evident as we work to understand and share our experiences that there are several people, initiatives, rituals,

traditions, records, and cultural norms and values around which they gather. As a result of achieving definitive or iconic status—possibly as a component of a story as defined by Clark or as an ongoing aspect of identity—a particular programme or collection of activities will often continue to have an impact indefinitely. It would be wise to take into account these varied customs and beliefs if one want to understand and contribute to an institution's story of identity. By a systematic and integrated reading of the institution as a book, they may be uncovered and explored since they provide hints about the bigger tale. There are several levels and layers of significance in tales, as Clark's description of the saga and our analysis of the story demonstrate. To comprehend their relevance, multiple types of enquiry must be employed. They always start in the concrete, with precise incidents, specific connections, actual locations, and actual individuals, as we've seen. These details are then combined into narratives that use a range of linguistic constructions to depict a series of events and outcomes while adhering to an endless number of plotlines. The tales often circulate in smaller or bigger pieces, yet in certain places their substance is well known and understood. Organizational stories cannot be created, but they can be found and made more visible. By doing this, we may be able to explain a variety of problems and quirks that have evaded us about an organisation. More significantly, when we become more intentional in comprehending and sharing our narrative, we may be able to take better control of our circumstances and our future. It becomes crucial to search for the distinctive patterns, themes, values, indicators, and motifs that they possess when we attempt to understand and describe the history of an institution since tales have been built around and through them. Here are a few of them:

1. Precipitating events include the establishment, a life-changing gift, a noteworthy incident, a daring new course, a comprehensive transformation, and surviving a catastrophe.

2. Transformational leaders: those who, by their vision and leadership, brought about a notable and long-lasting change in the organisation, such as presidents, board members, professors, and employees.

3. Salient personalities: people whose interests, successes, and endearing idiosyncrasies stand out in the community.

4. Generative programmes: unique educational initiatives that establish the organization's standards of behaviour and self-awareness

5. Markers of distinction: the institution's, professors', staff, students, and alumni achievements in all facets of teaching, research, service, sports, and leadership that stand out for their exceptional quality and degree of achievement

6. Markers of distinctiveness: features that are perceived as differentiating the institution, such as a unique mission, a religious commitment, a unique location, unusual programmes, strong administrative and academic capabilities, a unique campus, special service to a community

or profession, or a connection to a specific constituency

7. The traditions, rituals, practises, beliefs, norms, patterns of interpersonal interaction, and community-building structures that define an institution as a human and intellectual community.

8. Broader implications: the manner in which the tale illustrates and exemplifies the greater goals and ideals of education in the pursuit of knowledge, the development of the whole person, and service to society, contributing to the larger narratives of those goals.

The voices of the campus and of crucial constituencies are an essential source for tales of identity. The first step in telling the tale is listening for it and hearing it in other people's narratives. When the moment is appropriate, the leader starts to share the tale after systematising, interpreting, and maybe even transforming it, while reflecting on what was learnt from listening. She will learn in the process how much others value hearing the narrative, even if they are familiar with it. People like hearing it narrated in a fresh manner because they often pick up on details, they were aware of but were unable to express. Since it is their story—one in which they have taken part and contributed—the listeners feel validated. With the aid of a systematic method, listening intently is one approach to go about it. The series of questions that follows is one example of how to start a conversation about identity. While it uses a light touch, it may provide insightful information that can be further examined in different situations [12], [13].

III. CONCLUSION

Setting policies, processes, and goals in order to increase a company's or organization's competitiveness is the process of strategic management. Strategic management often focuses on efficiently allocating personnel and resources to accomplish these goals.

REFERENCES

[1] . Sunahwati, M. S. Maarif, and A. Sukmawati, "Human Resources Development Policy as a Strategy for Improving Public Organizational Performance," JKAP (Jurnal Kebijak. dan Adm. Publik), 2019, doi: 10.22146/jkap.37957.

[2] T. Eriksson, J. Robertson, and A. Näppä, "Functional top management teams and marketing organization: exploring strategic decision-making," J. Strateg. Mark., 2020, doi: 10.1080/0965254X.2020.1765410.

[3] S. P. Sparkes, J. B. Bump, E. A. Özçelik, J. Kutzin, and M. R. Reich, "Political Economy Analysis for Health Financing Reform," Heal. Syst. Reform, 2019, doi: 10.1080/23288604.2019.1633874.

[4] C. Molan, S. Kelly, R. Arnold, and J. Matthews, "Performance Management: A Systematic Review of Processes in Elite Sport and Other Performance Domains," J. Appl. Sport Psychol., 2019, doi: 10.1080/10413200.2018.1440659.

[5] A. Opoku, V. Ahmed, and H. Cruickshank, "Leadership style of sustainability professionals in the UK construction industry," Built Environ. Proj. Asset Manag., 2015, doi: 10.1108/BEPAM-12-2013-0075.

[6] A. Armstrong, L. Mook, J. R. Whitman, and J. Quarter, "7. Leadership and Strategic Management," in Understanding the Social Economy of the United States, 2021. doi: 10.3138/9781442663947-013.

[7] M. Iszatt-White, "Strategic leadership: The accomplishment of strategy as a 'perennially unfinished project,'" Leadership, 2010, doi: 10.1177/1742715010379310.

[8] B. S. Cochrane, "Leaders go first: Creating and sustaining a culture of high performance," Healthc. Manag. Forum, 2017, doi: 10.1177/0840470417718195.

[9] A. Ayough, R. Rafiei, and A. Shabbak, "Making distribution operations lean: the management system approach in a case," J. Eng. Des. Technol., 2021, doi: 10.1108/JEDT-10-2020-0419.

[10] J. A. de Feo and A. Janssen, "Implementing a strategy successfully," Meas. Bus. Excell., 2001, doi: 10.1108/13683040110411223.

[11] S. K. McGrath, "Leadership and Strategic Management," in Speaking Management, 2021. doi: 10.1007/978-981-16-2213-7_15.

[12] S. Vázquez-Álvarez, C. Luján-Álvarez, J. M. Olivas-García, H. G. González-Hernández, and H. Luján-Álvarez, "Prospectiva del sistema organizacional del sector forestal en Chihuahua, México," Madera Bosques, 2017, doi: 10.21829/myb.2017.2321646.

[13] I. S. Kalenuk and N. B. Kuznetsova, "University Competitiveness Indicators," Theor. Appl. ISSUES Econ., 2021, doi: 10.17721/tppe.2021.42.5

Study on the Evaluation of Leadership

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Abstract— The performance assessment systems put into use by linking the leadership idea and the system will significantly advance the academic literature. In addition, to assist leaders in comprehending the significance of performance evaluation systems in the business world and their contributions to the growth of effective business leadership, as well as to offer leaders some helpful recommendations on how performance evaluation systems can be successfully implemented. About your personality type by taking a good leadership exam. On the path to improving as a leader, this is an important consideration. The way you manage teams and interact with people may be dramatically improved by having self-awareness of your own traits and leadership abilities.n.

Index Terms— Identity, Leader, Leadership, performance, Strategic

I. INTRODUCTION

The economy's ups and downs and stock market uncertainty are becoming worse every day. Moreover, as new technologies continue to grow quickly, they have the ability to entirely replace integrated business models that use cutting-edge technology overnight. Sometimes technical advancements render company models utterly inoperative, while other this quick transformation can only be brought about by the existence of significant rivals in the market. Regrettably, businesses often lack the authority to restrain the influence of their rivals [1]–[3].

Leaders are individuals who have exclusive control over a business organization's facilities and performance management system. If leaders manage the organisations and implement effective and efficient performance evaluation systems, they can successfully take the organisations under their control and help them achieve success in business facilities. The leader, like a conductor, deftly chooses the speed of the music in the venue; at times, he leads the music as he pleases, sometimes with a rapid tempo and other times with a leisurely one, with his baton swinging in his hand in innocent gestures.

If a leader wants to create a successful and high-performing firm, they should concentrate on employee performance and, in light of the business strategy the leader has established for the company, these workers should be especially interested in and motivated by middle managers. According to recent research, effective communication across organisational stakeholders is essential to maintaining workers' loyalty to the firm and enhancing their performance.

Organizational commitment, organisational level business communication, and performance concerns have increased nowadays, particularly during the Covid-19 pandemic era, has more relevance. Those in charge who want to advance their organisations achieving their goals for business success, supplying and maintaining workforce motivation, and increasing employee loyalty to the business. To do that, role leaders must also establish positive working relationships with senior and middle-level managers. have established efficient corporate communication channels inside an organisational framework. Perhaps the most typical error of people who labour in challenging circumstances, such as the circumstances of the present epidemic, and maybe all of us, is to defend ourselves against one another. Usually, doing this is a waste of our time and efforts. This strategy accomplishes nothing but diminishing the power of our company. In actuality, the organization's Unawarely, resources are diverted to pointless tasks. Conversely, if staff members feel secure inside the company, They may easily combine their skills and qualities to accomplish a single objective by eliminating concern and anxiety. This is how it may simply concentrate on one thing in order to avoid risks outside, take advantage of possibilities found, and notwithstanding all the challenges, move the company's resources to the proper location

One crucial aspect of strategic thinking is tying the narrative strands of an organization together. It applies the advantages of methodical contemplation to identity-related concerns, whose strategic importance is often disregarded. To build a complete story of identity that will serve as the basis for strategy, it is necessary to go through yet another step of analysis. As we've said, it's critical to interpret the narrative into a collection of unique ideas, themes, meanings, objectives, and values. By doing this, we provide a set of conceptual benchmarks that participants in the task of strategy may refer to in order to clarify and capture the implications of the institution's self-perception for the future [4]–[6].

In its practice as a discipline, strategic leadership harnesses the strength of a methodical approach. Yet there are several limitations to the approach. The ability of the tale to energise and excite the participants in a community will be lost if it is not kept tied to specific events. Abstractions are essential for communication, the development of systems and policies, and connecting our educational obligations to broader social issues. But the life currents that they have come from and must be continually regenerated via are what give abstractions their energy. One discovers a broad range of

ideas and ideals that organizations employ to characterize themselves and their goals while analyzing strategic plans and associated papers. We may again use Centre College as an example since its present leaders have lately reflected about and written about the ideals that form the foundation of the college's history. A mix of high expectations and high dedication, of aspiration and affirmation, or rigour and reward, is the common thread in the different forms and recollections of the Centre experience, according to one member of the faculty and leader in the planning process. "Tough love" is used. Students experience the college as an intimate educational community of intense relationships and high expectations that showcases a student's multiple talents in the classroom, around campus, on the playing field, and on stage. As one chemistry professor once said, "At Centre the collar fits a little tighter." Previous Centre officials have used phrases like "transformation," "empowerment," "education of mind and body," and "leadership" to define the educational goals of the institution, including its current and previous presidents. The college's own narrative is strengthened via examination of these aspects of the wider liberal education narrative. The topic of how narratives should be connected to the use of strategy inside a formal process is raised by our focus on them.

Identity declarations

There are several responses to these issues since institutional contexts and narratives are so diverse. Nonetheless, despite the diversity, it is obvious that effective means for making the link and for values and insights drawn from the narrative to be openly included in the strategy process are necessary for strategic leadership. To achieve this, we suggest that strategy papers should, unless the work has already been performed in other readily accessible documents, contain a short section on institutional identification. The institution's history should be synthesised and condensed in the identity statement, resulting in a four-fold self-definition that includes purpose, vision, and, finally, stance. A consistent interpretative framework is provided for the creation of the other components of the self-definition and priorities of the plan, despite the fact that an identity statement typically does not have a direct link to the decision-making process. It establishes a common direction for their work by providing participants with a set of shared reference points, values, pictures, and metaphors. It offers a crucial resource for leadership as an interactive process of influence by reflecting the experiences, convictions, and contributions of the larger campus community.

Narratives and identity statements will vary greatly in length and style to match institutional demands, traits, and situations. An institution may just need one or two paragraphs to convey its identity if it already has a high level of awareness of its history. In other instances, a college can need several pages or more to adequately describe its pivotal events, recurring themes, distinguishing features, and guiding principles. The part will be lengthier if there hasn't been much consideration given to the institution's narrative of identity or if strategy is a novel concept on campus. An identity statement may be used by institutions that have experienced significant change or that are thinking about doing so to explain that transition to their constituents. They may demonstrate genuine continuity in purpose and values, indicate their sensitivity to the problems of change, and mobilise support for the possibilities and challenges that lie ahead.

Primary Values

Similar to this, a collection of core values that express the institution's identity thematically should be created and communicated. In certain situations, this statement may even be the core values themselves. This entails investigating what really important to a place, as indicated in its history, goals, budget, facilities, policies, and programs, as well as its culture and connections, based on our previous research of values. What comes first and what comes second? What persists and what is transient? In order to achieve what larger benefit, what would individuals give up? What are the rules and standards that influence decisions and ought to? When a representative sample of a campus is asked to identify a small number of really distinctive values in response to these types of questions, the institution's values profile starts to take shape. When a value is said to be basic and important, the inquiry "Why?" may be used to continuously challenge it. "Unless individuals acquire greater degrees of identification and provide compelling justifications for its importance. In order to provide the values dimension, authenticity, and credibility as the lived norms of the organization's narrative, core values should always be described and explained with reference to events, programs, and practices.

The University of Twente in the Netherlands developed during a thirty-year period after its inception in 1964 into a successful and creative technical university, according to Clark, who studied five entrepreneurial institutions in Europe. The fascinating examination of its key principles might be used as an example of a declaration of identity. The college has developed into:

1. The two-core university provides a novel blend of applied scientific and applied social science degrees.

2. The campus university: by building a stunning, verdant campus with a unique, self-sufficient living and learning environment for the Dutch setting.

3. The responsible university, with its dedication to the cultural and economic development of its area

4. With its worldwide nature in both teaching and research, the university without borders

5. The university with a specific focus: by offering in-depth education in a variety of subjects

6. The adaptable university, which uses a range of decision-making and governance processes as well as several financing sources to accomplish its objectives.

The Evaluation of Storytelling

Stories often acquire mythological importance and transform into little paradigms that act like magnets dragging everything towards them. When this happens, it may be quite difficult to overcome the myth and develop new, original perspectives on the occurrences. As a consequence, the difficult task of demythologizing the myths of a society that have been conventional or have become defensive and stale sometimes falls to new leaders or to crises. Criticism is a strategic leadership responsibility.

Not everyone in an academic community accepts the version they are familiar with or has read, for better or worse. There are many stories of what the founders intended and accomplished, as well as the actual substance of the organization's ideals, in every organisation. The narrative may include certain errors and recollections of exclusion and prejudice that need to be brought up and corrected.

Nonetheless, even when there are flaws and disagreements, situating strategy inside an identity story gives it a starting point that fosters a feeling of teamwork. Disputes in values may be addressed via discussion and consideration of the true meaning of educational excellence since they are often disputes about the exact substance of those values rather than their purpose. The narrative will improve engagement in the process, provide more cogent insights, and increase credibility while enhancing the strategic discourse and debate. The common commitments necessary to overcome structural difficulties in academic decision-making and to set an enticing trajectory for the future will be defined and made clear, and that is what will matter most [7]–[9].

II. DISCUSSION

A strong understanding of the connection between story and leadership as a result of our efforts to uncover the narrative sources of strategy. It has become evident that some of the key responsibilities of leadership include knowing, communicating, acting out, and embodying the organization's narrative. This is in line with our prior descriptions. Using this viewpoint, we may see leadership dynamics as an interesting reciprocal process. Since these narratives of identity disclose the fundamental values, needs, and beliefs of their followers, leaders exhibit unusual sensitivity to these narratives. Leaders develop an understanding of what counts, what inspires, and what spurs action as they discover the history of the group they represent. They are aware of the way their group's narrative depicts how human experience develops as a result of commitments to things that are critically important to both the leader and the group's members [10], [11].

National Identity: Gettysburg under Lincoln

Examining a well-known tale of national identity is the best way to understand narrative at action in leadership. Abraham Lincoln invokes America's history when speaking at Gettysburg on November 19, 1863, in the midst of a devastating civil war, but he does not provide an objective historical narrative of the country's origin. Instead, he frames his remarks inside an identity story. A historian looking at the same events would emphasise the political conditions that led to independence, highlighting the founders' economic motivations and France's determination to support a young country in its fight against its longtime foe, Great Britain. According to a philosophical interpretation, the Declaration of Independence may be seen as a derivative work that borrows concepts from a number of Enlightenment authors and makes lofty but questionable assertions about human equality that run counter to reality. These histories might be classified as outside or external. But, when Lincoln approaches the platform on Cemetery Hill, he addresses the audience as an agent in a historical drama by providing an inner history that takes the shape of a narrative.

By using metaphorical images of birth and narrating a tale about truths that the founders, "our forefathers," staked their lives and their reputations on, he evokes the shared memories and collective commitments of a national community and can thus say to his countrymen that "our forefathers brought forth on this continent a new nation conceived in liberty and dedicated to the proposition that all men are created equal." He continues by stating that the actions and deeds of "those who sacrificed the last full measure of their dedication" to maintain it have served as the most effective means of communicating the commitment to human freedom. Lincoln frequently exhorts his compatriots to have "great resolution" in his final remarks. They must take action to prevent those who lost their lives in war from dying in vain. Lincoln's main points at Gettysburg and in subsequent addresses all entail active ways of creating and sharing sense and call for participation from his audience. He urges the country to address the effects of war, "heal up wounds," "care for" the widow and the orphan, and "to attain and cherish a fair and enduring peace" in his second inaugural address. Lincoln's account of the events serves as a wake-up call and a call to arms for those who consider the American tale to be their own. Stories have value.

The Best Minds

This story-based leadership example may be used many times and has been the focus of research from a variety of angles. Freud's remarks on the influence of ideas on leaders are seen by George Goethals to have significant echoes of the topic. Howard Gardner presents a cognitive theory of leadership in his significant book on leadership, Leading Minds: An Anatomy of Leadership, stressing the leader's capacity to recognise and communicate the group's narrative. Of course, the idea of leading by knowing supports our claim that leadership has a disciplinary component. Yet, the complexity of the cognition in issue stems from the fact that it also heavily incorporates emotion and reason. Maybe a better way to say it is that it is a kind of cognition that must provide proof of the legitimacy of the values it chooses.

Via a series of succinct monographs on eleven notable

leaders, both direct and indirect, Gardner develops his argument. He researches figures such as Eleanor Roosevelt, Martin Luther King, Mahatma Gandhi, George C. Marshall, Margaret Thatcher, Robert Maynard Hutchins, and Pope John XXIII. He describes them as "fabricated accounts in any symbol system," which is a wider description of tale than we use here, but he mainly focuses on how these leaders employed narratives of identity in their practise of leadership.

Several of Gardner's works centre on figures like Gandhi, King, and Eleanor Roosevelt who not only transcended racial, ethnic, and gender lines but also had tremendous influence on society while not holding official positions of high authority. Eleanor Roosevelt, a patrician by birth and by virtue of her marriage to one of the most powerful people of the twentieth century, started to develop her own independent voice and influence in her middle years. She and other female leaders show that story leadership is not constrained by gender, particularly since it places a strong emphasis on parts of relational knowledge and personal experience, which are areas where many women find their voice.

Roosevelt established and eloquently expressed the concept that women should undertake autonomous positions of leadership in public life as she began to take an active participation in political groups and issues. She wrote, debated, and spoke ceaselessly in public and private venues for civil rights for women and blacks, and her tale eventually included a plea for greater social justice for all Americans. Despite the fact that her opinions were often divisive, she managed to distinguish herself from her husband's position in order to avoid any potential political issues.

In her own right, she was for many years among the most powerful women in the world. When she advocated for the rights of the oppressed while serving as a member of the US delegation to the UN, her narrative eventually became worldwide. Eleanor Roosevelt lived the tale she recounted and was the first to articulate, bring to national prominence, and support many of the social and cultural changes of the 1960s and subsequently. An excerpt from Gardner's thesis effectively conveys the importance of narrative in leadership:

Leaders make an effort to convey and persuade people of a certain viewpoint, a distinct vision of life, using both the verbal and nonlinguistic tools at their disposal. The most effective word to use to describe the idea is "story." The artistic development and articulation of stories is a vital component of the leadership vocation since tales are a fundamental component of human cognition. Tales appeal to both the rational and the emotional sides of the human mind. The strongest tool in a leader's literary armoury, according to this argument, is a story about identity—a narrative that encourages people to reflect on and experience a sense of who they are, where they came from, and where they are going.

The Story's Embodiment

The strength of a good tale should not lead us to believe that it completely explains what a leader does. In order for their narrative to be a successful vehicle for leadership, leaders must in particular live it, or as Gardner puts it, "embody" it, in addition to telling it. Hence, an even more strict personal commitment discipline supports storytelling as a cognitive discipline. "It is a stroke of leadership brilliance," writes Gardner, "when tales and embodiments seem to meld. The dance alone cannot reveal the performer. Martin Luther King and Mahatma Gandhi both advocated for peaceful resistance and stayed steady in the face of the blows that such defiance to authority unleashed. General George C. Marshall, who upheld honesty as a military value, risked his career by telling the truth to those in authority, including President Roosevelt, at all times. Robert Maynard Hutchins fiercely argued and toiled ceaselessly to embed his views at the University of Chicago and abroad. He had a strong belief in the influence of reasoned thinking and the study of great literature. He permanently altered the curriculum discussion at the institution by demonstrating the principles he asserted. The "walk" must always match the "talk"; otherwise, accusations of hypocrisy or deceitfulness quickly surface, destroying the leader's credibility and influence for all but a small number of diehards. Followers are deeply suspicious if leaders fail to demonstrate in their lives the values they articulate.

The leader's portrayal of the narrative highlights another aspect of leadership that isn't always there. Often, we focus on the story's ability to inspire followers and ignore its significant effect on the leader. Both leaders and followers are empowered by embodiment. Since it touches the leader's principles and personal identity, it achieves high levels of intrinsic drive. When the leader clarifies, comprehends, and embraces the tale, it develops into a source of energy that inspires devotion and builds self-assurance. Leadership gains a new depth of meaning when leaders develop their self-awareness and demonstrate their dedication to the narrative. As a result, their followers show them more respect and loyalty. The mutual commitment's sincerity enhances performance and fosters trust [12], [13].

III. CONCLUSION

It gives a firm the chance to evaluate the team- and project-leading skills of business managers at various levels. In order to fill open senior general management jobs as they exist, human resources departments use leadership evaluation to determine where there are talent shortages and who is qualified to fill them

REFERENCES

[1] S. Tafvelin, H. Hasson, K. Nielsen, and U. von Thiele Schwarz, "Integrating a transfer perspective into evaluations of leadership training," Leadersh. Organ. Dev. J., 2021, doi: 10.1108/LODJ-11-2019-0492.

[2] A. K. Løkke and S. M. L. Krøtel, "Performance evaluations of leadership quality and public sector leaders' absenteeism," Public Manag. Rev., 2020, doi: 10.1080/14719037.2019.1638441.

[3] J. Ahn, S. Lee, and S. Yun, "Leaders' Core Self-evaluation, Ethical Leadership, and Employees' Job Performance: The Moderating Role of Employees' Exchange Ideology," J. Bus. Ethics, 2018, doi: 10.1007/s10551-016-3030-0.

[4] E. Dóci, J. Hofmans, S. Nijs, and T. A. Judge, "Leaders under pressure: time pressure and state core self-evaluations as antecedents of transformational leadership behaviour," Eur. J. Work Organ. Psychol., 2020, doi: 10.1080/1359432X.2020.1714717.

[5] K. W. Lamm, L. R. Sapp, and A. J. Lamm, "A Longitudinal Evaluation of Change Leadership within a Leadership Development Program Context," J. Leadersh. Educ., 2018, doi: 10.12806/v17/i3/r7.

[6] B. Hoppe and C. Reinelt, "Social network analysis and the evaluation of leadership networks," Leadersh. Q., 2010, doi: 10.1016/j.leaqua.2010.06.004.

[7] J. M. Madera and D. B. Smith, "The effects of leader negative emotions on evaluations of leadership in a crisis situation: The role of anger and sadness," Leadersh. Q., 2009, doi: 10.1016/j.leaqua.2009.01.007.

[8] B. K. Joo, H. J. Yoon, and C. W. Jeung, "The effects of core self-evaluations and transformational leadership on organizational commitment," Leadersh. Organ. Dev. J., 2012, doi: 10.1108/01437731211253028.

[9] S. Dunne, C. Lunn, M. Kirwan, A. Matthews, and S. Condell, "Planning and selecting evaluation designs for leadership training: A toolkit for nurse managers and educators," J. Prof. Nurs., 2015, doi: 10.1016/j.profnurs.2015.04.005.

[10] [T. F. Cheng and H. C. Wu, "A follow-up study on vocational high school principals' opinions about 360 degree evaluation feedback and their leadership effectiveness and behavior change," Asia Pacific Educ. Rev., 2020, doi: 10.1007/s12564-019-09608-x.

[11] [. Lau, "Cultivating eHealth evaluation leadership," Healthc. Manag. Forum, 2019, doi: 10.1177/0840470418806534.

[12] [L. Pratch and J. Jacobowitz, "Gender, Motivation, and Coping in the Evaluation of Leadership Effectiveness," Consult. Psychol. J., 1996, doi: 10.1037/1061-4087.48.4.203.

[13] S. K. Jones, K. H. Chan, J. S. Bourdage, and A. Bharwani, "Identifying leadership in medical trainees: evaluation of a competency-based approach," BMJ Lead., 2022, doi: 10.1136/leader-2020-000402

Leadership Styles: Transformational, Transactional, and Visionary

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Abstract— Although transactional leadership focuses more on extrinsic incentive for the accomplishment of work duties, transformational leadership builds a vision and motivates followers to go above and beyond needed requirements. According to the philosophy of transformational leadership, leaders inspire followers by coordinating their objectives with their own. This chapter discusses leadership and traditions..

Index Terms— Leadership, Transformational, strategy, Transactional, Visionary

I. INTRODUCTION

The examples we have used to demonstrate the impact of narrative may lead us to believe that the idea only holds true for historical figures such as the Lincolns, Monarchs, Gandhis, Roosevelts, Marshalls, and their contemporaries. People of this caliber are referred to as "visionary" or "innovation" leaders by Howard Gardner because they often update well-worn narratives or see the world in daring new ways. Nonetheless, "regular" leaders also use tales as a form of motivation, even if their impact may not be as great or their stories as creative [1]–[3].

These typologies, together with the transactional and transformative leadership categories, are useful for classifying the many dynamics and facets of leadership, but they are challenging to apply precisely or consistently to specific situations or people. Great presidents like Franklin Delano Roosevelt sometimes display inventive and even visionary leadership, but other times, he behaves much more like a classic backroom politician. Lincoln had a remarkable moral vision for the American unity, but his responses to the blatant injustice of slavery were varied. So, it is wise to exercise caution when making unjustified generalisations about specific leaders and the nature of the narrative, particularly in professional settings like colleges. By letting go of rigid classifications, we may also think about the more extensive applications of narrative in businesses' daily operations. Universities and colleges, whether they are visionary or transactional, transformative or ordinary, require the resources offered by their narratives of identity for the task of strategy and leadership as they adapt to a changing world and plan their futures.

Many glimmers into how collegiate narratives influence and direct leadership processes at colleges and universities have been offered, and techniques for disclosing and articulating institutional tales have been explored. We can now go on to a more detailed examination of the role that narratives play in college leadership processes, particularly those that are connected to strategy, and we'll come back to

the topic in subsequent portions of the book on a more concrete level. College administrators often put worries about transformation and legacy at the forefront of their discussions about their strategic responsibilities. The dual focus is evident in any review of college strategic plans, despite the fact that the terminology employed to characterize the conflict is sometimes formulaic. One can plainly observe the conflict between tradition and innovation in Presidential Essays: Success Tales, a collection of writings by the presidents of thirteen small schools and institutions that concentrate on challenges of strategic change. The necessity to connect change to the organization's history is always clear, especially when presidents deal with more general strategic issues rather than narrow management innovations. A constant commitment to connect the achievements of the present with the traditions of the past, in the words of one president, "is perhaps most vital to getting community on board with our mission." Similarly, to borrow the words of another, "Tradition was a key source of the college's pride and identity. It was vitally crucial to honour tradition even while substantial change was being attempted [4]–[6]."

Similar ideas regarding legacy and transformation are presented as they concentrate on the moral qualities of leadership in a collection of twenty-four essays by the leaders of several huge and complicated organisations on the presidency. The presidents use a variety of metaphors to express the duties of leadership, particularly in times of crisis, but they often stress how vital it is to have a thorough understanding of the organization's principles and culture. The destiny of the university and of society as a whole should be shaped by the currents that presidents constantly search under the surface of events to uncover. They are able to express their organization's narrative and build a "bridge from where we are to where we could be" by using the appropriate metaphors and symbols.

Large-scale empirical investigations provide evidence to support these instances of the importance of narratives in leadership. According to Birnbaum's analysis, presidents who are seen as being exemplary by their core constituents

stand out for having good interpretative abilities, the capacity to personify the institution's principles, and the capacity to highlight its positive attributes. By expressing a vision for the institution, they are able to connect their leadership to the standards and principles of the organization's culture. . . that expresses what others have thought but been unable to say.

Simsek and Louis and Simsek have shown the significance of narratives, metaphors, myths, and paradigms in tracing what they see to be transformative change at one of America's major land-grant institutions, further defining their claim.

Early planning procedures and state budget cutbacks made it abundantly evident that the University of Minnesota's unrelenting and misdirected development was straining its resources and degrading its quality by the early 1980s. Open admissions were becoming more common in many programmes, teaching loads were increasing, and funding for graduate study and research was generally declining. The interim president Kenneth Keller offered his own interpretation of these occurrences and suggested a plan of action dubbed Commitment to Focus. It recommended the creation of distinct goals, a better ratio of undergraduate to graduate enrollments, more central coordination, and a focus on quality rather than quantity. As the proposed modifications marked a significant departure in how the institution saw itself, they were met with both support and criticism.

Simsek and Louis examined these changes in faculty members over time and discovered evidence of a change in the paradigms, mythologies, and metaphors that the faculty used to interpret their experiences in the organisation. People found it simpler to communicate their views on change when they used realistic metaphors as opposed to intellectual abstractions. In the university's previous era, pictures of massively expanding plants or ungainly huge creatures like elephants had predominated. The lion is an image from the later era, and metaphors that convey a stronger feeling of being smaller and more directed are also common.

The older narrative of the university being all things to all people was transformed into a model emphasising more central direction, smaller size, and an ability to make differentiated judgements about programme quality and funding. Simsek and Louis see a shift in the basic paradigm for the organisation itself from "entrepreneurial populism" to "managed populism." The shift was significant in terms of populism's conventional viewpoint. Simsek and Louis draw the conclusion that "leadership methods that stress interpretation of organisational principles and meaning" are necessary for true organisational transformation, and that "Leaders must become effective story-tellers rather than commanders-in-chief." It follows that strategic leadership is affected. A vision cannot be imposed from above, but it may develop as a result of a strategy process that examines competing paradigms, values, and myths that attempt to explain how organisation members perceive their work [7]–[9].

The University of Richmond's financial future was in question by the late 1960s. This tiny, private institution, established in 1830 by Virginia Baptists, has around 3,500 undergraduate students and has served the community and state well by offering high-quality education opportunities. Yet, as the 1970s came into being, there were growing problems in the competitive arena, particularly as Virginia increased financing for its esteemed public institutions and established the Virginia Commonwealth University right next to the University of Richmond.

The institution had a $6 million endowment at the time, and professor wages were at the fortyth percentile. Faculty offices were being utilised in abandoned resident hall spaces. The campus heating system was beyond repair, the food services failed a health inspection, and two dormitories had to shut or build fire escapes. The scientific laboratories were on par with those of other high schools, and the library lacked the required number of seats for accreditation. Only a miracle or a merger with the state system, according to President George Modlin, could save the university's financial collapse.

Three decades later, the University of Richmond is seeing a remarkable metamorphosis. Total assets are close to $2 billion, including the endowment and additional investments worth over $1.5 billion. At minor colleges, professor incomes by rank are above the 90th percentile, while the faculty-to-student ratio is less than one to ten. The number of applicants for the 750 undergraduate spots averages 6,000, test scores have climbed from 1,000 to 1,300, and the School of Law has become very selective. The breathtaking site is home to an ever-expanding assortment of cutting-edge facilities and fresh educational initiatives. There are sizable operational and plant reserves, and no maintenance has been put off. The accomplishments of the faculty and the students continue to exceed expectations. What took place? One of the university's recent graduates, E. The greatest contribution to a college or institution made at the time by a living person was given by Claiborne Robins in 1969, who came out to pledge $50 million. Robins and his family would provide an additional $125 million in gifts and bequests during the next 25 years. Others, such as the Jepson and Weinstein families, joined in making multimillion dollar gifts thanks to his leadership.

II. DISCUSSION

Several of these transformations had already taken place by the time I became president of the university in 1988 under the zealous direction of President Bruce Heilman, and they proceeded under the ambitious ambitions of my successor, William Cooper. discovered that many of the teachers, employees, and trustees had a strong sense of potential and aspired to national leadership. The momentum was embodied by a proposed new school for leadership studies that Robert Jepson, an alumni, supported with a $20 million contribution. Yet, profound and puzzling forms of animosity over changes made to the institution throughout the changeover were also

discovered. There were alarmingly high levels of tension among the senior professors, certain trustees, and sizable portions of the alumni group. Several people found the success indicators to be unsatisfactory, and at every board meeting they would ask, "How many of the applicants are from Virginia?"

Reflecting on the transition period, it was found that the university's narrative of identity had shattered, and with it, the significance of its accomplishments. An organisation that had been struggling financially had prospered. A school where Virginians made up more than 80% of the student body today has the same proportion of out-of-state students, mostly from the Northeast. A Virginia Baptist-founded and -run college gained independence, and the co-educational academic structures of Richmond College for men and Westhampton College for women had developed into residential programmes [10], [11].

Hearing, absorbing, and expressing the university's story was one approach that sought to address these problems. In order to gain their comprehension and commitment to the university's ambitious vision of national leadership, it was necessary to first address the feeling of loss experienced by many graduates before setting the university's identity in a bigger strategic framework and aim as a leader.

The place's history persisted in several locations and ways, with more continuity than discontinuity, and remained whole and vivid. and pleasure in its accomplishments is preferable than contempt. I made an effort to summarise the major ideas and principles of the university's history in order to show that continuity. Even though new buildings were continuously erected and remodelled, the strong feeling of place that distinguished the Richmond experience via its gorgeous woodland collegiate gothic campus remained. The campus's spiritual tradition and the professors and staff's outstanding levels of dedication served as inspiration for the prevailing feeling of camaraderie, decorum, and service. The faculty's dedication to engaged learning via an ever-expanding range of possibilities for student research and other types of active and collaborative learning was clear evidence of a continuity of purpose and practise. The core of Richmond's mission has always been education as the transformation of human capacities and potential, made possible by the faculty's deep involvement in students and their own work. A tiny collegiate institution with the intimacy and style of a college and the scope of a university served as the story's structural foundation. While the university's complexity was evident in Division athletics, schools of arts and sciences, business, law, leadership, and continuing studies, as well as a wide range of interdisciplinary programmes and a comprehensive programme in international education, student learning remained the primary focus of the collegiate experience. A consistent theme and objective of the Richmond experience was to give participants a sense of how the many educational strands were interconnected. Moreover, it was said that the university's self-understanding and future vision have long

included a feeling of potential in the dedication to seek and capacity to realise the greatest intellectual objectives.

The pivotal yet improbable choice to move the college out from downtown in 1910 served as the narrative's touchstone and served to show the consistency of the vision of possibilities. The location of the campus was unfortunate—it was a deserted amusement park in a distant area of the city with a tiny lake surrounded by bare hills. The institution opted to borrow the money it required, which was an unprecedented risk for the period and location since it had limited resources to build a new campus and create Westhampton College for women. President Boatwright hired the renowned Boston architectural firm of Cram, Goodhue and Ferguson, creators of the Princeton chapel and graduation quads, as a powerful symbol of lofty aim. The idea to construct the structures in the collegiate gothic style and set up the colleges separately after Oxford and Cambridge was approved by the board. A compelling vision was beginning to take shape within otherwise conventional forms when a Baptist college in the South sought out architects in the North, defied the prevailing tradition of Georgian campus design with high-church architecture, and founded a woman's college with strict academic standards.

The effectiveness of this attempt to present the Richmond tale as a kind of strategic leadership with any guarantee of demonstrating causal relationships is difficult to evaluate. The inspiring force of the tale may in fact have contributed to the achievement of the objectives of two challenging strategic plans and a significant capital campaign, and the campus atmosphere for decision-making remained focused and extremely productive. At the moment, direct evidence from alumni leaders of a shift in viewpoint on the university's national horizon of goal was highly compelling, and the resistance to change seemed to lessen. Yet there is no simple method to demonstrate the connections, and those changes may have been caused by unrelated occurrences.

Others, though, came to believe that the university's history was really characterised by its pursuit of intellectual excellence via a spirit of possibility. The narrative established the circumstances that allowed for many of the university's accomplishments and provided a framework for understanding its development. The narrative was included into tactical plans, documents, speeches, solicitation drives, and all other types of governance and management. Maybe most significantly, it gave the leadership team and Myself, as president, a feeling of clarity, confidence, and conviction about what the organisation stood for and what it could become. The narrative developed into a sincere source of drive and direction for the responsibilities of leadership. Narrative leadership includes a number of components, such as carefully analysing epochal events, promoting discussion about their importance, consistently interpreting them, inspiring people to uphold shared ideals, and turning the tale into plans and objectives.

The discipline of strategic leadership:

One of the major themes in college tales is clearly continuity and change, and the examples of narrative leadership that we have looked at all contain this aspect. But, the fact that it keeps happening shouldn't make us believe there aren't any other plots in stories. In other instances, stories relate to recounting the transformation of ostensibly negative traits into resoundingly positive results, describing national or global supremacy in applied or fundamental research, describing a steady rise to greatness through an unwavering focus on student learning, relating an institution's disproportionate influence in relation to its size and resources, or relating a constant singleness of purpose. The narrative continues to serve as a touchstone of identity as leadership develops via strategy, a point of reference for sense-making and sense-giving, and a source of the integrative and systemic potential of the whole process.

Identities and Purposes

"Identity" is a bigger notion and deeper phrase than "mission," which is sometimes understood as static. "Mission" may be the most popular word in the higher education vocabulary for these issues of self-definition. Identity includes culture and structure, meaning and accomplishment, drive and accomplishment, ambitions for the future, as well as past and present successes. Uniqueness is important to identity. Finding identity is about "seeing through" all the layers of the organisation, including its organisational charts, numbers, earnings, staffing, and history, according to Lawrence Ackerman, who shares his experiences as a consultant in strategic management. This is done in order to discover "the heart, mind, and soul of the company as a self-directing entity in the purest sense." Mission is still a crucial idea, but when it develops from identity, its definition as a proactive commitment to a cause may be refreshed and reclaimed. While not being the same, each need the other in leadership.

The Integrated Discipline of Strategy

The investigation and narrative of the story's substance and significance rely on many approaches of reflection, analysis, and synthesis, which are essential components of strategic leadership as an applied and integrative profession, as we have now been able to witness in a number of different situations. To comprehend and transmit the meaning of tales, one has to possess a certain set of abilities and capabilities. We link many of these skills to the humanities and some branches of the social sciences, particularly since they focus on comprehending human commitments and values. Understanding how the imagination expresses itself via diverse forms of language and symbolism is necessary in order to identify and explain the story's wider human relevance. As tales are primarily, though not exclusively, understood and shared via the written and spoken word, command of the language is a tremendous tool for leadership.

We have also come to understand that an institution's narrative is a subtext that is expressed in its policies and programmes, connections and structures, campus and resources, and what is now known as the organization's culture. The cultural text must be exposed and openly read in order to effectively influence strategic choices for the future. Several types of intellectual abilities are required for the identification of the defining characteristics and values of the culture; some of these abilities may be found on the applied sides of disciplines like anthropology, sociology, social psychology, and organisational behaviour. As a result of the need to identify the organization's cultural and structural patterns of identity, the work now requires more analytical thinking and less artistic expression. Background information for understanding and retelling the tale is provided by how the institution views itself and carries out its mission, sometimes via crucial rituals and practises. As we have seen time and time again, numerical strategic indicators are yet another essential instrument for understanding the character of an organisation.

Narrative and Motive

Strategic enquiry has a unique aspect that pertains to the story's ability to move, inspire, and inform action as a leadership discipline. Since it tackles values that foster a feeling of commitment among its members, the narrative in leadership is more than just an entertaining tale or a collection of ideas to stimulate the mind. Communication of beliefs to believers and of obligations to people who hold them are both parts of an identity story. Leaders must go beyond external explanations to develop internal meanings that speak to everyone, including themselves, as members of a community of commitment. They must not dismiss the facts or duck compelling arguments, however. They aim to engage the lives of people they lead by telling the tale in words and putting it into practise via their deeds. Leaders offer personal narratives that help to bring shared principles to life and unleash their potential. As we've seen, stories often combine a vision that inspires us and a call to action. Hence, knowledge and storytelling come first and second in an integrated leadership discipline.

Criteria for Normative Tales

Given how often leaders use and embellish tales for their own ends, there are significant moral ambiguities and challenges surrounding the role of narratives in leadership that must be addressed. Many identity myths are authoritarian and restrictive. They have the power to captivate the mind and ensnare people in never-ending cycles of conflict, hegemony, and misery. Tales have the power to stir nasty impulses and a wicked imagination. The account has to be questioned and assessed according to criteria and standards of proof, as is the case with any kind of cognitive enquiry or discipline, as we have discovered after looking at a number of instances of disputes over the use of language. Every narrative has to be put to the proper tests since not all of them are good or truthful. It has been difficult for the contemporary imagination to come up with tests for issues pertaining to

values, yet it would be foolish to leave the most significant commitments that people will ever make to the whims of emotion, choice, or circumstance. Notwithstanding whatever logical disagreement we may have on the usefulness and objectivity of our guiding principles and narratives, we are compelled to base the real substance of our life on principles we believe to be unquestionably true. When it comes to explaining the tales and values we live by, we should be able to do more than merely stutter or shrug our shoulders.

These observations may appear disconnected from the stories of colleges and universities, yet they are vitally linked to them if some of the leadership responsibilities are to be carried out using the techniques of an applied discipline. Every narrative has counter-stories that give an alternate view of an organization's history, beliefs, and goals, as Howard Gardner points out, therefore the veracity of college tales relies on standards and supporting data.

A tale needs evidence to back up its assertions if it wants to prevail against its rivals. College leaders will not be able to effectively or credibly use the narrative as a tool for leadership if they attempt to use it as a toy for their egos by falsifying the facts, deleting the heritage, or presenting an empty vision.

This is not the appropriate place to do a thorough investigation of the normative aspects of identity tales. While it doesn't call for as much, collegiate storytelling does benefit from being linked to the kind of issues that everyday experience raises in order to examine its own commitments. It is useful to quickly consider the ways that we introduce normative expectations to the narratives of our organisations, just as we aim to define and codify a manner of leadership that is already at work in an effective strategy process. We should make sure that the narratives around our identities, both those we tell and those others tell, accurately and credibly represent historical events and actual conditions.

We are aware that legends and exaggeration are the stuff of tales, but we don't want to mislead anybody with our words or allow ourselves to be misled by what others say. The significance of events as they are owned and lived transparently by the participants must be reflected in stories, which must also be real. We must support our claims with facts when we rewrite and reinterpret tales in order to avoid misleading the audience. Stories must have an internal consistency in order to be convincing and inspiring, even if this is not a question of logic or deductive reasoning.

Consistently, tales encourage action rather than merely talk, enduring objectives over temporary ones, and constant attention over ebb-and-flow excitement. Another test for our tales is their coherence since without it, we are unable to link the story's many elements and see how the various themes fit into a larger integration of values and ideas. We also ask that the meaning of local commitments be fully explained in our collegiate stories in relation to the larger world of fundamental social and educational values, to significant emerging realities, and to the cause of education as a means

of human transformation, which has its own larger narrative. Stories that are narrow-minded and protective that strictly worship the past are the byproducts of a defective imagination and are thus insufficient as forecasts for the future. Thus it continues. We demand that our tales demonstrate their credentials by repeatedly stressing questions with normative power. A leadership discipline has certain types of evidence, but it still has them [12], [13].

III. CONCLUSION

Despite the fact that transformational leadership also has a beneficial impact on employee performance, the transactional leadership style is having a greater positive impact on employee performance. Effective managers play a crucial role in transformational leadership since manager performance ultimately decides the success of the business. Companies that invest in teaching leadership have a significant advantage over their rivals.

REFERENCES

[1] R. Van Eeden, F. Cilliers, and V. Van Deventer, "Leadership styles and associated personality traits: Support for the conceptualisation of transactional and transformational leadership," South African J. Psychol., 2008, doi: 10.1177/008124630803800201.

[2] I. Kanwal, R. N. Lodhi, and M. Kashif, "Leadership styles and workplace ostracism among frontline employees," Manag. Res. Rev., 2019, doi: 10.1108/MRR-08-2018-0320.

[3] K. Dartey-Baah and S. A. Addo, "Psychological identification with job: a leadership-OCB mediator," Int. J. Organ. Anal., 2019, doi: 10.1108/IJOA-10-2017-1262.

[4] T. K. Vatnøy, B. Dale, M. Sundlisæter Skinner, and T. I. Karlsen, "Associations between nurse managers' leadership styles, team culture and competence planning in Norwegian municipal in-patient acute care services: A cross-sectional study," Scand. J. Caring Sci., 2022, doi: 10.1111/scs.13064.

[5] A. F. Soliman, "A proposed model for leadership styles effect on total quality management implementation: An applied study on telecommunication for mobile service companies in Egypt," Int. J. Product. Qual. Manag., 2018, doi: 10.1504/IJPQM.2018.092983.

[6] A. Farouk Soliman, "Investigating the Leadership Style Effect on the Technology Transfer Effectiveness: A Proposed New Model (An Applied Study on the Dairy Manufacturing Sector in Egypt)," Int. J. Bus. Manag., 2016, doi: 10.5539/ijbm.v11n10p141.

[7] T. R. Hinkin and J. B. Tracey, "Transformational leadership in the hospitality industry," J. Hosp. Tour. Res., 1994, doi: 10.1177/109634809401800105.

[8] T. Lauer, "Success Factor Person: Right Leadership in Change," in Change Management, 2021. doi: 10.1007/978-3-662-62187-5_6.

[9] P. Kristianti and R. Loisa, "Analisis Budaya Organisasi dan Gaya Kepemimpinan dalam Komunitas Wadah Pemimpin," Koneksi, 2021, doi: 10.24912/kn.v5i1.10187.

[10] . L. Thyer, "Dare to be different: Transformational leadership may hold the key to reducing the nursing shortage," J. Nurs. Manag., 2003, doi: 10.1046/j.1365-2834.2002.00370.x.

[11] H. Vanharanta, J. Einolander, J. Kantola, E. Markopoulos, and A. Sivula, "Phronetic leadership style evaluation with a fuzzy

logic application," Theor. Issues Ergon. Sci., 2020, doi: 10.1080/1463922X.2020.1768319.

[12] V. J. Owan, M. E. Asuquo, and E. Etudo-Eyor, "Leadership Styles, Public Relation Skills and School-Community Collaboration: A Quantitative Analysis of the Perception of Stakeholders," Int. J. Leadersh. Educ., 2022, doi: 10.1080/13603124.2022.2045627.

The Core of Strategic Leadership: Mission and Vision

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Abstract— A mission specifies an organization's purpose, while a vision outlines its course. The mission aids in setting priorities for tasks and offers a context for decision-making by emphasising the value a company generates. A leader's plan for the company also heavily relies on vision. This chapter covers vision and action plan, developing a stated mission, strategies and mission-based leadership, and moral implications of a vision..

Index Terms— Academic, Education, Leadership, Plan, Strategy

I. INTRODUCTION

We must establish a new set of standards for strategy's duties if we want it to become a kind of leadership. Since it deals with human values, objectives, desires, and needs, leadership is demanding. Although using the same structures, it alters the objective behind strategic planning and decision-making. Integrative thinking creates new connections between results in a leadership process. The process of making decisions develops a sensitivity to symbolic meanings as it creates a methodical plan of action [1]–[3].

When a purpose and goal are stated, the leadership dynamic unavoidably assumes a central role in strategy. The logic of management must unavoidably give way to the language of leadership once these ideas are brought up in the strategic conversation. It is expected of leadership to play a unique role in igniting a passion for common objectives. A need of strategy and a duty of leadership, the expression of a vision is closely related to the defining of purpose or mission. It cannot be added as an afterthought to a strategic management process that would otherwise function normally. Academic communities are ambivalent about how power should be used, but they also demand that there be a clear sense of direction.

Leadership responds to fundamental human psychological needs and expectations, as we have seen and will continue to discover. Because of this, strategy enters dangerous territory when it addresses issues with purpose and vision. Mission and vision must not only provide a genuine course that ties into the identity story, but they must also create the means by which the organisation may achieve its objectives.

The Mission and Its Troubles

Regrettably, the majority of schools associate their purpose with the declarations that need to be updated every ten years for regional or specialised accreditation. Unluckily, those who have eaten at the certification table for mission statements try to resist going back for more. Cutting and pasting words and phrases together is often the order of the day, which makes the process lifeless. Alternatively, it is obvious that the endeavour is primarily political, with people attempting to further their own disciplinary, administrative, or other objectives. Usually, the procedure is undertaken as a compliance obligation and has nothing to do with the creation of a plan. Around this activity, discussions on the primary objectives of student learning, the social factors impacting education, the main markers of strategic self-definition, or the outcomes of internal or external assessments do not often take place.

As a result, the majority of mission statements are uninspired and ambiguous. The accreditation committees often make fun of their similarity since they have to read many of them at once. Institutions were unable to respond when Newsom and Hayes inquired about how they really applied their mission statements. They also found that the mission statements could not be distinguished by institution when the names of the colleges and universities were covered up.

"It is in no one's interest that purpose be stated clearly," Gordon Davies writes in an even sharper criticism of mission statements that captures the political reality of struggle for resources in state organisations. Higher education's version of the Army's motto, "Be all that you can be," is dubbed "Get all that you can get."

Why is it so difficult to identify an organization's mission, which is its most essential component? One solution is offered by the circumstances of the attempt. The strategic importance of self-definition might be distorted by both accreditation and budget procedures. Strategic thought may be stifled by administrative conformity in one situation, while it is inappropriate in the other due to budgetary gamesmanship. Keeping it safe by using revered abstractions like teaching, research, and service keeps things peaceful at home and the bureaucrats and accreditors at bay.

Academic institutions obviously cannot even attempt to conceal their goals from the outside world in a substantive or strategic sense. They are evident and undeniable in the

arrangements of a campus's physical assets as well as in the intangible principles and initiatives that a particular institution uses to set itself apart. While missions may only be loosely expressed in words, they are inextricably linked to acts and activities. According to George Kuh and his colleagues, institutions have two missions: one that is executed in campus life and culture and one that is expressed in policies and printed materials. Institutions that seem to be particularly effective at achieving their educational objectives for students exhibit "aliveness" to their mission in both conceptual and operational choices.

Being everything to everyone may be a ruse to amass money or avoid making difficult decisions, but it cannot be maintained as a goal. The organisation that conforms to such a norm will eventually be consumed by it. Without specific goals, humans are unable to think or function properly. "The freedom to be anything the imagination proposes is equally the freedom to be nothing in particular," Leslie and Fretwell write.

Vision And Action Plan

Purpose has evolved into a permanent strategic problem as colleges and universities have dealt with the difficulties of recent decades. Almost every day brings new types of change in the social dynamics and commercial realities of larger society, as we have seen in our examination of diverse models of decision-making from the academy to the corporate university. The age-old topic of institutional purpose takes on a new urgency as a result of accepting change responsibly.

The backdrop that is appropriate for the explanation of institutional purpose as a main point of reference for strategic leadership is provided by our prior investigation of the concepts of narrative and identity. The identity story gives the background, texture, and depth for the goals that have been carried out. Identity expresses itself plainly in a clear sense of purpose when the institutional narrative is translated into the overarching themes and values of its identity.

The organization's distinctive existence as a culture and its forms of community, as well as its whole spectrum of memories and dreams, assets, and accomplishments, will not all be explicitly stated in its goal. While evaluating our purpose, we pay more attention to why we are here than the minutiae of how we got there. The focus is mostly on the substance of what we do. The strategic leadership discipline that explains purpose is concentrated. It seeks accuracy in laying forth the distinctive values, objectives, and capabilities of the company. By doing this, it encourages the school to continue reflecting on how it defines itself and sets itself apart from other higher education institutions [4]–[6].

Although being intensely focused, the discipline of purpose produces results that are vital for the practise of leadership. As the drive to accomplish purposes is ingrained in the human inclination's nuclear structure, it plays a crucial role in both the sense-making that participants look for in an organisation and the sense-giving they expect from its

leaders. Leaders are therefore given a strong rallying point through purposefulness, which inspires energy and dedication to shared objectives. It is possible to reclaim and then relinquish the feeling of conviction, dedication, and calling that is associated with the concept of mission.

The creation of a mission statement

The purpose of a college or university must first be brought into clear understanding before it can be included in a process of strategic leadership. The most probable setting for a continual strategic dialogue on mission is the SPC or one of its subcommittees. It gathers professors and administrative officials around a single table. The following types of questions will assist in bringing an institution's purpose to explicit form as a pattern of self-definition that lays a claim on its members, regardless of which group or groups actually carry out the work and regardless of procedure.

While they provide a starting point, sequential responses to distinct questions do not effectively convey a sense of aim. A clear sense of purpose should emerge from the process of enquiry and self-definition as criteria that underline the institution's difference. Which of the proposed mission's distinguishing traits, for instance, achieves a degree of meaningful strategic differentiation? What distinguishes a location from others and gives it its unique identity? What unique educational or managerial capabilities does it have? What specific economic, social, and political issues have shaped its present and future? The idea of core competencies prompts us to consider the unique, innovative skills a business may possess that may traverse departments and programmes. Has the level of any competences been consistently distinguished to the point that they can now be used to legitimately define performance and quality? We question how educational value is produced and competitive advantage is attained using the language of business strategy.

Other criteria, such as the evaluation of successful measurement, are used to direct the process of strategic differentiation. An organisation must have a method of confirming that its stated objectives are being met as its goals are stated. The measurement need not be numerical but rather might be meaningful. The goal of "student transfor- mation" may be examined by a wide range of various types of analysis and evaluation; it is not quantifiable alone. An institution thus constantly evaluates itself as it assesses its purpose in a strategic framework by asking, "In terms of what measure, indicator, or proof can we promote this claim? "

A crucial aspect in the strategy process is the concise and thorough explanation of purpose. One of the most important benefits is that it provides the business with a model for making strategic decisions in an organised manner. It serves as the focal point for the formulation of strategic plans and objectives as well as the determination of budgetary priorities. At organisations like universities that are full of brilliant and ambitious individuals, developing strategic understanding in successful financial decision making is essential. The perceived demands and innovative ideas

usually outweigh the resources in such areas. A crucial component of effective management is having a strong sense of purpose.

Strategy and Mission-Based Leadership

A strong sense of strategic purpose offers more than simply a useful standard for making decisions. It provides a solution to the deeper aspects of human nature and the need for significance. People quickly lose motivation or get confused if they believe that each option is as excellent as any other. People become jaded, cynical, or rebellious as a result of bureaucracies, even academic ones, losing their sense of purpose or developing pointless systems of control. On the other side, individuals get involved when they can influence the goals of their companies and understand why they are doing certain actions. A person may develop and become more empowered by having a lived purpose, which is a fundamental way of making sense of the world. The expression of real purpose is thus a component of leadership, not merely management [7]–[9].

A feeling of purposefulness not only strengthens the individual, but also fosters a sense of community, as individuals in all organisations are well aware. An academic institution empowers itself by recognising its existence as a community, which is a recurring thread in the historical story of higher learning, much as a person thrives by knowing her profession as a vocation. Communities are built around a variety of things, including shared beliefs, experiences, memories, and spaces in a neighbourhood, but they are usually characterised by similar goals that foster a feeling of teamwork. The community's members develop a basic bond with one another via service to a shared cause and understanding of a common objective. People become bonded because of their common commitment to the cause, and these relationships are shown via reciprocal actions of affirmation and rebuke.

It is crucial to underline that higher education serves goals that provide the groundwork for a free society in an era when market realities rule and its value as a public benefit has been muddled. It is one of the responsibilities of academic leadership to elevate and confirm these strong beliefs as a source of dedication and motivation. Academic professionals are intrinsically driven by a dedication to the power of knowledge and to the integrity necessary to seek it, while often being seen as being everlasting doubters. "In our cultural milieu, the university is still the area where dedication to knowledge is most fundamental, where it not only endures but has immense force," writes Burton Clark in his classic essay The Academic Life. Many academics are aware of this influence. They discover a devil who clutches the threads of their own existence when they devote themselves to intellectual honesty. Without being aware of the depth of these values and beliefs, one risks missing a key element in the institution's narrative of identity while attempting to comprehend the purpose of the organisation. When we see an institution's purpose as its own

self-investment in noble goals, we may better understand how strategic leadership taps into a plentiful source of zeal and allegiance.

The creation of a future vision is integral to the definition of strategy and establishes an unbreakable link to the leadership theme. Nevertheless, for a number of reasons, campus strategic plans often fail to reflect the strength of a vision. The word is sometimes contested because it is seen to be a fashionable component of pop management jargon. Prior experience with a vision that failed to deliver the big improvements it promised often causes campus hostility.

The fundamental concept of vision is neither obscure or fantastical; rather, it is the heart of leadership and strategy. If we were to ask ourselves, "Who are we? "And with regard to our mission, we ponder, "Why are we here? Next, we question, "To what do we aspire? in terms of our vision. We use the metaphor of sight to describe how an institution chooses among its finest future options. Burt Nanus makes a strong case for how vision is essential to strategy itself: "A strategy has cohesion and legitimacy only in the context of a clearly articulated and widely shared vision of the future. A good strategy may be indispensable in coordinating management decisions and preparing for contingencies. A strategy is only as effective as the vision it is based on, which is why purpose and intentions often have greater influence on organisational behaviour than plans do. Nanus is explaining the connection between strategy and leadership without using words. The prerequisite for the process and domain of strategic leadership is the existence of a successful vision in the strategy. When everything is said and done, one of the most extraordinary human abilities—the capacity to foresee the future in order to create it—will be what propels the process. Humans are capable of transforming their visions of the future into reality under the correct conditions by applying their knowledge, creativity, willpower, and resources to the endeavour. This unique human potential gives birth to many of the essential elements of strategic leadership.

The intellectual synthesis necessary to develop a vision is challenging and complicated. Strategic choices need to be both thorough and analytical, as well as creative and inventive. Strategic thought, once again, must depend on tales as well as ideas, pictures, and metaphors, together with facts, to understand possibilities that are not yet completely developed. Both identification and aspirational narratives need for a perceptive use of language. Each concept conveys a complex set of meanings that strategic leadership must first explain and then enact through a set of strategies, goals, and actions. We speak of "greatness" or "eminence" or "distinction" and try to grasp and convey the emerging meaning of education in "cyberspace," of "engaged" learning, of "diversity," of "global education," and of education as "discovery" and "empowerment." An successful vision is a fundamental way of producing and conveying meaning that often takes the shape of a story.

II. DISCUSSION

Moral Implications of a Vision

It is a strong reminder that leadership is about the human condition to centre strategy around a vision. It focuses on complex levels of human motivation and agency, as well as human potential and constraints. We get a picture of the future because we are temporal creatures that live and move in time. We wouldn't be the people we are now, and we wouldn't have the ability to understand the connections and responsibilities in our lives without the pictures and patterns that organise our individual and communal memories. We feel the depth of our finitude and search for accomplishments and meanings that will survive because we have a limited amount of time, both in the things we take on and in the days of our life. We strive to understand the future via tales that provide pictures of hope and symbols of promise, whether we are doing so as individuals or as members of the local or larger groups in which we engage. We react to leaders who provide an honest picture of future possibilities for these reasons.

What should the collegiate vision include given this challenging environment? It is false to assume that they must be brief epics, audaciously inventive, or very original. The effects of these are well known. By revealing the potential of the community's future, visions provide sincere and deserving goals that uplift, motivate, and energise the community. Their message should be clear, memorable, and applicable to daily choices. When statements are made concerning achievement levels, it should be obvious how the institution intends to back them up. The reader or listener should be able to state, "That signifies excellence in terms of these determinable traits and accomplishments," whenever the word "excellence" or a similar phrase comes.

Just like we discovered when talking about purpose, a vision also helps to foster a strong feeling of community. If a vision is to be shared by the whole business and not just one person, it must by definition be broadly held. Even if it will never captivate everyone's attention, a shared vision may enliven a group of individuals and inspire devotion to shared responsibilities. Throughout the process, connections are made amongst community members that support the vision itself, helping to establish a feeling of direction and momentum. When the team carries out the vision, a feeling of pride and affirmation develops in the group as a whole and in each member's contributions. Failure of the vision is failure of each other [10], [11].

It should come as no surprise that a vision produces these mutually reinforcing patterns as a large portion of its fundamental information, particularly at institutions like schools and universities, originates from the opinions and experiences of the group itself. To be sure, leaders at all levels, particularly those at the top, significantly contribute to the vision, which is why they are there. They systematically express it in a variety of ways. Alternatively, at different times throughout its growth, they could increase it and even change it. It must begin and establish itself inside the company before it can be disseminated. Its origins may really be found in genuine parts of the institution's history. According to Peter Senge, "If individuals cease posing the question, What do we actually want to create? ' and start evangelising the 'official viewpoint,' the quality of the connections fostered by that discussion degrades. The need to be linked, to a greater cause and to one another, is one of the most fundamental impulses underpinning shared visions. A vision taps into the fundamental human desire to achieve ever-higher standards of excellence as a tool of strategic leadership. What psychologists refer to as intrinsic drive, the pursuit of personal satisfaction, academic excellence, and professional acclaim, forms a reinforcing cycle of achievement. A significant portion of the leadership work will have been completed once the leadership process has been able to ignite the human desire to produce something of enduring value.

People have a true feeling of empowerment and pride when the process of strategic leadership picks up speed, and many new leaders come forward to take on their duties. They simultaneously lead others and themselves[12], [13].

III. CONCLUSION

Most academic professionals exhibit a palpable dedication to excellence in their work, which, as we have seen, is woven into each individual's sense of self. The professional's desire for excellence may quickly become brittle and self-centered, yet it is always there as a strong source of inspiration. It provides a summary of your main points, helping your readers remember them. It gives the writing or speech a sense of completion, making it feel complete. This sense of closure, which gives the impression that things have come full circle, is frequently provided by a reference to anything from the Introduction

REFERENCES

[1] A. G. Dohamid, M. Akbar, and M. R. Luddin, "Strategic Leadership For The Implementation of Three Values of Higher Education Performed by The Indonesian Defense University (IDU) In The 2015-2018 Period," IJHCM (International J. Hum. Cap. Manag., 2020, doi: 10.21009/ijhcm.04.01.07.

[2] M. M. Chikamai and F. Makhamara, "Influence Of Leadership Competencies On Performance Of Tea Companies In Nandi County, Kenya," Eur. J. Econ. Financ. Res., 2021, doi: 10.46827/ejefr.v5i1.1071.

[3] R. J. Vender, "Leadership: An overview," American Journal of Gastroenterology. 2015. doi: 10.1038/ajg.2014.199.

[4] J. Hall, P. Fusch, and J. Booker, "Tribal Gaming Leader Strategies toward a Sustainable Future," Qual. Rep., 2019, doi: 10.46743/2160-3715/2019.3291.

[5] N. B. Osman, M. L. Almeida, M. B. Ustá, C. Bique, and E. David, "Development of a strategic plan by the Mozambican Association of Obstetricians and Gynaecologists: Direct and indirect effects," Int. J. Gynecol. Obstet., 2014, doi: 10.1016/j.ijgo.2014.07.008.

[6] M. L. Frigo and K. Krumwiede, "Strategic Analysis and the Management Accountant," Strateg. Financ., 2020.

[7] N. Kumari, "Comparative Analysis of Organizational Culture in IT Sector," J. Bus. Theory Pract., 2021, doi: 10.22158/jbtp.v9n4p1.

[8] A. S. Lake, "Strategic Planning in Nonprofits : An Analysis and Case Study Application," Int. J. Bus. Soc. Sci., 2008.

[9] E. S. Goldey, "Leadership for undergraduate STEM reform: Weaving a communal web," J. Leadersh. Stud., 2014, doi: 10.1002/jls.21322.

[10] R. D. Cordova, C. L. Beaudin, and K. E. Iwanabe, "Addressing diversity and moving toward equity in hospital care.," Front. Health Serv. Manage., 2010, doi: 10.1097/01974520-201001000-00003.

[11] F. Alkaraan, "Public financial management reform: an ongoing journey towards good governance," J. Financ. Report. Account., 2018, doi: 10.1108/JFRA-08-2017-0075.

[12] S. I. Plan, "Strategic implementation plan 2016-17," Idf, 2016.

[13] M. W. Neumeister and E. G. Zook Endowed, "Can a Plastic Surgeon be a Department Chairman?...Really?," Handchirurgie Mikrochirurgie Plastische Chirurgie. 2016. doi: 10.1055/s-0042-104233.

Conceptual Foundations for Leadership and Vision

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Abstract— The conceptual foundations for leadership and vision provide a framework for understanding the role of leaders in organizations and the importance of having a clear vision for the future. This framework emphasizes the need for leaders to have a strong understanding of their organization's values, culture, and goals, as well as the ability to communicate their vision effectively to their team. Leadership is a complex and multi-dimensional concept that involves a range of skills and behaviors. Effective leaders must be able to inspire and motivate their team, make difficult decisions, and navigate complex interpersonal relationships. They must also be able to adapt to changing circumstances and anticipate future challenges.

Index Terms— Academic, Educational, Leadership, Strategy, Vision

I. INTRODUCTION

As a type of collaborative leadership, we have already seen some of the substance and profound relevance of a vision for the strategy process. Similar to the question of what a purpose is, we must also consider how a vision is consciously formed throughout the strategy-development process. There are systematic methods and insights to be applied as circumstances and the dynamics of a campus dictate, even if there are no set recipes [1]–[3].

As we have seen, the process of building a vision is anchored in the institution's past and identity, much like the formation of purpose. In many respects, vision is the past retold for the present as an aspirational tale. This might imply that the tale is altered by change and new goals, or that it is expanded upon and reinterpreted. But, in the cases we've seen, hopes for the future bring back the tyrannical master ideals and imagery. They give the vision credibility in the eyes of the neighbourhood and give it meaning. Standards, ideals, and representations are open to new information. Instead of the ever-changing substance of choice, they are orientations to choose. Good leaders are constantly cautious about whether structures, initiatives, or rules will need to be updated in order to realise a vision since they can have unforeseen significance for the institution's future. Yet some people will have to go, and if that happens, their loss might be grieved as a necessary payment for a greater good and an honest vision.

Although vision statements may often be given in a few lines as opposed to many paragraphs like mission statements, their associated justifications can sometimes span several pages. It will be useful to look at a few statements from a variety of institutions as they appear in mission statements, strategy plans, accreditation self-studies, and official publications in order to give our topic some context. We may examine some of the statements' similarities and patterns to shed light on their evolution by using the statements that are in front of us.

The University of Connecticut will be regarded as the best public university in the country and a top-tier institution of higher learning. With equal breadth and depth, a well-deserved reputation for quality in teaching, research, and broad societal contributions, Duke University aspires to become completely as excellent as any of the top private research institutions in the nation during the next 20 years. Princeton University wants to be the best undergraduate institution in the world as well as one of the top research universities. Building on its history of innovation, problem-solving, and multidisciplinary cooperation to address the changing requirements of society, Carnegie Mellon will be a leader among educational institutions. The teachers and staff at Sweet Briar College have made the decision that they must show how intellectual and professional pursuits pervade our students' lives in order for the institution to assert its preeminence as a woman's college for the twenty-first century. The relatively tiny coeducational liberal arts college Centre College seeks to be a national model of significance for schools of its size and kind. Williams College is dedicated to become the best liberal arts college in the country.

It will be acknowledged that Pfeiffer University is the ideal school for preparing church-related servant leaders for lifelong learning. Rhodes College strives to produce graduates who have a lifelong love of learning, empathy for others, and the capacity to combine personal concern and academic research into successful leadership and action. Through study, exploration, and service, the University of North Carolina at Greensboro connects the Piedmont Triad to the rest of the globe.

The University of Richmond has set out on a quest to convert into an institution that is superior to all others, greater than all, and unique from all. brilliant brains become outstanding performers. The learning community of Juniata College is committed to provide the best liberal arts and sciences education possible and equipping its graduates with the skills they need to thrive in the modern world. One of the top liberal arts universities in the country is what Roanoke College aims to become. Among the top research colleges in the country, Virginia Commonwealth University strives to be

a pioneer in innovation. Within 10 years, Baylor University hopes to join the elite group of American institutions while asserting and developing its unique Christian purpose.

The goal of becoming the best

Several similar themes emerge when one examines these assertions. The attempt to capitalise on the language of superlatives, especially the term "the finest," is one of them. The terminology may differ and contain terms and phrases such as "the preeminent" or "the remarkable," but the intention is the same and refers to the highest degree of success. Vision statements may use the logic of equivalence in a subtle variation on the subject by asserting either positively that the institution will be "as excellent as any" or negatively that none will be any better. Of course, there are alternative institutions that are just as excellent, which is the unavoidable consequence.

The assertions about being the finest and its variations exhibit hints of reality despite how lofty and exaggerated they often seem since they are virtually always defined by institutional goal and kind. In the references, it is discussed how to become the top liberal arts institution, the best tiny coeducational liberal arts college, or the finest private research university. The twin goals of being undergraduate colleges and graduate research institutions are often stated clearly by smaller and midsize private universities.

Despite their briefness, vision statements stand out by retelling portions of their story in the words that surround them. Being the best and being in the top tier may seem mutually exclusive logically, but they demonstrate how narrative and metaphor shape statements of vision. Rhodes College thus describes its path towards excellence and its place among the top tier of liberal arts colleges by describing the influence of President Charles Diehl, who boldly moved the campus to Memphis in 1925 and suggested that "The good is ever the enemy of the best."

The University of Connecticut has long had a mission and vision to be "a great state university" and, since 1994, to be the country's "outstanding public university." Over the past ten years, the vision has served as a rallying cry to transform the run-down campus, which was once dubbed "a neglected embarrassment" by the local paper, into a showplace worthy of its lofty aspirations. Incredibly, $2.8 billion has been spent on transforming the campus, adding 53 new structures, and achieving significant advancements in applications, selectivity, sponsored research, and other important indicators. By spurring the university and the government to take the initiative in addressing the educational and economic needs of the people of Connecticut, the ambitious goal has acquired local importance [4]–[6].

The goal of being "among the best," which includes many variants such as "in the top tier," "among the top ten," or simply "to be a leader," is another frequent way to frame a vision statement. In setting such a goal, the aim is to draw a circle of shared reputation around a group of top performers that includes or will eventually include the institution. The

vision may implicitly recognise that the goal of its strategy is to attain a quality level that it does not now have, or it may declare its intention to maintain its existing place in a leadership group of peers. Once again, the purpose and the taxonomy of institutional kinds, which includes elements like national and regional, public and private, undergraduate and graduate, and liberal arts and professional, distinguish the aim.

The commitment to excellence

The desire to attain a high degree of accomplishment in specified educational programmes, techniques, and results is a quite different approach to creating a vision. The focus switches from trying to be the greatest to trying to do the best. The language of ambition is still present: phrases like "highest quality" are usually employed to define the desired level of performance. Consequently, we see references on our list to developing a "passion for learning," training "servant leaders," or "empowering students. How successful is the terminology of "the best" and its substitutes when seen in the context of strategic leadership? Does it succeed in presenting a deserving and motivating common vision of the future for the academic community? While the use of superlatives as a leadership tool will always be very context-dependent (the goal is to engage and inspire participants, not the broader public), there are several distinct traits and requirements for superlative-based visions.

II. DISCUSSION

It seems that one of a vision's objectives is to awaken people's ingrained need to distinguish one's reputation and output from others, namely the competitors. The desire to elevate an institution to the level of or higher than rivals and have that perception drive some of the typically polite but very genuine competition for the best professors, students, and resources. Strategic plans may be quickly reviewed to see if this competitive motivation is there. No matter how much one would wish to deny it, competition is a crucial component of strategic thinking and a source of drive.

Yet if the desire to be the best is not balanced by the desire to achieve real and valuable levels of excellence in and of themselves, competition descends into a negative spiral of distortion. The vision must satisfy a number of requirements if it is to inspire individuals to pursue ever-higher standards of excellence as a matter of satisfaction. It must express the principles and real ambitions of a certain institution with its unique background, characteristics, and potential. For these reasons, identifying the area or niche where a company might succeed or take the lead is a worthwhile job. Differentiation is a technique for capturing the unique potential and promise of an institution. Finding and articulating the exact structure of the maximum level of quality and value creation that a certain organisation is capable of achieving is the aim. A differentiated vision highlights the many types of quality that are achievable, making degrees of commitment feasible that

would not have been possible otherwise [7]–[9].

A vision must be both ambitious and realistic if it is to aid in the responsibilities of leadership. It will outline appealing possibilities because it is inspiring, and since it is practical, people will see it as reachable over time. Making ensuring the vision is determinable and, thus, susceptible to many types of measurement is essential to finding the proper balance. A strategy plan or other publicly accessible papers must provide a list of indicators for a successful vision. If a company wants to be the greatest, it must be explicit about how it will achieve that goal or it will rapidly lose credibility. As is often the case, concepts without definitions or context-specific meanings turn into meaningless platitudes that are either kindly disregarded or, worse, resound in cynical asides on campus.

Creating a Strategic Vision that Integrates Being and Doing the Best

A critical weakness of ambitions that are not specifiable is that they block the processes of precise knowledge, focused reflection, linguistic richness, and integrative judgement that are required to create a sustained and powerful vision. Combining reflections about being the best with disciplined explorations of "doing the best" is one of the most effective ways to ensure that superlatives have strategic force. People with in-depth contextual knowledge often engage with peers to investigate organisational issues and possibilities, which may lead to strategic innovation. They begin with an understanding of what they do well rather than how they may improve. These problems give rise to distinct, quantifiable areas of performance, the latter of which leads to a long list of intricate presumptions that, as we have seen, may be challenging to define and quantify. The two types of "best" should, of course, combine in the end, but the sequence in which the problems are tackled is crucial to a vision and leadership.

We briefly touched on Collins' treatment of this topic in Good to Great; it will be beneficial to think about it in more detail. As we've said, there are significant ramifications for other kinds of organisations, including—unexpectedly, perhaps—colleges and universities—in this study of business success. Collins discovered that exceptional firms are often founded on startlingly simple concepts that they remained laser-focused on. That is not, however, simply any concept. It "is not a goal, a plan, or an aim to be the best." It is an awareness of your finest areas of expertise. In each instance when a corporation went from excellent to great, it did so by fervently committing to becoming the greatest in the world at a certain task or ability. Moreover, "The outstanding to excellent organisations concentrated on the pursuits that sparked their enthusiasm. Here, the goal is to identify your passions rather than to arouse it.

While there are comparisons, the concerted endeavour to identify the areas in which academic organisations have a high degree of dedication and the potential to thrive is often a different procedure than in business. The ideals, approaches,

relationships, resources, and qualities that are shown across the whole educational programme and in the campus ethos may possibly be the college's greatest claim to talent and unique excellence. These variables cut across discipline boundaries and might establish the fundamental components of a unique and potent learning strategy. One may trace its origins by asking an organization's members where they exhibit a strong, long-lasting drive for excellence. Where have they, without being told to, infused brilliance into the core of the business? . In order to contribute to a vision as an emerging process of collaborative leadership, it is necessary to expose these features in the work of strategy. The institution might attempt to increase its degree of quality in steps and stages, building on its specific abilities and features as their base. If the vision is genuine, it will play a crucial role in propelling the attainment process. The strategic translation of these unique and generative core skills from what a place does best into becoming the best within a narrowly defined class of institutions or programmes is what fuels a vision.

Imagining: A Make-Believe Campus Tour

Some strategic plans provide an intriguing technique for creating and testing a strategic vision that makes unique use of the narrative form. They use a technique of imagining the actual programmes, procedures, resources, and accomplishments that would be in place were the vision to be achieved or progress made towards obtaining it in a specific number of years, however this is often not done consistently or thoroughly. To bring the future into the present, one must make an effort to clearly conceive what is not yet actual. As it is not an exercise in making wish lists and fantasies, the strategic imagination operates via a structured and integrated way of reflection based on multiple patterns of evidence. It makes use of the most up-to-date quantitative data, employs collaborative techniques, and links its forecasts to the institutional story and its present and potential strategic positions. Hence, it is an example of intellectual synthesis.

According to Ramsden, "A vision is a picture of the future that you want to build an ideal image of excellence, a unique pattern that makes your department, your course, or your study unusual." This analysis is similar to many of the principles put out here. In a similar spirit, the facilitator of a recent strategy session suggested that we compare strategy to the process of putting together puzzle pieces and compare a vision to the image on the box that directs the process.

Consider a technique where a group of participants is asked to imagine a tour of the campus after it has achieved the goal set out for it as an example of how envisioning could take place. The trip will evaluate the plausibility of the concept and give it concreteness and clarity. What would individuals encounter as they go about, and how may it vary from what is there right now? What are the biggest differences between how things might be and how they really are? . Where is there a clearest need for improvement and change? What aspects of the concept stand out as being the most unique, intriguing, and appealing? How is the future

narratively portrayed?

The collection of ideas and pictures that results from a visioning process may be extensive and complicated, as we'll demonstrate below. These will be relevant to almost all areas of the company. The approach then turns into a helpful method for different offices and programmes throughout a campus to determine the significance and potential of the vision for its own work. Every area of responsibility will learn unique techniques to adjust and improve its performance in order to conform to the goal. The main enquiry as the study progresses is whether the ideas and objectives of the vision provide criteria that will inspire commitment to it among all organisational members and communicate real meaning.

Hence, during their make-believe campus tour, visitors will wish to, for instance, look into different aspects of students' academic experiences. They'll want to witness how the teachers and kids get along in the classroom. What types of instruction—both within and outside the classroom—fulfill the vision? What format will the general education and majors curricula take? What standards will educators establish and learners meet, as shown in course syllabi? What kinds of tasks and educational opportunities are planned? What much of writing will be necessary? What additional types of projects—individual and group—can be anticipated? What amount of rigour and quality of labour can we discern from exams and papers? What does the whole educational programme achieve and how does it fit together? What are the students' plans after they graduate? What kind of contributions do they want to make to society at large? What can they do there after they arrive? Where do they go once they depart?

Suppose that as the tour progresses, the visitors ask the same kinds of questions to other academic and staff members in different departments and programmes. Students will be asking questions and imagining the professional traits and accomplishments of persons they meet, notably the contributions that faculty members make to the body of knowledge. The tour will also include a review of the campus's physical resources and amenities. The team will also devote a lot of effort to gathering and evaluating data related to the strategic indicators, which will inform them of the requirements that must be satisfied for the vision to be realised. They will pay close attention to the institution's financial situation as well as the evaluation of the performance of the staff, teachers, and students.

When everything is finished, the group will be free to choose or modify the words that best describe what they imagined and evaluated in their thoughts during your hypothetical stroll. With a twist on the common idiom, in this case the "speak" defines the necessary "walk." The process of envisioning will provide metaphors and symbols that bring the vision to life and encapsulate the institution's future identity. If phrases like "the best," "highest quality," "national leader," "world class," or "outstanding" are acceptable, they

have been associated with certain, reachable levels of success. These must be imaginable and justifiable in light of the institution's ability to rule the setting in which it will probably operate. Yet if they are just words, they will have the opposite effect and breed scepticism rather than inspiration. On the other side, if the process of imagining reveals that the vision resonates with the real greatest opportunities for a location to provide educational value, it has produced a strong source of inspiration.

Locating the most significant differences between what we desire to become and our existing circumstance may also be done via the imagining process. While the restrictions may take many different forms, they always strategically relate to the organization's fundamental capabilities. Most visions may take decades to accomplish, taking longer than a typical strategic plan, but they are able to draw our attention to the structural problems and causative traits that are the main obstacles to realising our highest potential. What are the most crucial holes that need to be filled? When we analyse organisational strengths and shortcomings, this deeper perspective will influence the nature of our strategic self-assessment.

Whether a vision is created by leaders and imposed on the organisation, or if the leader primarily serves as the storyteller for the vision that the organisation creates for itself, is one of the enduring questions about a vision that emerged from our earlier analysis of leadership in higher education. It is more accurate to think of these two opposing extremities of the spectrum as polarities that complement one another.

Vision is a relational idea because leadership involves active reciprocity. It is difficult to understand how a leader's vision could motivate an organisation, particularly a professional one like a college or university, without platforms for honest discussion and open exchange, without engaged and ongoing collaboration to discover his or her constituents' needs and ambitions. It seems inevitable to draw the conclusion that a college vision is always both/and and never either/or in terms of leader and organisation.

It is also evident that listening is a proactive process in which the leader offers suggestions, collects data, incorporates advice, tests limits, and draws on privileged outside-campus knowledge and experience. Ultimately, it is the responsibility of the chosen leaders of organisations to express a strong sense of direction. Hence, sharing the narrative and the vision requires much more than just repeating a vague list of desires and requirements. It is a fundamental aspect of leadership that serves to both provide and make sense.

Aspirational narratives must be maintained and put into action by the leader's commitment in addition to being incorporated and transformed in the telling. Depending on the situation, the formulation and execution of a vision may qualify as either decisive moral leadership or transformational leadership, which entails systematic and

widespread change. The president or other top executives may need to speak out in support of the organization's core principles if a bold vision is declared. When this happens, the scales tip in favour of the leader taking the initiative to assertively formulate, communicate, and implement a vision.

The Requirements for a Vision

It is obvious that the project of turning strategy into a process and discipline of leadership depends on its ability to create, communicate, and carry out a vision. There are a number of requirements that must be met for leadership to succeed in this duty. It would be beneficial to group them together here in an explicit summary form since many of them have a direct connection to the creation of a successful mission as well. A vision statement that serves leadership objectives should be:

1. Clear
2. Concise
3. Focused
4. Differentiated
5. Aspirational
6. Plausible
7. Motivational
8. Shared
9. Authentic
10. Worthwhile
11. Measurable

Conflict Between Mission, Vision, And Structural

According to our argument, strategic leadership may resolve fundamental value conflicts in college governance systems in ways that really matter. Penetrating declarations of goal and vision provide a framework for overcoming the greatest conflicts and problems of shared governance, much like the integrating power of identity narratives.

A vision is an actual contextual articulation of purpose that has developed through open discussion and discourse, not a romantic ideal that a leader has gleaned from some secret realm. As for the procedure, it communicates and fosters trust. As for substance, it offers standards that distinguish, mediate, and resolve the structural tension between autonomy and authority, as well as the intrinsic and instrumental value and measurement that characterise academic decision-making. The ideals of the mission and vision must be implemented in the identity of a particular company. They provide academic communities a sense of professional and moral purposefulness that redefines what autonomy and power really entail. It makes autonomy more aware of the organisational criteria it must meet and authority more aware of the scholarly and moral duties it has. The practise of strategic leadership is about resolving structural conflict at many levels and in various forms across the company, as we will see in other areas [10], [11].

We can also observe that when strategic awareness grows, new tools for tackling some of the more puzzling dynamics of organisational decision-making, like the decoupled choice

system, are made available. As we've seen, in such a decision-making environment, participants carry about personal and ideological preoccupations that they would want to express on a choice, whether or not it is relevant. Yet, when strategic leadership has been able to articulate a sense of institutional history, purpose, and vision, the significance of the context alters. There are now strategic criteria that build the foundation for decision-making by asserting both covert and overt standards of relevance. Participants can more readily create plans and create agendas to make choices and solve issues if they don't have to lug around a lot of extra idiosyncratic baggage.

In some respects, we are ahead of ourselves since it is already assumed but not yet specified how to think about the difficulties and opportunities of the future. We purposefully looked at the mission and vision questions separately to better understand what they signify for leadership. They are always, in a sequential sense, taken into consideration in relation to the larger social, economic, and cultural contexts in which academic institutions are situated. Now, we'll think about how to assess the larger field of strategic factors that colleges and universities must face [12], [13].

III. CONCLUSION

The conceptual foundations for leadership and vision are essential for understanding the critical role of leaders in organizations and the importance of having a clear sense of direction and purpose. Effective leadership requires a combination of skills, behaviors, and a deep understanding of the organization's values and culture. A strong vision can provide a roadmap for achieving the organization's goals, motivating employees, and fostering a sense of unity and purpose. By focusing on these conceptual foundations, leaders can develop the skills and knowledge needed to navigate complex challenges, inspire their teams, and drive their organizations forward. Ultimately, the success of any organization depends on the quality of its leadership and the clarity and strength of its

REFRENCES

[1] E. Sorokina, Y. Wang, A. Fyall, P. Lugosi, E. Torres, and T. Jung, "Constructing a smart destination framework: A destination marketing organization perspective," J. Destin. Mark. Manag., 2022, doi: 10.1016/j.jdmm.2021.100688.

[2] G. Broman et al., "Science in support of systematic leadership towards sustainability," Journal of Cleaner Production. 2017. doi: 10.1016/j.jclepro.2016.09.085.

[3] R. Germain, "Welfare and world money: the domestic foundations of currency internationalisation," J. Int. Relations Dev., 2021, doi: 10.1057/s41268-020-00203-x.

[4] D. F. Olivier and J. B. Huffman, "Professional learning community process in the United States: conceptualization of the process and district support for schools," Asia Pacific J. Educ., 2016, doi: 10.1080/02188791.2016.1148856.

[5] J. Cordo and D. Hill-Rodriguez, "The Evolution of a Nursing Professional Practice Model Through Leadership Support of Clinical Nurse Engagement, Empowerment, and Shared

Decision Making," Nurse Lead., 2017, doi: 10.1016/j.mnl.2017.07.009.

[6] A. Walker and P. Hallinger, "Synthesis paper: A synthesis of reviews of research on principal leadership in east asia," J. Educ. Adm., 2015, doi: 10.1108/JEA-05-2015-0038.

[7] J. Anwar, S. Hasnu, and S. Y. Janjua, "Knowledge, wisdom, leadership and vision: A conceptual framework for learning organizations," World Appl. Sci. J., 2013, doi: 10.5829/idosi.wasj.2013.28.01.1932.

[8] G. M. Jensen, T. Nordstrom, E. Mostrom, L. M. Hack, and J. Gwyer, "National study of excellence and innovation in physical therapist education: Part 1-design, method, and results," Phys. Ther., 2017, doi: 10.1093/ptj/pzx061.

[9] K. Muff, "How the Circle Model can purpose-orient entrepreneurial universities and business schools to truly serve society," J. Manag. Dev., 2017, doi: 10.1108/JMD-06-2016-0120.

[10] P. M. Senge, B. B. Lichtenstein, K. Kaeufer, H. Bradbury, and J. Carroll, "Collaborating for systemic change," MIT Sloan Management Review. 2007.

[11] P. Lachapelle, "Assessing the potential of community foundation leadership through a new conceptual lens," Community Dev., 2020, doi: 10.1080/15575330.2020.1750445.

[12] R. Mullins and N. Syam, "Manager-salesperson congruence in customer orientation and job outcomes: The bright and dark sides of leadership in aligning values," J. Pers. Sell. Sales Manag., 2014, doi: 10.1080/08853134.2014.890905.

[13] A. M. Ryan and S. Watson, "Impact and Inclusion: Transforming an EdD Program into a Crucible for Systems Change," Impacting Educ. J. Transform. Prof. Pract., 2021, doi: 10.5195/ie.2021.123.

Strategic Position: The External and Internal Contexts

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Abstract— The term "external analysis" refers to the investigation of the organization's surroundings, including its rivals, suppliers, macroenvironment as a whole, and trends. The examination of the organisation as a whole is called internal analysis. To provide the foundation for good strategic management, both are required. An organization's identity, target audience, activities, and motivation are all shaped and guided by strategic planning, which is a disciplined process with an eye towards the future. That is just the practise of seeing before leaping. It is a discipline, after all..

Index Terms— Discipline, External Contexts, Internal Contexts, Leadership, Strategic.

I. INTRODUCTION

It is crucial to stress that strategy is an iterative process in order to assess the concept of strategic position. Before gaining shape in a written work, the same issues may be revisited multiple times in various circumstances. For instance, in of historical chronology, it makes sense to evaluate how an institution fits into its surroundings before developing a vision. How can the institution's greatest prospects be predicted without knowing what the institution's external surroundings is like? But, it is also true that external trends can only be understood in the context of an organization's identity, purpose, and vision. External analysis and internal self-definition activities are mutually supportive of one another. So, the many phases in a strategy process should always be connected, particularly when it is motivated by the integrative perspective of strategic leadership. As the investigation progresses, conclusions are open to modification and reformulation. The process is best shown as a spiral as opposed to a straight line [1]–[3].

Strategic Leadership as A Change-Focusing Discipline

James MacGregor Burns keeps us focused on the importance of change by reiterating concepts discussed in our previous assessment of leadership: "Of all the tasks on the work agenda of leadership analysis, first and foremost is a knowledge of human change, since its nature is the key to the rest." Once again, we see that the leadership viewpoint leads us deeper into the events to discover their true meaning. Leadership is focused on transformation, much as it is with narratives, values, and vision. Each of these ideas gives the strategy process a deeper perspective, enabling it to understand social and human issues that are concealed in the divided processes of strategic management. When strategic planning performs at its peak, it often reaches the level of leadership invisibly by organising change in a coherent manner and developing an inspiring plan of action.

Change and the Human Agency Paradigms

Remembering our prior discussion of paradigms will help us to understand the need for a conceptual framework capable of successfully interpreting the meaning of change in the discipline of strategic leadership. The intriguing and essential subject of how academic institutions and the professionals who work there should see their job in light of change and outside reality comes up again. Once again, considering our own presuppositions in order to comprehend strategic leadership as a discipline of transformation is the first step. Learning organisations must evolve from learning institutions.

In their most basic form, the teleological presuppositions of the academy's paradigm describe the ultimate good as an intellectually self-sufficient universe in which change is a non-existent reality. According to this viewpoint, the university is where a collegium of academics establishes constant benchmarks of quality for the scholarly community. This approach may provide a compelling story of meaning, but it is unable to explain the nature of change or how to adapt to it. Change is incomprehensible to its systems of meaning and understanding.

The ideas that discontinuities provide new opportunities, innovation may enhance tradition, initiative is conceivable, and change can better things all belong to a separate school of thinking. All of these viewpoints are consistent with the overall picture of responsibility. As we've seen, this paradigm of thinking is founded on the ability of human agents to respond intelligently, adapt, and take initiative in order to make sense of the constantly shifting environment in which they exist. The themes of responsiveness and response-ability lead us into a realm of ideas that provide light on the manner in which strategic leadership responds to the realities of change. Good leaders work with a community to select a future course as they anticipate and grasp change in a creative and consistent manner [4]–[6].

A Scan of The Environment

Strategic leadership requires more than merely models of thinking if it is to adapt to change in an effective way. It has

to develop effective strategies for recognising the realities of global transformation. This is referred to as an environmental scan in conventional strategic planning procedures. Strategic leadership must attempt to transform the knowledge of social and historical processes into opportunities for self-understanding, as we have seen in other domains. In the end, it is necessary to turn a knowledge of change outside the institution into deliberate change inside it.

To identify the forces at work in the larger world, one must first follow a rigorous technique. Unfortunately, many institutions' strategic plans, particularly those of smaller colleges, sometimes provide little to no comprehensive study of the reality of their surroundings. When they do, they often include a lengthy and disjointed collection of facts, figures, patterns, and potential outcomes that may or may not be significantly related to the organisation in question. The unparalleled velocity of technical and societal change is often described in broad terms in strategic plans, but its consequences are seldom converted into a strategy for deliberate transformation. A hole in the fabric of strategy development is caused by the absence of concentrated attention on the significance of change.

While there are valid reasons to be wary about environmental scanning, there aren't enough of them to stop using them. Everything relies on how a plan is developed, just as it does in itself. It's true that early iterations of strategic planning often failed, typically as a result of their attempt to anticipate the future. For instance, planners both within and outside of the academy understood for a certainty that by the early twenty-first century, information technology will render the majority of brick-and-mortar colleges obsolete. When futuristic thinking seeks to forecast particular events and trends as well as their exact influence on an organisation, it loses its appeal in both the business sector and higher education. The future is unknowable by its own nature, whatever else it may be.

PEEST

Nonetheless, a disciplined effort to contemplation on change should not be discouraged by the appropriate scepticism of predictions. Creating a multidisciplinary ability to think methodically about the significance and direction of trends that have already emerged and are unavoidably influencing the institution's future should be the goal. For instance, although technology may not completely replace fixed-site universities, it is changing the ways in which they may educate their students. The ability to evaluate the future effects—the futurity—of unstoppable forces like technology becomes a key component of strategy work, particularly when used as a leadership technique.

PEST method, an abbreviation for the fundamental categories of political, economic, social, and technological movements, is a strategic strategy that many institutions employ to evaluate the forms of change. Organizations may include additional trend lines depending on the industry. It would be foolish for industrial and natural resource industries

to not include environmental trends to their list of areas to pay special attention to. Of course, educational institutions should take educational trends into account when determining the realities to which they must adapt. The acronym for an environmental scan for higher education is PEEST. The requirement for flexibility in developing the criteria to assess continually is already clear. The members of a planning team may and should establish a set of classifications or concerns that are more useful for their work if they feel that the PEEST categories are too artificial or restrictive. The groups are only a tool for concentrating on and methodically considering the aspects of change.

The methodical gathering of data on outside effects becomes a need for the development of successful strategies. The duty might be split among various offices at smaller schools, while planning and research staffs are available to lead the effort in larger universities. In every situation, easily accessible sources of analytical and quantitative information significantly aid the process. National educational organisations, regional coalitions, state and municipal governments, as well as recurring special initiatives on the future of higher education, are sources of data. Naturally, journals focused on higher education provide current and accessible trend analysis. The World Wide Web provides access to a wide range of additional options for finding information, including a plethora of comparative data from IPEDS, concerning both higher education and other areas of interest [7]–[9].

II. DISCUSSION

Early in the twenty-first century, it became evident that the following factors are influencing higher education:

Political Powers: Accountability and evaluation: State and federal governments are placing gradually more regulatory restrictions and accountability demands on the public, notably via the measurement of student performance and discussions of educational policy that are polarised on ideological grounds.

Limited government funding: programmes supporting fundamental research and student aid may be restricted or reduced as a result of enormous deficits in the federal budget, rising entitlement and military spending, and unclear tax laws.

Declining state funding: erratic and uneven funding for higher education, highlighted by shaky economic growth, choppy stock markets, and erratic state government support, in a general pattern of long-term decline in public revenues as a percentage of total university income, accompanied by a strong push towards privatisation.

Global economic competition: the interconnectedness of the world's economies and the ongoing outsourcing of American jobs, which results in pockets of unemployment and stagnating middle incomes.

Growing and unequal access to and quality of education: the steady rise in participation in higher education among all

age groups to previously unheard-of levels is accompanied by starkly unequal access to and quality of education, with a strong focus on professional and vocational programmes and a loss of centrality for liberal education.

Affordability: the cost of higher education is continuing to rise at rates substantially above inflation and increases in family income, posing a persistent and worsening structural affordability issue.

Engaged learning: an increasing emphasis on active, participative, and involved student learning styles, but inconsistent implementation

Market-driven and international competition in higher education: The market is driving an ever-increasing level of competition in the field of education, which includes new educational providers, distance learning, the globalisation of higher education and research, particularly in the fields of science and technology, differential pricing through tuition discounts, as well as various forms of resource-driven entrepreneurship and competitive improvements to programmes and facilities.

Rapid growth of information: There is an ongoing explosion of new knowledge that has the potential to influence both the individual and communal economic future and quality of life for people.

Social Movements:

Internationalization: the ongoing and significant effects of cross-cultural and cross-political contact in both healthy and unhealthy ways, which have a significant influence on curriculum and programmes.

Diversity and demography: Up until 2010, when decreases will start in certain areas, social and educational diversity will continue to rise, increasingly driven by immigration.

Public criticism: intense concern and disagreements over ideologies about the value and expense of higher education.

Technology Development: Technological transformation: the extensive, pervasive, and ongoing effects of information technology on society, education, and administration, particularly the explosive expansion of remote learning

Environmental Scan Utilization

What happens to the massive amount of data that might be acquired on these important educational and other trends? The PEEST categories should serve as a framework for holistic and integrative examination of the institutional environment and, eventually, for the creation of a concise analysis of the institution's situation. By using statistical and content analysis, the attempt should proceed methodically from particular data points, trend lines, and events to the patterns and driving factors they reveal. The developments described here constitute a significant collection of possibilities and pressures, some of which are close to reaching the point at which change becomes systemic. These are the types of issues with higher education affordability. Finding links, themes, and structural interconnections in the trends that are most important for a certain institution should

be pursued at the same time as attention is paid to external reality. An organisation must have complete control over its history and identity, purpose and vision, management information systems, and strategic indicators in order to do integrative analysis at this level [10], [11].

The institution is able to create its own set of contextual concerns and priorities as it forges these links between the worlds within and outside the academy; in essence, it creates a watch list of crucial factors and connections that will define its destiny. While defining its strategic position by analysing its strengths, weaknesses, opportunities, and threats, those insights on the forces of change with the most leverage will become crucially important.

We'll use a few instances to illustrate how the PEEST method should create a specific institutional centre of gravity. For instance, in terms of social and political developments, institution A, a small regional private university, may be particularly concerned with changes in federal financial aid regulations, the demographics of the region's high school graduates, and family income trends. It closely monitors these trends and creates methodical quantitative studies since it is aware that tuition hikes cannot outpace pay and compensation growth in its target market for hiring. The patterns and trends of adult educational involvement should attract the greatest focus for adjacent institution B, a public university with a wide range of professional programmes. They are significantly impacted by local employers' tuition-assistance programmes as well as the rising rivalry between proprietary universities and distance-learning providers. They will have to pay careful attention to employment trends and regulations. The state's largest research university, institution C, is focused on trends in the financing of scientific research and equipment from the public and commercial sectors. These factors are crucial to its ability to cover overhead costs and to attract graduate students who can teach laboratory courses. It improves its capacity to observe and shape trends in Washington, D.C.

Due to the fact that each institution conducts its own analysis, the outcomes of the identical PEEST method should seem substantially differently in each. It becomes evident that broad classifications like "social" or "economic" are really only markers for the investigation, differentiation, and linkage of the most important movements. An environmental scan is crucial because it deepens and intensifies the self-knowledge process, which is the foundation of successful strategic leadership. When the institution contrasts itself with trends in the outside world and at other institutions, its identity is sharpened. When they realise that nothing in the future is guaranteed, not even for the safe and the good, participants in the process also learn to critically examine their own conceit and defensiveness. The task of strategy develops new sensitivities and patterns of cognition to comprehend emerging dangers and possibilities that distinguish a responsible learning organisation by encouraging new ways of thinking about change.

Using the notion of responsibility to reframe the assumptions behind collegiate decision-making is what strategic leadership is all about. For today's schools and institutions, maintaining academic integrity exactly in a world of market-driven competition is a tough issue. An environmental scan is a crucial part of strategic leadership, both in terms of its goal of comprehending change and its approach of informed cooperation. Its purpose is to illuminate what matters most about the dynamics influencing the company and to provide opportunities that will inspire individuals to accept change.

In conclusion, higher education institutions must have the ability to worry creatively and rationally about the forces that are exerting pressure on them. According to Arthur Padilla's research of six exceptional university presidents, one of their leadership's distinguishing traits was exactly this aptitude for systemic thinking. He refers to it as "an aerial" or global grasp of the linkages between various corporate components and the greater environment."

Strategic Collaboration in Learning

The investigation of an institution's setting from the standpoint of collaborative strategic leadership yields a number of additional intriguing findings. When members of an SPC or one of its subcommittees are immersed in the same data and have an open discussion on trends and reality, something significant often happens in the group dynamics. A feeling of shared reality, trust, and solidarity develops among participants, excluding hostile confrontation. People start to envision themselves in a similar scenario when they get the same information and provide intelligent interpretations of it. There are fewer barriers between individuals, and the gap between teachers and administration is closing. An environmental scan provides a crucial opportunity for interaction, education, and coherence in problem-solving previously unconnected issues.

Analysis of Competitors and Constituents

In addition to change, the world of higher education is characterised by important partnerships and rivalry, both of which need strategic evaluation. As we've seen, strategic governance requires interactions with constituencies and stakeholder groups that have a range of diverse expectations in addition to the conflict between the administration and faculty.

A strategic leadership approach gives colleges and universities the opportunity to practise listening, which is a skill they often lack. The voices of discontent and criticism need to be heard, even if what they hear contains misconceptions or resentments based on emotion or incomplete facts, or complaints that further political or self-interested objectives. They should be integrated into the institution's self-awareness and serve as a catalyst for serious reflection on its strategic positioning. Whether or whether colleges are guilty as alleged, the pervasive belief that they obstinately oppose change and are insensitive to the concerns

of the public throws a hazardous shadow over all institutions. Institutions may express criticism from their constituents that they need to address through the strategy process. They may elevate the prominence of the problems and make them a proper part of their agendas by carefully thinking about them.

While they are generally so many and different that strong bilateral rivalry is more the exception than the norm, every institution or university is more or less aware of its rivals. As we have previously mentioned, a critical component of developing a strategic self-understanding is to compare benchmarks, strategic indicators, initiatives, and capabilities. When an organisation is able to see itself via a reflective comparative lens, it knows itself the best. Without doing a comparator analysis, it is hard to comprehend one's own strategic identity since strategy is directly related to one's position in relation to others. Many of the criteria required to evaluate a company's competitive position are outlined by Alfred et al., including cost, convenience, programme delivery method, quality, innovation, systems and technology, networks with other institutions, administration and governance, culture, reputation, resources, and uniqueness.

Competitive analysis has several potential outcomes. In order to garner donor support or demonstrate that wages must rise to or stay competitive with a group of peers, it may be useful to expose and clarify the necessity for a long-term commitment. In certain instances, a focused and detailed competitive study results in the construction of new facilities or the launch of a new scholarship programme. An institution will often attempt to move heaven and earth to maintain its position if it begins to feel that its position in the competitive landscape is under threat.

Strengths And Weaknesses of A Plan (Swot Analysis)

The SWOT analysis is if anything always connected with strategic planning, based on experiences at strategic planning seminars on both sides of the Atlantic. An integrated way of thinking that explains an institution's place in the world is the examination of its strengths, weaknesses, opportunities, and dangers. If done correctly, it may provide a wise synthesis of the internal and external realities that determine an organization's potential. Some of the responsibilities of a successful SWOT analysis are prefigured by scanning the surroundings with a focus on what matters most to a particular organisation. The SWOT analysis clarifies what's occurring at home in relation to what's going outside, as described by the scan.

A SWOT analysis accomplishes a number of crucial tasks. It highlights the aspects of the setting and the institution that stand for risks and possibilities, as well as their strengths and flaws. As it does so, it looks internally to consider its strengths and weaknesses and turns forth to concentrate on dangers and opportunities. Yet, the analysis is relational and contextual in both situations. Threats to one college are opportunities for another. Similar to this, an institution's strengths and weaknesses may be more or less important

depending on outside trends.

Early on in a strategy programme, a SWOT workshop may be extremely helpful. It gives participants a chance to start exchanging ideas based on the institution's history, mission, and strategic data. The creation of lists of strengths, weaknesses, opportunities, and dangers based on the results of the environmental scan might be a useful activity as a first stage in the process.

Let's start by discussing methods for identifying strengths and weaknesses, then threats and opportunities. Colleges start the effort by looking at a list of institutional components like the one in our strategy process framework. As we examine the typical components, we discover that tangible resources—starting with the organization's financial resources and its space and location—are crucial. These resources can be either deficiencies or resources, or frequently both, depending on the campus's facilities and geographic location. The capabilities of an institution may also be distinguished by other material resources like technology, apparatus, and collections. An academic organization's capacity to produce value is largely dependent on its human resources, especially its professors and staff. In order to evaluate educational programmes, including the curriculum, teaching and learning, research, and student life, relative levels of scope, quality, and accomplishment must be made. Systems and procedures, as well as the systems of governance and decision-making, are crucial success determinants, particularly those relating to admissions, enrollment, image, constituency ties, and fund-raising. Organizational culture has both positive and negative aspects related to community, identity, values, and relationships on campus. It seems sense to start by making lists of these aspects' strengths and flaws and discussing them.

However, caution is advised. There are many different types of strengths and weaknesses, some of which are quite unimportant or don't have much of a strategic or competitive significance. Many concerns might only be short-term operational difficulties or could be clashes in leadership or personality types. A moderate operating loss for a year may not be a strategic concern, but the failure to find a solution within a certain time frame most definitely is. The attempt should be made to shift the conversation away from the symptoms of the issue and towards its causes since there is a genuine propensity for negativism and complaints to dominate an examination. Finding the distinctly structural and strategic forms of capability and incapacity, as well as vulnerability and opportunity, should be the goal. Which areas of the organization's distinctive and defining traits are strong and weak? What encourages or inhibits its capacity to successfully compete for resources and talent to carry out its mission? Where are the actual leverage points? The strategic fit between an organisation and its environment should be the main emphasis using contextual analysis and relational thinking.

In particular, those facilitating the process must be attentive to whether participants can understand the connections between issues and recognise that strengths and weaknesses are a part of an interdependent system of relationships. A good SWOT process results in a significant amount of organisational learning. Instead of being didactic, learning comprises increased capacity for systemic thinking and new degrees of awareness. In a nutshell, process leaders are often instructors. According to Peter Senge, "Leaders are constantly helping people see the big picture: how different parts of the organisation interact, how different situations parallel one another because of similar underlying structures, and how local actions have longer-term and broader impacts than local actors often realise."

Essential Competences

Several cutting-edge approaches to strategic analysis have proven useful in business over the last 20 years and are now starting to be taught at schools and institutions. Without rigorous reconceptualization, much like what must take place throughout the process of strategic planning itself, they cannot be pulled into higher education. Making sure that the job of strategy is reinforced by ideas and techniques that will increase its effectiveness is one of the duties of strategic leadership.

In order to drive strategic debates on campus, we want to investigate two analytical techniques. One involves using a company's core skills to analyse its strengths and weaknesses, while the other involves using scenarios to research the effects of potential future trends. We'll start by looking at basic talents and related topics, such how to strategically analyse an organization's assets.

As we continue our investigation into strengths and weaknesses, we see that some of the most important traits are not particular assets or programmes, but rather, broad capabilities or talents that produce a variety of strengths and successes. For instance, a high admission rate for graduate programmes may indicate something more than just the programme itself, such as the ability to provide good faculty advice, challenging and creative instruction, or a set of unique pedagogies. We may find what business organisation students have come to refer to as core capabilities behind a collection of particular strengths, a term we have previously found beneficial in examining purpose and vision. These ideas, which go by a variety of names, cause us to turn our attention away from outward qualities and into deeper types of activity. The idea of core competencies leads us to the group of capabilities that form the foundation of the organization's more obvious and recognisable strengths.

In the business world, a core competence is not always a successful product; rather, it is a particular degree of skill, talent, and knowledge that results in market leadership across a wide variety of goods. For example, Canon, a Japanese maker of cameras and copiers, became the industry leader in lens technology in the 1970s. As it serves as the inspiration for several unique product breakthroughs, this broad competence may be categorised as a core competency.

Several of the ideas are employed in products made by other businesses instead of Canon at all.

A core competence is unique in addition to being an activity or talent that generates new knowledge. It is difficult for others to imitate, making it a significant competitive advantage. Fostering the development of core competences is a significant portion of the management role itself.

Core Academic Competencies

Higher education institutions may better understand themselves and make strategic choices by using the concept of core competencies. An institution's academic programme, for instance, reveals itself to be a repertory of capacities by which it defines itself in a world of challenge and change when seen as competences. Several courses and programmes of study do, in fact, include significant intellectual assets—subjects, themes, and disciplinary approaches developed by academic authorities and endorsed by their peers. Yet, a programme also shows and relies on a broad range of unique talents and qualities that both the institution's professors and its students possess. They could be differentiating traits or competitive advantages, or they might develop into core competencies.

They often provide a legacy of identification for what a location excels in. Strategically, a college or university's competitive advantage may result from the creation and articulation of a comprehensive academic portfolio of talents and capabilities. Therefore, depending on the institution's objective, the competitive advantages might manifest in a huge diversity of ways. Many fundamental competences, not all of which are exclusive to the academic sphere, may be shown by institutions. The idea of core competence is an exploration lens for identifying activities and abilities that cut across an organization's programmes rather than a finalised philosophy. The organization's core competencies serve as a reminder of its unique character and a call to action for renewal and innovation in the areas where it has amassed specific expertise.

Key administrative abilities

Both administrative responsibilities and core competences may be analysed. Once again, the process starts with an endeavour to identify defining traits, resources, and significant operational outcomes. When the self-evaluation is converted into an examination of key capabilities, it may then be elevated to a new degree of strategic understanding. What crucial procedures and activities—the special competencies and skills—support outstanding administrative performance? Take the following as one example out of many that are feasible.

Monetary Capabilities

For instance, a number of factors, such as precise budget estimates, effective operational controls, effective data systems, and smart planning and administration, may determine whether a company has strong or poor financial skills. Several institutions possess financial management skills that enable them to operate effectively and efficiently at levels that set them apart from the competition. They are able to create and maintain an equilibrium in the financial system, support innovation, and provide long-term financial flexibility even in challenging circumstances.

Ability to Give and Receive

All institutions, public or private, must now define their strategies based on their capacity to produce donations and grants. No matter how wealthy their supporters are, institutions that can effectively capture a large amount of their potential support will succeed. Since it relies on everything from sound planning to a compelling narrative, effective fund-raising is always systemic. In many organisations, the capacity to produce resources has evolved into a fundamental core capability; in those where it has not, this may signify a missed opportunity or a clear strategic weakness [12], [13].

III. CONCLUSION

By encouraging effective management of personnel throughout the change process, strategic leadership ultimately ensures that the change process achieves its goals. The success of organisations depends on their ability to adapt to their surroundings

REFERENCES

[1] R. Derakhshan, R. Turner, and M. Mancini, "Project governance and stakeholders: a literature review," Int. J. Proj. Manag., 2019, doi: 10.1016/j.ijproman.2018.10.007.

[2] W. Kenton, "Strength, Weakness, Opportunity, and Threat (SWOT) Analysis," Investopedia.com, 2021.

[3] F. van Vught and J. Huisman, "Institutional Profiles: Some Strategic Tools," Tuning J. High. Educ., 2014, doi: 10.18543/tjhe-1(1)-2013pp21-36.

[4] A. F. De Toni, F. Nonino, and M. Pivetta, "A model for assessing the coherence of companies knowledge strategy," Knowl. Manag. Res. Pract., 2011, doi: 10.1057/kmrp.2011.36.

[5] G. Buzsáki, "The hippocampo-neocortical dialogue," Cerebral Cortex. 1996. doi: 10.1093/cercor/6.2.81.

[6] D. Zhao, "Cost Management Strategy as a Determining Factor of the Corporate Business Quality in the COVID-19 Pandemic Context," Rev. Gestão Inovação e Tecnol., 2021, doi: 10.47059/revistageintec.v11i4.2393.

[7] P. Edwards, S. Sengupta, and C. J. Tsai, "The context-dependent nature of small firms' relations with support agencies: A three-sector study in the UK," Int. Small Bus. J., 2010, doi: 10.1177/0266242610375769.

[8] M. Geppert and K. Williams, "Global, national and local practices in multinational corporations: Towards a sociopolitical framework," Int. J. Hum. Resour. Manag., 2006, doi: 10.1080/09585190500366243.

[9] K. E. Kanyoma, F. W. Agbola, and R. Oloruntoba, "An evaluation of supply chain integration across multi-tier supply chains of manufacturing-based SMEs in Malawi," Int. J. Logist. Manag., 2018, doi: 10.1108/IJLM-10-2017-0277.

[10] [10] stages, and information-seeking behavior of strategic planners," J. Doc., 2019, doi: 10.1108/JD-01-2018-0015.

[11] [C. Chew and S. P. Osborne, "Exploring strategic positioning in the UK charitable sector: Emerging evidence from charitable organizations that provide public services," Br. J. Manag., 2009, doi: 10.1111/j.1467-8551.2007.00554.x.

[12] C. Kulich, F. Lorenzi-Cioldi, V. Iacoviello, K. Faniko, and M. K. Ryan, "Signaling change during a crisis: Refining conditions for the glass cliff," J. Exp. Soc. Psychol., 2015, doi: 10.1016/j.jesp.2015.07.002.

[13] R. Sharma and J. Bhatnagar, "Talent management – competency development: Key to global leadership," Ind. Commer. Train., 2009, doi: 10.1108/00197850910950907.

Using strategic leadership to make decisions

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Abstract— By predicting events, imagining possibilities, fostering flexibility, and giving others the tools to effect strategic change, strategic leadership is understood to be the process of envisioning and implementing long-term transitions. Effective leaders carry out the routine duties involved in formulating and putting into action a plan. They create a strategic vision and mission, establish goals and objectives, build the tactics, put them into action, and then assess the results..

Index Terms— Decisions, Leadership, State, Strategic, Weakness.

I. INTRODUCTION

The flaws and weaknesses that are often seen in campus cultures and decision-making processes and that have been thoroughly examined in this book are not concerns of destiny but rather of capacities that may be changed and improved. No matter how brilliant the idea or how promising the product, it will never be implemented without a framework of competent leadership and decision-making. Institutions with dysfunctional governance systems and a culture of distrust not only squander time and resources, but also endanger themselves by being unable to adapt to change. Effective systems of strategic governance, leadership, and management have become essential skills and success factors in the contemporary higher education environment. Strong strategic decision-making core competencies provide institutions a competitive edge [1]–[3].

This list of essential skills from the academic and administrative domains should be expanded to include the vital areas of student life and extracurricular activities. One of the major strategies that connects the instances is the intentional differentiation of strengths and weaknesses in terms of levels and types of underlying ability. A natural strategic sequence is followed by the logic of self-evaluation, which decides if a programme or service is weak, adequate, a distinguishing competence, or a core competency. These kinds of variations could provide the process of analysing strengths and weaknesses more significance and importance. Such weakness is highly destructive when an organisation is unable to mobilise its resources in order to handle its threats and opportunities.

While a differentiated assessment of levels of strength and weakness is necessary for strategic planning, it is inadequate to fulfil the role of strategic leadership. The impact of leadership becomes more clear when strengths and weaknesses are seen in terms of skills and competencies, which are then positioned within the context of human agency and choice. Because of the shift of perspective, people are more prepared to handle problems that may otherwise seem insurmountable. Being given the chance to develop a set of generative skills is very motivating because it

gives people the authority to make decisions that include them in a larger leadership and responsibility process. As it moves from description to action, the role of strategy entails motivation, which is achieved via participatory leadership.

Strategic Assets

The analysis of strengths and weaknesses carried out in a leadership environment has an impact on the evaluation of an institution's enduring characteristics and intrinsic assets that may seem immune to change. An unclear objective, a lousy location, and a lack of resources are often seen by members of a campus community as major deficiencies. Findings are likely to be unhelpful and demoralising if a strategic self-analysis makes the shortcomings seem insurmountable or if only the negative aspects of advantages and traits are highlighted. Instead of only focusing on weaknesses, the research should map leadership assets in order to create a sense of urgency and possibilities. To do this, one must first have a comprehensive grasp of the organization's assets, which include the talent and commitment of its employees as well as the possibilities that result from its identity, mission, and surroundings [4]–[6].

In Smart Communities, Suzanne Morse describes this approach to strategic thinking via her research of successful community development efforts in many areas. In troubled towns, listing the problems and weaknesses that are obvious to onlookers, such empty stores and high crime rates, is often the first step in the process of finding remedies. Even in cases when it is unavoidable, the research shouldn't begin or be focused on the analysis of the drawbacks. Negative thinking makes one needy and pessimistic. If the process begins with a mapping of assets—with a study of the connections, organisations, people, programmes, and resources that are available to promote progress—a sense of possibility and empowerment may take hold. The main benefit of this strategy is when people realise they can manage their life and the future of their neighbourhood, together with their neighbours.

Despite the disparities in the details, strategic thinking in communities and institutions has certain parallels. If higher education institutions concentrate on what they are not, they often enter a downward spiral of self-doubt and

self-judgment that saps their motivation and ambition. People often compare themselves to an unstated image of status that highlights their weaknesses and keeps them from appreciating who and what they might be. Yet, if the process of self-analysis is led by strategic leadership, the logic of self-affirmation and potential is used. It begins by recognising its advantages and distinctive characteristics and by searching for any hidden opportunities within its goals and identity.

Virginia Commonwealth University

In the start of the 1990s, Virginia Commonwealth University embraced a leadership vision as an urban research university. For instance, a dispersed urban campus was seen as a tactical advantage. Those characteristics may have been easily categorised as disadvantages. The organisation reached a settlement with a neighbourhood that surrounded the school and was anxious about integration. VCU made the decision to expand to the other side of its urban location in order to provide new economic life and opportunity to an otherwise unpromising commercial region. VCU reiterated its distinctive urban mission and committed to the economic development of the city and the surrounding area. The university's hospitals grappled with the significant financial challenges of providing treatment to those with little resources. It has established a ground-breaking new engineering school in addition to a large biotechnology research park near its downtown medical centre. By using the traditional research skills of the city's medical institutions, it brought more than 1,500 new jobs and hundreds of millions of dollars in capital investment in less than 10 years. Despite an unpredictable changing cycle of both severe financial cuts and increases from the commonwealth, the school has been able to grow to become the largest university in the state. It has seen a tremendous rise in both private contributions and financed research, as well as several gifts totaling several million dollars. VCU has become stronger and more well-known by reinforcing the logic of its urban possibilities, encouraging innovation, and putting problems into the realm of possibility. President Eugene Trani and his colleagues have continuously used strategic planning and strategic leadership to enable VCU to be what it is and what it may become rather than embarking on a depressing hunt for what it is not [7]–[9].

Asset mapping aims to release the value of being oneself while understanding and revealing the possibility that comes with particularity. Instead of ignoring or burying the issues, focus on the positives to put them in an accessible perspective. The findings that show brittleness and weakness are recognised and dealt with, but they are not considered individually. They are seen as components of strategic leadership as a discipline of possibilities and are understood in the context of a more complete pattern of duty and purpose.

II. DISCUSSION

The analysis of strengths and weaknesses lays the path to transform the environmental scan into a specific set of issues and opportunities for an institution. As we have said, the first step, which requires developing a systematic, structural, and thematic understanding of what the forces of change represent, should be completed within the scope of the scan itself. The following step is to assess how these factors impact the institution's essential competencies, assets, capabilities, vulnerabilities, and deficiencies, which are also referred to as its strengths and weaknesses. The insights on the most important hazards and possibilities will be determined using a relational thinking process that systematically links the most significant external trends and internal traits. A variety of strategic discussion participants' thoughts and views are included into the interpretation process, which is very collaborative. It is driven by quantitative information and qualitative points of view, which help people understand and define the institution's central strategic position. The major objective of searching for threats is to identify structural factors in the environmental scan, such as the cost of tuition, that touch on core organisational flaws. Opportunities, on the other hand, connect an institution's abilities with a distinguishing aspect of the environment, such the creative use of technology. In terms of strategy, the goal is to pinpoint both the threats that impede or cripple the institution's ability to adapt to change and the openings that provide it an edge over its competitors and the surrounding circumstances [10], [11].

matrix analysis

Some strategy students suggest using a cross-impact matrix, which asks participants to evaluate the influence of elements in the environmental scan on the institution's main performance metrics—basically what we have called strategic indicators. The authors Rowley, Lujan, and Dolence explain how to create a matrix with a vertical axis listing crucial performance indicators and a horizontal axis showing important environmental factors. The aim for participants in the process is to provide a numerical weight to the influence of environmental factors on the crucial performance measures. When the different weightings offered by individuals are averaged and assessed in terms of standard deviations, the institution's greatest difficulties and potential are revealed. The method, which was adapted from Rowley, Lujan, and Dolence, is shown in table 8.1.

Integrative thinking about threats and opportunities may be performed by comparing organisational characteristics with trends, but the quantitative maths is challenging. It must be understood as simply one step of a process that ultimately depends on logical analysis, dialogue, and judgement for it to be successful. Opening a strategic dialogue about risks and possibilities could be beneficial, but it shouldn't be the primary or only approach to doing the study.

The root reasons are obvious. While systemically tied to

one another continually, it is abnormal to represent external effects in a table as isolated occurrences or patterns. Analyzing their impact on a group of unique strategic indicators that are tied to one another is as nonsensical in a system where the one conceivable external element is only one among many aspects that regulate the system. How, for example, might a new governor's support for education translate into an effect on indicators like the volume of applications, the state subsidy, or retention rates? The governor's recommendations may never be adopted, and since other variables have an influence on each strategic indicator, numerical measures might lead to indications that seem to be too exact.

If cross-matrix analysis is employed thoroughly, as recommended by Rowley, Lujan, and Dolence, the 10 steps of the strategy process become an extremely complex and challenging technique. In addition to doing numerous additional calculations, it would be essential to assess a sizable number of trends from the PEEST analysis in order to identify opportunities, threats, strengths, and weaknesses as well as to review policies, processes, goals, and objectives. Calculating the numbers is simple; the tough part is realising what they mean. What was meant to be a tactical engine seems to have changed into a scary machine with no off switch. Surprisingly, and this is crucial, the engine does not have a designated space for a future vision.

Tows Matrix

To compare the results of an organization's strengths and weaknesses with the risks and opportunities found during the planning process, a matrix may be employed. The graphic is simple, yet it aids in focusing strategy work on the issues that need it most and will provide the best results. It provides a useful beginning point for guiding the strategy process towards the selection of the strategic initiatives and goals that rank as priorities. Each of the four quadrants in the matrix below suggests a suitable course of action for handling the various relationships between opportunities, threats, and weaknesses: seizing opportunities where there are strengths, fending off threats with strengths, considering opportunities to overcome weaknesses, and avoiding threats where there are weaknesses. This is what some people mean when they talk about a TOWS matrix.

Doing SWOT and environmental analyses is surely a critical step in the strategy-development process. Instead of trying to predict the future, they may observe trends that are now obvious and predict how they will likely affect the organisation. Nonetheless, as forces and events continuously astound us, it is still conceivable for mistakes and distortions to happen when anticipating the impact of significant trends even when no effort is made to foretell the future. In order to prepare for these possibilities, a number of commercial organisations have employed the analysis of alternative scenarios to identify several workable patterns for how future events will unfold. Hermann Kahn of the Hudson Institute was the first to develop scenarios, and they immediately gained popularity in Shell Oil's strategy-making and preparation for the shock of the 1973 oil price. Scenarios are beginning to be used in higher education more and more.

A scenario, as the name indicates from its use in plays and movies, is a basic narrative thread from which a whole story or screenplay may be produced. The rags-to-riches narrative, the lone hero, love in opposition to duty, loyalty and betrayal, and love opposed duty against love are only a few of the often occurring dramatic interaction patterns that appear in literary scenarios. These concepts lead to a situation that forms the basis of the story. Scenarios have developed to be utilised in business planning, although they still have some of its dramatic flare. Their writers look for emotionally engaging plots that readers will remember. Scenario writers often use images or metaphors that are directly derived from mythology or the animal realm to illustrate a point. Although the Icarus scenario includes players initially flying before falling to their deaths, the ostrich scenario entails avoiding or disregarding problems.

Scenarios begin with a thorough review of external driving variables and their anticipated consequences on the organisation, much like a normal PEEST and SWOT analysis. Yet, important changes are taking place. Scenarios take into account the fact that there will always be components and trends in the future that are fundamentally predetermined as well as unclear and unforeseen events. For instance, while no one can predict with confidence when, the world will someday run out of oil.

Although if it is hard to predict the future, most uncertainty can still be improved via better communication and administrative decision-making. A range of scenarios that depict the most probable outcomes may be devised in order to do this.

Creating a scenario is a challenging task. It begins with being aware of key events and then makes an effort to understand them in the context of bigger patterns, some of which are mostly certain and others of which are not. After a number of trends have been found and investigated, the goal is to look at the structural patterns, the causal processes, and the relationships that are producing the trends. A scenario is the product of these assessments. According to Van van Heijden, the scenario "is a story, a narrative that connects historical and contemporary incidents with probable future events."

For instance, it is possible to trace the interwoven events, trends, and economic and cultural realities involved in the remarkable emergence and global effect of the Internet, as Friedman did in The World Is Flat. These evaluations may then be combined with others to create scenarios for topics like the future of international scientific research, international student exchanges, or economic development spurred by information technology. While it is sometimes misunderstood, the technique's objective is not to provide the most precise or foresighted scenario. In order to reduce uncertainty to manageable levels, the goal is instead to

develop a number of scenarios, each of which is a plausible possibility for the future. The job is challenging since each scenario must be internally consistent and backed by trustworthy facts. To show a point, one cannot try to make anything fit. The causal relationships in the scenario must correspond to how interacting trends, events, forces, and powers manifest themselves in real life. If they are effective, they also perform the critical task of putting to the test the present reality models and assumptions held by the decision-makers. It keeps coming up that organisations learn best when outmoded concepts are rejected.

They serve as several types of test environments for strategy. Scenario analysis may be used to examine a strategic vision, a broad strategic endeavour, a specific project, or a critical decision. No of the level, the objective is to ascertain if the selected solution can effectively meet the contextual challenges given by each scenario. If not, it will need to be altered so that it functions properly in every scenario imaginable. Of fact, one or more of the situations might provide conditions that favour one tactical option over another. But, putting the plan to the test in the face of a difficult set of potential future conditions equips the company for success in a variety of scenarios. After doing its study, the organisation may determine that its plan meets all criteria, adjust specific elements of its strategy to handle certain risky or favourable conditions, defer taking action on the strategic choice until a later time, or even decide to abandon it.

Examples from John Adams University

A brief example from higher education might help to make the idea of situations more relatable. Envision John Adams University, a small public institution in the West, is getting ready to present a list of brand-new initiatives as part of its strategic plan. It intends to evaluate the coherence of its ambitious strategic objective in order to become a state and national leader in supported applied research and in the evaluation of student learning. It has made the decision to create a really thorough and expensive programme of institutional and academic assessment in order to increase its quality. In order to assess these and other activities, the SPC develops three scenarios based on a PEEST analysis that takes into account changing trends both locally and nationally.

One of the several aspects of the future environment that are known and will stay constant in each of the scenarios is the demand for educational services in the state, which will be consistently robust and expanding, supported by continuous population growth. Although changes in the state and region's economic fortunes rapidly translate into rising or decreasing state subsidies, the nature of the state link and diverse political philosophies are the primary elements that distinguish each scenario. For the last 10 years, the state legislature has financed its public institutions at varying rates, exactly in accordance with state revenue. Throughout a four-year period, Adams' tuition costs decreased before rapidly increasing. There have been some very strong

indicators that the state wants to support institutional autonomy, while other signals show that the government is enmeshed with bureaucratic control. The university develops three hypothetical futures: the status quo, creative independence, and the competitive market. These hypothetical situations are based on in-depth analysis of these and other trends and political leanings.

As is typical

It is clear in this instance that the intricate and ingrained patterns of political, administrative, and academic ties and expectations won't change. As far as the eye can see, financing will fluctuate based on the state's changing economic situations while cycles of political and administrative control alternate with some advancement towards more autonomous forms of governance, albeit not in a straightforward, coherent, or predictable manner. Tuition will vary in patterns of stability or increase in accordance with the state's revenue, and capital finance will be reactive rather than proactive and dependent on the political timing of bond offers.

Creative Individuality

The second model's picture is distinct. This scenario shows how a well-thought-out plan may be implemented with the help of political leadership in order to make positive self-reliance the standard for decision-making and governance. Public colleges get a minor boost in state funding, but it is done in a way that promotes innovation and capacity growth. For example, financial assistance is given for research facilities, but after a start-up period, operational support for such facilities declines. Institutions must find funds for the maintenance and repair of their physical structures even while they are free to set their own tuition prices and keep the money they save for annual operations. The amount of financial aid that is made available to low-income students by the state is increased, although it is expected that the institution would cover some of the costs via fund-raising. With one-time incentive awards, such as matching donations to endow professorships, the state often sets and finances incentives for achievement in certain areas.

The Competitive Industry

There are elements of the third scenario in the second as well. The main contrast is that privatisation is now strongly supported by the state's political elite. The circumstance also exposes a concealed antipathy for higher education that has crept into the legislature, the executive branch, and the media. There are significant new levels of autonomy and far less resources available for public institutions. The relationship between the state and its institutions is essentially considered as commercial rather than legislative. Although while it does not contest its legal authority or responsibility, the state believes that all organisations, including institutions of higher education, must function on a market-driven, competitive basis. The key financial factors

for all facilities, which are now all supported purely on a one-to-one matching basis, are student fees or private fundraising initiatives. When strong competition for funds and students grows, some colleges thrive and sharply increase their fees, while others struggle because they are unable to expand their customer bases. The four-year system eventually sees a reduction in the number of available student spots. owing to a lack of funds for the expansion of programmes and facilities. The state's leadership seems unfazed by the trend, pointing to the excellent calibre of the state's community colleges, the availability of online courses, and the low cost of education from a range of new suppliers.

Analysis of a case study

By creating these scenarios, Adams University now has a set of benchmarks by which to measure various aspects of its strategy and objectives. In each of the situations, it is compatible with and even desirable for it to dominate applied research in the state. The study also demonstrates that Adams must give priority to expanding its staff and its capacity to receive funding from the government, organisations, and enterprises in addition to individual donations. Increased financial independence is a major expectation in each of the scenarios.

Also, many strategies may be assessed and improved. The effort to develop a core competency in programme assessment is a critical goal in any situation. As success almost definitely relies on the ability to compete effectively in markets for students, resources, and recognition, the ability to demonstrate performance will be more important than ever. As a consequence, the evaluation project moves up the list of financial priorities. Each of the possibilities also makes it clear that admissions, marketing, and fund-raising would require greater resources, despite the fact that these needs were not previously envisioned as being crucial.

When it evaluates its information technology skills, the institution comes to the contrary conclusion to what it had first anticipated: it lacks the ability to be a large independent provider of remote education. As a consequence of the market-driven circumstances, it decides that it will join a group of universities that provide online degrees in certain professional fields.

An overview of the situation

The process of creating scenarios is difficult, but it's also imaginative and fascinating. Contrary to small institutions, large colleges and multibillion dollar corporations have the resources to invest in a continuous competence for scenario creation. To perform a scenario workshop as part of its environmental scan, however, even the smallest schools could need a number of staff and faculty members to obtain the requisite information, perhaps with the help of a qualified facilitator. It goes without saying that developing scenarios is not a goal in and of itself, especially when it comes to strategic leadership. Scenario thinking offers another systematic language for comprehending change and the

organization's place within it. It offers a technique for questioning and enlarging the campus community's current thought patterns as well as incorporating strategic thinking into organisational life. It is simpler to anticipate the future and take advantage of new possibilities and challenges when one has a clear understanding of how various factors interact in a given circumstance. As a consequence, change becomes less unsettling, strange, and unwelcome. To be fully effective, strategic leadership must affect the values and thought processes of many, if not most, decision-makers at an academic institution, including a sizeable number of the faculty. By creating perceptual, reflective, and judgemental habits, systematic techniques like PEEST, SWOT, and scenario analysis help in domesticating change. They show how organisations, especially academic institutions, are clearly situated and involved in time. We circle back to our main subject, the importance of the paradigm of accountability and the mental processes involved in leadership.

Strategic Position

In addition to assisting employees in thinking about responsibility, these change-management disciplines play a significant role in the step-by-step process of strategy creation. They have an impact on how an institution views its strategic position as well as the unique resources, talents, and abilities that allow it to thrive in a competitive context. Without an objective self-evaluation that arises at least tentatively early in the process, the content of strategy may become fuzzy, vague, and a wishful thinking exercise. A concise explanation of the institutional viewpoint dispersed across many pages centres the process. It emphasises the outcomes of the SWOT analysis and the environmental scan and enables the selection of a small number of crucial strategic issues for in-depth investigation and implementation. According to Adams University, for instance:

The school is in a good position to exploit its unique capabilities in applied research and the assessment of student learning in order to meet the educational and economic needs and opportunities of a growing population in its state and region. It has the focus, creativity, and decision-making abilities necessary to adjust to changing circumstances. Through partnering with the state government, industry, and private donors, it may be able to raise the funding required to achieve its goals. Adams may logically have high hopes for the future.

A variety of strict criteria are established by the analysis of an institution's condition for choosing the subjects to include in its plans. Instead of just operational concerns, it concentrates emphasis on matters that are genuinely crucial from a strategic standpoint. Position analysis will also be able to highlight the tactical choices that provide the best return on investment for the time and resources invested. In order to effectively choose its priorities, an organisation must be capable of carrying out the tasks it sets out to do. It gains a

stronger sense of who it is as a result of defining its job, which also helps it have a better awareness of the talents that are required. The ultimate objectives of strategic leadership are to find ways to influence the environment, to have the knowledge and tools necessary to react appropriately to changing circumstances, and to be adaptable to those circumstances. One of the duties of leadership is to anticipate what will be required to achieve a future objective with a sustained degree of effectiveness.

The subject of institutional position has been proposed as one of the four components of a strategic self-definition. When a college or institution articulates its narrative of identity, defines its mission, creates a vision of its potential, and formulates a proclamation of its strategic posture, it has formed a solid foundation for strategic leadership. This gives it the confidence to go on and make the exact plans it needs to deal with potential issues and future possibilities[12], [13].

III. CONCLUSION

Making the proper judgements is a crucial element that may be the difference between success and failure for a business. Not all choices must be made on the same day, or even in the same week, and not all decisions are created equal. If you have an idea, you should put a strategy, a course of action, and a deadline in place to carry it out. To make data-driven choices, it's critical to have a clear knowledge of which concepts are most useful for your company

REFERENCES

[1] H. M. Alhawamdeh and M. A. K. Alsmairat, "Strategic Decision Making And Organization Performance: A Literature Review," Int. Rev. Manag. Mark., 2019, doi: 10.32479/irmm.8161.

[2] Y. T. Hsu and K. C. Chang, "A study on top managers from a resource-based perspective," Meas. Bus. Excell., 2021, doi: 10.1108/MBE-02-2020-0038.

[3] İ. Kumkale, "Strategic Leadership," in Accounting, Finance, Sustainability, Governance and Fraud, 2022. doi: 10.1007/978-981-16-7582-9_2.

[4] H. E. Lin and E. F. McDonough, "Investigating the role of leadership and organizational culture in fostering innovation ambidexterity," IEEE Trans. Eng. Manag., 2011, doi: 10.1109/TEM.2010.2092781.

[5] J. J. Meier, "The future of academic libraries: Conversations with today's leaders about tomorrow," Portal, 2016, doi: 10.1353/pla.2016.0015.

[6] A. Güngör, E. Özkul, P. F. Tuna, and S. Çelik, "The Relationship Between Strategic Decision-Making and Leadership Styles: An Application in 4 and 5-Star Hotels in Istanbul," J. Bus. Res. - Turk, 2016, doi: 10.20491/isader.2016.143.

[7] M. Song, R. J. Calantone, and C. Anthony Di Benedetto, "Competitive forces and strategic choice decisions: An experimental investigation in the united states and Japan," Strategic Management Journal. 2002. doi: 10.1002/smj.258.

[8] A. Gracey, "Building an organisational resilience maturity framework," J. Bus. Contin. Emer. Plan., 2020.

[9] [9] Dynamic leadership for a digital future," ISPIM Conf. Proc., 2021.

[10] M. Useem, J. Cook, and L. Sutton, "Developing leaders for decision making under stress: Wildland firefighters in the south canyon fire and its aftermath," Academy of Management Learning and Education. 2005. doi: 10.5465/amle.2005.19086788.

[11] [J. Spanjol, L. Tam, W. J. Qualls, and J. D. Bohlmann, "New product team decision making: Regulatory focus effects on number, type, and timing decisions," J. Prod. Innov. Manag., 2011, doi: 10.1111/j.1540-5885.2011.00833.x.

[12] [J. Mun, "Risk-based ROI, capital budgeting, and portfolio optimization in the Department of Defense," Def. Acquis. Res. J., 2020, doi: 10.22594/dau.19-829.27.01.

[13] S. W. Ndungi and J. Gacobo, "Internal Environment and Organizational Performance of World Vision in Nairobi City County, Kenya," Int. J. Bus. Manag. Entrep. Innov., 2021, doi: 10.35942/jbmed.v3i3.220.

Contextualizing Strategic Leadership

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Abstract— Context plays a significant role in effective leadership. Leaders must recognize the difficulties present in their particular corporate environment and react in a manner appropriate to that environment. Leaders' goals, attitudes, and behaviors are shaped by their context. For their part, leaders must help their followers create context. This chapter covers the topics of education reputation and strategic planning, strategic leadership and successful education, involvement in learning, learning as the development of human power, and the characteristics of effective learning.

Index Terms— Academic, Education, Knowledge, Leadership, Strategic

I. INTRODUCTION

Ranging from financial models to academic programs. The essential elements of the strategy process have been defined and demonstrated so far. In the end, each institution must apply these techniques to particular spheres of organizational accountability. The precise text of the planning that takes place inside the many sectors of each institution's diversified operations, from academic to financial matters, determines strategic objectives, goals, and actions. Hence, it is impossible to acquire in-depth strategic material from other sources. Strategic content has to be created locally since each college and university's narrative, vision, contextual location, and deliberative procedures are ingrained in its own identity [1]–[3]. While various organizational operations and programs adjust to the changing external environment, it is still viable to emphasize the general qualities of strategic leadership while giving full weight to uniqueness. In doing so, we'll quickly and selectively look at how strategic leadership affects how certain factors are taken into account.

1. Academic initiatives
2. Education of students
3. Basic education
4. Admissions
5. College life
6. Facility management
7. Money resources
8. Fund-raising

Answering fundamental contextual queries that could be on the thoughts of persons in charge of or taking part in a strategy process is the aim of the analysis of these areas. How can a strategic perspective alter how one approaches problems in varied contexts? What are some of the most notable strategic opportunities and challenges that institutions are now facing? What conceptual frameworks should be used to position and examine problems? In order to foreshadow some of our conclusions, we will see the history of strategic leadership as an applied and integrated discipline that is analytical and contextual, conceptual and data-driven, integrative and systemic, value-centered and action-oriented, and collaborative and motivating.

Academic Quality and Strategic Thinking

The introduction of a genuine strategic viewpoint is a particularly difficult issue in the field of academic specialities for many of the reasons we have discussed. Think about how we typically evaluate the calibre of academic departments. Let's do this by taking a look at the profiles of two history departments that were modelled after real ones, one at a large institution and the other at a little college. A significant regional research university's extensive undergraduate history programme has 110 courses, five courses, eight programme specialisations, and a departmental staff of 54. Two of its specialisations are in the top twenty-five of graduate school rankings, its staff is well-publicized and many of its members are well-known, and it draws outstanding doctorate candidates despite being less selective than it would like in certain subjects. Majors' courses typically have between thirty and forty students enrolled, while honours students participate in a senior seminar. The majority of lower-division courses are large lecture sessions assisted by teaching assistants. Although if the majority of students believe history to be a popular subject with reasonable requirements, the quantity and quality of its undergraduate majors have somewhat decreased over the last ten years.

Next, think about a small liberal arts institution with a reputable history programme in the area. It has a five-person faculty and just one major with emphases in either European or American history. Its full-time faculty members are all employed there, and all of its programmes heavily emphasise the usage of authentic texts and materials. Its biggest class has 25 pupils in it. It is known as a tough department and its majors have historically been among the most outstanding college students.

Despite certain formal similarities in the curriculum and requirements, the institutional goal, culture, size, and resources have formed two very distinct history departments. We must determine that the little college's program is marginal in quality and feasibility when we closely evaluate the two programs with the professional eye of a historian. Its

depth, breadth, and faculty's standing in the industry are all quite lacking. The extensive scope, depth, and prominence that is, the quality of the university program cannot even begin to be compared to the underdeveloped version that is offered at the university when it comes to disciplinary measures.

But, when we focus on the department's culture of student learning at the little institution, additional traits become apparent. We discover that numerous of the college's top graduates majored in history, and that a disproportionate number of them including several renowned historians went on to acquire doctorates in the subject. Every time these alumni share their experiences, they consistently mention how their instructors forced them to read primary sources and documents, write several interpretative essays, and actively participate in debates and presentations in small courses in order to understand history. While encouraging them, their instructors held them to high standards. Faculty members routinely connected with students outside of class and took on the role of mentors for them. The focus of the faculty's account of academic excellence is on the nature and scope of student learning. They uphold these principles and base their professional choices on this concept of excellence.

We are able to ask an inappropriate inquiry in these situations. Naturally, the answer relies on the qualities that a person prioritises when defining academic excellence. At a college, student learning is evaluated in terms of intellectual engagement and transformation, but in a university, quality is centred on knowledge production. The majority of us find that the subject raises a number of scholarly problems that can never really be addressed but may be amicably settled by competent leadership [4]–[6].

II. DISCUSSION

The strategic articulation of educational value concepts is a tough undertaking for most disciplines, while seeming to be deceptively simple. This is the case because, as we have seen, it often takes place in a setting that is predetermined by the internal standards of a single academic speciality or is mandated by an outside management system. Tensions often arise when management reasoning and disciplinary logic clash. Although the shift to a wider pattern of reflection is initially difficult, the process becomes more strategically important and fruitful when a program's educational rationale is explicitly linked to the more inclusive goals of liberal education and student learning, to special institutional characteristics and capabilities, and to changing methods of the discipline and the needs in society as a whole. At the completion of these processes, the model switches its emphasis from highlighting managerial needs to concentrating on the duties of collaborative strategic leadership [7], [8].

Strategic leadership and effective education

The goal of strategic leadership is to simultaneously see an institution from the inside and the outside and to synchronise the two viewpoints. It uncovers key indicators when looking for structural developments in today's higher education that need its full attention. The increasing emphasis on student learning is one of them. A self-conscious movement has emerged as a result of long-simmering changes in the ways that teaching and learning are conducted. There is an increasing focus on the nature of learning, namely what and how children learn in ways that are inspiring, powerful, and long-lasting.

Participation in Learning

An emphasis on student engagement—on teaching and learning methods that successfully leverage the interest, vigour, and drive of the student—is a recurring theme in many manifestations of the learning movement. The focus is on how the learner may directly interact in the learning process. The suggested contrast is with passive learning, in which a student is given information and knowledge by a teacher. Students who are actively involved in their learning are more than observers; they create meaning rather than just receive it.

Learning as Human Power Development

One of the key tenets of this increased emphasis on learning is that liberal education has to do with the development of profound and long-lasting intellectual and interpersonal skills. Institutions often use the development of sophisticated cognitive skills like critical, analytical, and integrative thinking, effective communication, global and intercultural awareness, and technical and mathematical literacy to justify the value of a liberal education. Also included are adherence to the ideals of an open society as well as intellectual traits and characteristics like curiosity, mental toughness, and inventiveness.

The unstated assumption that liberal education has to do with the development of core human capabilities, the improvement of the intellectual and moral qualities through which the human endeavor itself evolves, is more significant from the standpoint of strategic leadership than these lists. Donald Levine discovers and formulates the inherent logic in the quest to develop the varied mental faculties in his analysis of the development of liberal education at the University of Chicago. As Thomas Green puts it, "The distinguishing presence of educational value is coming into ownership of the powers that we have as human beings." Hence, engaged learning is also effective learning since it seeks to dramatically alter how people as agents generate meaning and behave in the environment.

III. DISCUSSION

Why does any of this important in terms of developing strategies? If strategic planning is only a market-based discipline, then no. To contribute to academic leadership, a strategy must be an essential component and link with the

organization's highest goals, which have been developed in response to the environment in which it operates. A college or university has to be aware of its core values, the kind of education it wants to provide, and how it can develop the procedures and environments that will support effective student learning if it is to grasp what makes it unique. It must constantly ask itself, "What does it mean to be an educated person?" and, in the diversity of responses, consider where the educational gravity in its own practices and initiatives lies. It must achieve this in particular at a time when liberal education is undervalued and misrepresented. Is liberal education focused on facts or knowledge, processes or subjects, mental or emotional faculties, or something else? How does it connect to society's constant desire for a skilled workforce and for students to pursue careers? The institution must think about where, if anyplace, it has created generative core strengths that set it apart from competitors and profoundly influence its educational offerings and atmosphere. Institutions may better understand what aspects of learning actually set them apart and where they succeed strategically by reviewing and self-evaluating the following list of some of the components of strong learning.

The Qualities of Effective Learning

Effective education is:

Transformative: It seeks to advance the basic and lasting forms of human intellectual, moral, and personal capacities.

Intentional: It teaches students how to intentionally tailor their studies to align with their own objectives and makes them aware of the interrelated goals and outcomes of liberal and professional education.

Engaged: Students are actively involved in their learning via group work, debate, writing, speaking, performing, doing research, taking charge of projects and presentations, and developing connections with instructors who hold them to a high standard.

Global: It includes students in the study of many languages, cultures, and societies; living and studying abroad is the ideal setting for this.

Broad: It calls on pupils to grasp a range of topics, thinking processes, and problem-solving techniques.

Coherent: Both in general education and in the major, it organises and delivers plans of study with a clear rationale and objectives that link topics, courses, and learning experiences in significant and explicit patterns [9]–[11].

Why Useful: It illustrates the crucial role that cognitive abilities and knowledge play in preparing pupils for civic engagement and employment.

Inclusive: It includes educational materials that emphasis the variety of human experience and cultures.

Integrative: It provides programs based on interdisciplinary and integrative techniques and develops a knowledge of the link between areas and disciplines in the study of intellectual, moral, and social concerns.

Enriched: It makes use of a broad range of resources, including buildings, technologies, scientific equipment, books and journals, cultural events, and regional businesses.

Technological: It makes use of information technology to access the vast new body of Web-based knowledge in order to promote computer literacy and make learning and communication continuous, universal, interactive, and inspiring.

Experiential: It integrates theory and practice closely by using a range of techniques to engage students in learning via experience in fieldwork, internships, and service projects.

Responsive: It develops students' commitment to the fundamental principles of a democratic society and equips them to comprehend and act upon their responsibilities in such a society.

Substantive: It employs important original texts and resources to study the frameworks, working practices, vocabularies, and substance of several disciplines and bodies of knowledge.

Strict: It has high expectations for both the amount and quality of student academic accomplishments and establishes strict requirements for both.

Assessed: It employs a variety of techniques to assess the efficacy of learning and incorporates the findings into the teaching and learning process to enhance future performance.

All-encompassing: It takes place in a variety of campus relationships and contexts, both inside and outside of the classroom, and is bolstered by an ethos that carries, communicates, and reinforces a strong and consistent set of messages about the institution's identity as well as its goals and practices in education [12], [13].

IV. CONCLUSION

An organisation may acquire the anticipatory abilities and context awareness needed to identify changes in its environment that might positively or adversely influence its goals by adopting a contextual leadership mindset. The contextual approach takes into account how people interact with their social, cognitive, and physical environments. It also looks at how environment and sociocultural factors affect development

REFERENCES

[1] M. Binacci, E. Peruffo, R. Oriani, and A. Minichilli, "Are All Non-Family Managers (NFMs) Equal? The Impact of NFM Characteristics and Diversity on Family Firm Performance," Corp. Gov. An Int. Rev., 2016, doi: 10.1111/corg.12130.

[2] J. Baxter and A. Floyd, "Strategic narrative in multi-academy trusts in England: Principal drivers for expansion," Br. Educ. Res. J., 2019, doi: 10.1002/berj.3550.

[3] Z. C. Meda, L. Konate, H. Ouedraogo, M. Sanou, D. Hercot, and I. Sombie, "Leadership and vision in the improvement of universal health care coverage in low-income countries," Cah. Santé, 2019, doi: 10.1684/san.2011.0268.

[4] T. Oraro-Lawrence and K. Wyss, "Policy levers and priority-setting in universal health coverage: A qualitative analysis of healthcare financing agenda setting in Kenya," BMC Health Serv. Res., 2020, doi: 10.1186/s12913-020-5041-x.

[5] C. Cumming, "CPD: Support strategies for professional learning, national initiatives and major curriculum reform," Improv. Sch., 2011, doi: 10.1177/1365480211407336.

[6] D. Fierro, S. Putino, and L. Tirone, "The Cynefin Framework and Technical Competencies: a New Guideline to Act in the Complexity," INCOSE Int. Symp., 2018, doi: 10.1002/j.2334-5837.2018.00498.x.

[7] T. Gande, "Professional Accountants' Perceptions of Servant-Leadership: Contexts, Roles and Cultures," Eur. Sci. J., 2014.

[8] M. Langa and P. C. Marnewick, "Adapting IT management for Effective IT strategy leadership," 2020.

[9] M. Z.C., K. L., O. H., S. M., H. D., and S. I., "Leadership and vision in the improvement of universal health care coverage in low-income countries ," Cah. Sante, 2011.

[10] Z. C. Meda, L. Konate, H. Ouedraogo, M. Sanou, D. Hercot, and I. Sombie, "leadership et vision exercée pour la couverture universelle des soins dans les pays à faible revenu," Cah. Sante, 2011, doi: 10.1684/san.2011.0268.

[11] S. Søndergaard, M. Kerr, and C. Clegg, "Sharing knowledge: Contextualising socio-technical thinking and practice," Learn. Organ., 2007, doi: 10.1108/09696470710762646.

[12] R. Buchanan, R. Boland, and K. Chung, The Handbook of Design Management. 2011. doi: 10.5040/9781474294126.

[13] A. A. Elabbar, "Strategic Pause on the National Libyan Education Reform Plan: Insights & Enhanced Tactics," Int. J. Educ., 2021, doi: 10.5296/ije.v13i3.19007..

Potent Learning and Strategic Thinking in leadership

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Abstract— Strategic thinking is sometimes described as the capacity of a corporation to "figure it out," even in the most complex circumstances. Critical thinking, timely decision-making, expert problem-solving, and the creation of goal-oriented action plans are organisational skills. This chapter covers powerful learning and creative planning, fundamental teaching, marketing strategy and leadership, living on campus, and strategies.

Index Terms— Authority, Learning, Leadership, Marketing, Strategic Thinking

I. INTRODUCTION

It is a fruitful strategic endeavour to assess which types of learning are most prevalent in a given institution, and the above list of qualities provides a starting point. By asking numerous questions regarding each attribute, faculty and staff groups may analyse and map their own institutions and activities. Which of these characteristics most closely aligns with our story of educational identity and quality? Where do we now stand and where do we want to go in the future? Where do we lack and where do we have enough? Which of these learning methods stands out among the rest? Exist any that now exist or may develop into key competencies? What plans and objectives would help us advance? Many faculty and staff members should be interested in the analysis process because it provides a structured framework for identifying topics that are important to them [1]–[3]. An institution starts to develop a distinct sense of its own identity and its goal as a community of learning as a result of discussing and analysing its culture and features. Its self-evaluation should be reasonable and take into account the fact that, in most cases, only a small number of its qualities may develop into core competencies. A content analysis of its academic programmes and practises, the findings from the National Survey of Student Engagement, and other types of assessment and strategic evaluation should all be included as part of the conversation.

One of the book's key assertions is that a key strategic concern is the kind and quality of student learning. Despite the fact that the writers do not use the phrase, there is a close relationship between student learning and this broader concept of strategy. As we've previously seen, the report outlines the features of 20 campuses whose graduation rates and engaged learning practises are above average given their institutional makeup and student body. Because, among other things, they show a "living" mission and "lived" educational philosophy, an unwavering focus on student learning, an improvement-oriented ethos, and a sense of shared responsibility for educational quality and student success, the colleges exhibit characteristics that directly relate to aspects of strategic leadership. Moreover, each of them has a powerful culture and deeply felt identity that outlines pathways for student achievement and fosters an atmosphere that enhances student learning. The leadership of these institutions likewise places a high priority on student learning, both in terms of what people in power do and how it is dispersed across the organization's systems and connections. In our terminology, the organisational cultures, programmes, and collaborative practises of these schools and universities communicate their stories, values, and visions. All of these elements are maintained through a decentralised process of strategic leadership.

The fact that official leaders often act as followers in strategic leadership may not be any more evident than in the context of student learning. The practises of engaged learning are primarily shaped by teachers and students; individuals in academic leadership roles may then contribute to their clarification, systematisation, and support. The notion that strategy comes through practise is perfectly appropriate and correct in the context of teaching and learning. The University of Richmond picked a topic that emerged from the educational practises that were developing both within and outside of its classrooms for its strategy report on engagement in learning that was published in the middle of the 1990s. The planning committee engaged in discussions with teachers and students on how they employ collaborative learning, interactive classrooms, experiential learning, study abroad, service learning, and student research. From these discussions, the strategic awareness of those practises emerged. The study had a name and covered topics that will soon take centre stage in the larger discussion about higher education [4]–[6].

Basic Education

General education is one area where the strategic examination of student learning should be focused. It is a classic strategic problem since it sits at the crossroads of many key organisational commitments. To start, general

education often entails a significant institutional resource commitment. Its unique courses and requirements put a significant strain on faculty time and resources and need a sizable number of academic positions. As general education often takes up more than half of a student's first two years of study, its impact on a student's early educational experience is frequently significant. Usually throughout these years, a student establishes some kind of intellectual relationship with the school, but this may never happen. The connection between enrolment and retention is thus very important. Most significantly, many institutions specifically outline what a liberal education entails in relation to the goals of their general education curricula.

In terms of the theme of strong learning, institutions often make clear their defining traits, fundamental skills, educational principles, and credos in general education. It became evident that schools were progressively linking their general education programmes to their unique traits and skills during the development on the Association of American Colleges and Universities' Greater Expectations. The distinctive academic character of a college or university in terms of teaching, curriculum, and research was translated into strategies for involving students in cogent, deliberate, and integrated general education.

We recognise the depths to which strategic leadership must penetrate when we think about it in the context of student learning and general education. To answer comprehensive educational concerns, it must rely on the institution's most potent conceptual resources. Faculty members and academic administrators who are working on general education must be inspired and given the tools they need to be educators rather than merely subject-matter specialists. While it may seem strange, strategic leadership demands that institutions dedicated to higher learning concentrate on the theoretical underpinnings of academic programmes. An institution's unique educational capabilities are brought into foreground through a well-founded, distinctive, and robust programme of strong learning across the undergraduate curriculum and co-curriculum, reflecting its history, beliefs, and identity. It fosters a feeling of teamwork and aims to include staff and students in the experience of a real learning community. If this intense concentration on learning is to continue, faculty members as educators must regularly consult the best current research on student learning, research successful educational models, and continue to think clearly and coherently about educational planning and delivery in terms of a differentiated concept of quality. In the academic setting, strategic thinking takes on this form. It navigates through arguments and disagreements to identify the common principles and ideas that people are prepared to commit to.

II. DISCUSSION

Several strategists believe that how a firm offers its goods and services differently in a crowded market constitutes the essence of the process. The analytical and quantitative approaches of marketing have emerged in consumer goods businesses as the queen of the business sciences and are mostly responsible for the corporate strategy. On the campus, some of these same patterns have moved in. In stark contrast, we have grounded the strategy process in collegiate narratives of identity and desire, locating it at a deeper level. The differences between these two beginning points in today's world are often most evident in the work of admissions offices.

Most colleges and universities have an imperative or strategic effort related to enrollment and admissions in their strategic plans. As practically every school relies significantly on tuition and many private institutions are just a few poor admissions years away from extinction, marketing often plays a significant part in reports on college strategic planning. Hence, notwithstanding how repugnant most faculty members find the vocabulary of markets, brands, and consumers, its language and tactics are becoming more and more prevalent on campuses. David Kirp writes that the language of marketing is here to stay, whether we like it or not, both for good and for worse, based on trips to several campuses [7]–[9].

He asks a similar issue to the one we are asking: Can academic community values and market values be reconciled when it comes to the use of strategic marketing, or will colleges and universities sell their birthrights? When we think about admissions in a strategic framework, we have a test case for a problem that we have looked at in many contexts and that, as we have seen, has been the subject of several studies, including those by Kirp, Bok, Newman, Couturier, and Scully, as well as Zemsky, Wegner, and Massy. In general, it is about the boundaries of market rivalry and commercialism in higher education. The question in this particular instance focuses on the proper use of marketing language and techniques in the admissions process.

Strategic Marketing and Leadership

By looking at a few fundamental traits of integrated strategic thinking that set it apart from a marketing discipline, we can start to answer this issue. Deep strategy, in particular, calls for integrated and systemic ways of thinking and doing. At the strategic level, what could be hidden at the operational level is fully evident. It demonstrates the interconnectedness of administrative and academic operations and initiatives.

Take into account what is necessary to achieve almost any admissions objective, whether it be to boost applications or yield or to draw in more students with certain skills, backgrounds, or family income levels. Simply put, the admissions programme is the cutting edge of an intricately interconnected strategic structure. The point in such a construction links to all the main parts of the structure, regardless of where one touches it. Faculty and administrative executives throughout the company must comprehend the links inside a strategic system.

When seen in this context, efficient admissions work starts with the synthesis of several information types, ranging from

narratives to facts. Almost every aspect of the verbal and visual messaging that an admissions office conveys should include the institution's narrative, vision, unique educational qualities, and core competencies. They are taken from a complicated collection of assumptions and knowledge about the organisation that are both unearthed and valued via the use of deep strategy. This integration process gains discipline from strategic thinking, which also makes the process of creating the message unique, real, and targeted.

"At its core, a brand is the promise of an experience," asserts a proponent of branding and integrated marketing. The branding process includes comprehending and expressing to target audiences the veracity of that experience. This makes it evident that understanding is a difficult strategic endeavour that comes before branding and marketing. . . The legitimacy of a Coke, a coffee shop, or a car is one thing; the validity of an educational experience is quite another. The term "experience" has different connotations when used to describe goods and education. In contrast to education, which entails an intangible process of intellectual and personal transformation, products are experienced via practical use and consumption. Although products may be altered indefinitely to suit client preferences, educational standards are established that students can only fulfil via improvements in their skills and knowledge, which are mostly driven by their own motivation and will. If we skip the crucial step of identifying and articulating an institution's authentic identity, its goals could be reduced to whatever the inventiveness of marketing chooses to make of them. This is particularly true given that branding's roots are in the repetitive and occasionally deceptive mass advertising that was used to sell consumer products. Making ensuring that education is not turned into a business is one of the duties of strategic leadership.

These factors provide a clear view on how marketing techniques and terminology are used in higher education. The vocabulary we use important, and not merely to protect the faculty's sensibilities. Language communicates a way of thinking and beliefs. A real university is built on a distinct set of ideals and goals than those utilised by companies that sell goods and services and produces and disseminates knowledge as a public benefit. The question is whether the decision-making and thinking processes utilised in business are compatible with that intellectual environment. While we have worked hard to demonstrate, certain business processes do fit, such as marketing strategies and strategy tools and ideas. To do this, the language and pertinent management procedures may and need to be transformed into the idioms, principles, and strategies that shed light on educational concerns and university decision-making. If things goes well, integrated strategic marketing techniques may be able to improve the work of the admissions department and other departments by bringing fresh perspectives and organised procedures. Yet, certain jargon defies translation and cannot be turned into key strategic principles without changing the

meaning of education, such as the usage of the terms "customer" and "brand" for identity, image, and reputation.

What Students Go Through

Student life is seldom at the heart of institutional strategy, although admissions is often at the centre of planning papers for institutions. The definition of the educational goals of student life has been lacking since since the notion of in loco parentis was abandoned in the late 1960s. Indeed, a lot of student affairs officers bring an academic viewpoint to their job. Most campuses make an effort to connect residential and academic life, often via creative strategies and initiatives. Campus life also offers plenty of opportunity for students to learn and grow personally via activities like volunteer work, creative endeavours, and sports. But, in most cases, there is no clear or compelling conceptual understanding of how all of these activities contribute to the academic development of students. The objective seems to be customer happiness, and it seems that "edutainment" is often at the strategic core of things [10], [11].

Very seldom do faculty members demonstrate any interest in or understanding of the potential contributions that campus or residential life may make to the institution's instructional purpose. The predominant attitude is most often one of irritation at the coarseness of student social life and how it interferes with academic goals. Then there is the negative aspect of student life, which is also a strategic problem since it shapes the character of the campus when unsettling realities from the larger culture enter it. High rates of alcohol and drug misuse always result in acts of violence, vandalism, and sexual exploitation. Almost all modern campuses have created unique initiatives and strategies to combat excessive drinking and its consequences on students.

Living on Campus and Strategy

Strategic potential for exceptional educational attainment via the campus environment may be seen in contrast to this difficult image. The campus experience has been elevated in importance by American institutions more than it has by any other national educational culture in the globe. Resources are devoted heavily to campus activities, employees, programmes, sports, and facilities. Nonetheless, the instructional intent behind it all is seldom acknowledged or stated at most universities [12], [13]. Strangely, in the near future, campus life could end up being a key differentiator for schools and universities. What does it provide that a computer terminal cannot provide?

III. CONCLUSION

The educational value of on-campus student life is a neglected conceptual and strategic subject at a time when late adolescence is a difficult period for personal development and technology forms of remote education are dramatically increasing in popularity. It demands fresh expression by the academic leaders of the institution, particularly the opinions and voices of the faculty. Strategic thinking for leaders enables us to work together and approach issues from several

angles to find solutions. Even if you are the sole participant in a real strategic thought process, many viewpoints will nevertheless emerge.

REFERENCES

[1] M. I. Mostafiz, M. Hughes, and M. Sambasivan, "Entrepreneurial orientation, competitive advantage and strategic knowledge management capability in Malaysian family firms," J. Knowl. Manag., 2022, doi: 10.1108/JKM-09-2020-0693.

[2] G. Congdon, T. Baker, and A. Cheesman, "Enhancing the strategic management of practice learning through the introduction of the role of Learning Environment Manager," Nurse Educ. Pract., 2013, doi: 10.1016/j.nepr.2012.08.005.

[3] L. Heracleous and S. DeVoge, "Bridging the Gap of Relevance: Strategic Management and Organisational Development," Long Range Plann., 1998, doi: 10.1016/S0024-6301(98)00079-X.

[4] V. Cassar, K. Tracz-Krupa, F. Bezzina, and S. Przytuła, "'THE TIMES THEY ARE-A-CHANGIN': RECONSTRUCTING THE NEW ROLE OF THE STRATEGIC HR MANAGER," Manag. Sci., 2018, doi: 10.15611/ms.2018.3.01.

[5] S. Iyengar and A. F. Simon, "New perspectives and evidence on political communication and campaign effects," Annual Review of Psychology. 2000. doi: 10.1146/annurev.psych.51.1.149.

[6] B. Becker, "the Hr Scorecard," Order A J. Theory Ordered Sets Its Appl., 2001.

[7] V. Carragher and M. Peters, "Engaging an ecovillage and measuring its ecological footprint," Local Environ., 2018, doi: 10.1080/13549839.2018.1481021.

[8] F. Basbeth and N. Che Nawi, "Does Experience Co-creation (XCC) Change Entrepreneurial Intention?," Int. J. Bus. Stud., 2020, doi: 10.32924/ijbs.v4i3.167.

[9] L. Fogarty, "FROM SOCIAL LEARNING TO CULTURE: MATHEMATICAL AND COMPUTATIONAL MODELS OF CULTURAL EVOLUTION," Univ. St Andrews, 2012.

[10] J. Venkatesh, C. Aarthy, S. Thenmozhi, and P. Balasubramanie, "Operation of enterprise resource planning system implementation compatibility towards technical advancement," J. Comput. Sci., 2013, doi: 10.3844/jcssp.2013.169.175.

[11] V. Sahu, Jk, Ramanujam, "TRIGUNA PHILOSOPHY : AN ARMED FORCES PERSPECTIVE," IMPACT Int. J. Res. Humanit. Arts Lit. , 2019.

[12] P. Skehan, B. Xiaoyue, L. Qian, and Z. Wang, "The task is not enough: Processing approaches to task-based performance," Lang. Teach. Res., 2012, doi: 10.1177/1362168811428414.

[13] L. R. JACOBS and M. BURNS, "The Second Face of the Public Presidency: Presidential Polling and the Shift from Policy to Personality Polling," Pres. Stud. Q., 2004, doi: 10.1111/j.1741-5705.2004.00211.x.

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When seen in this context, efficient admissions work starts with the synthesis of several information types, ranging from

narratives to facts. Almost every aspect of the verbal and visual messaging that an admissions office conveys should include the institution's narrative, vision, unique educational qualities, and core competencies. They are taken from a complicated collection of assumptions and knowledge about the organisation that are both unearthed and valued via the use of deep strategy. This integration process gains discipline from strategic thinking, which also makes the process of creating the message unique, real, and targeted.

"At its core, a brand is the promise of an experience," asserts a proponent of branding and integrated marketing. The branding process includes comprehending and expressing to target audiences the veracity of that experience. This makes it evident that understanding is a difficult strategic endeavour that comes before branding and marketing. . . The legitimacy of a Coke, a coffee shop, or a car is one thing; the validity of an educational experience is quite another. The term "experience" has different connotations when used to describe goods and education. In contrast to education, which entails an intangible process of intellectual and personal transformation, products are experienced via practical use and consumption. Although products may be altered indefinitely to suit client preferences, educational standards are established that students can only fulfil via improvements in their skills and knowledge, which are mostly driven by their own motivation and will. If we skip the crucial step of identifying and articulating an institution's authentic identity, its goals could be reduced to whatever the inventiveness of marketing chooses to make of them. This is particularly true given that branding's roots are in the repetitive and occasionally deceptive mass advertising that was used to sell consumer products. Making ensuring that education is not turned into a business is one of the duties of strategic leadership.

These factors provide a clear view on how marketing techniques and terminology are used in higher education. The vocabulary we use important, and not merely to protect the faculty's sensibilities. Language communicates a way of thinking and beliefs. A real university is built on a distinct set of ideals and goals than those utilised by companies that sell goods and services and produces and disseminates knowledge as a public benefit. The question is whether the decision-making and thinking processes utilised in business are compatible with that intellectual environment. While we have worked hard to demonstrate, certain business processes do fit, such as marketing strategies and strategy tools and ideas. To do this, the language and pertinent management procedures may and need to be transformed into the idioms, principles, and strategies that shed light on educational concerns and university decision-making. If things goes well, integrated strategic marketing techniques may be able to improve the work of the admissions department and other departments by bringing fresh perspectives and organised procedures. Yet, certain jargon defies translation and cannot be turned into key strategic principles without changing the

meaning of education, such as the usage of the terms "customer" and "brand" for identity, image, and reputation.

What Students Go Through

Student life is seldom at the heart of institutional strategy, although admissions is often at the centre of planning papers for institutions. The definition of the educational goals of student life has been lacking since since the notion of in loco parentis was abandoned in the late 1960s. Indeed, a lot of student affairs officers bring an academic viewpoint to their job. Most campuses make an effort to connect residential and academic life, often via creative strategies and initiatives. Campus life also offers plenty of opportunity for students to learn and grow personally via activities like volunteer work, creative endeavours, and sports. But, in most cases, there is no clear or compelling conceptual understanding of how all of these activities contribute to the academic development of students. The objective seems to be customer happiness, and it seems that "edutainment" is often at the strategic core of things [10], [11].

Very seldom do faculty members demonstrate any interest in or understanding of the potential contributions that campus or residential life may make to the institution's instructional purpose. The predominant attitude is most often one of irritation at the coarseness of student social life and how it interferes with academic goals. Then there is the negative aspect of student life, which is also a strategic problem since it shapes the character of the campus when unsettling realities from the larger culture enter it. High rates of alcohol and drug misuse always result in acts of violence, vandalism, and sexual exploitation. Almost all modern campuses have created unique initiatives and strategies to combat excessive drinking and its consequences on students.

Living on Campus and Strategy

Strategic potential for exceptional educational attainment via the campus environment may be seen in contrast to this difficult image. The campus experience has been elevated in importance by American institutions more than it has by any other national educational culture in the globe. Resources are devoted heavily to campus activities, employees, programmes, sports, and facilities. Nonetheless, the instructional intent behind it all is seldom acknowledged or stated at most universities [12], [13]. Strangely, in the near future, campus life could end up being a key differentiator for schools and universities. What does it provide that a computer terminal cannot provide?

III. CONCLUSION

The educational value of on-campus student life is a neglected conceptual and strategic subject at a time when late adolescence is a difficult period for personal development and technology forms of remote education are dramatically increasing in popularity. It demands fresh expression by the academic leaders of the institution, particularly the opinions and voices of the faculty. Strategic thinking for leaders

enables us to work together and approach issues from several angles to find solutions. Even if you are the sole participant in a real strategic thought process, many viewpoints will nevertheless emerge.

REFERENCES

[1] M. I. Mostafiz, M. Hughes, and M. Sambasivan, "Entrepreneurial orientation, competitive advantage and strategic knowledge management capability in Malaysian family firms," J. Knowl. Manag., 2022, doi: 10.1108/JKM-09-2020-0693.

[2] G. Congdon, T. Baker, and A. Cheesman, "Enhancing the strategic management of practice learning through the introduction of the role of Learning Environment Manager," Nurse Educ. Pract., 2013, doi: 10.1016/j.nepr.2012.08.005.

[3] L. Heracleous and S. DeVoge, "Bridging the Gap of Relevance: Strategic Management and Organisational Development," Long Range Plann., 1998, doi: 10.1016/S0024-6301(98)00079-X.

[4] V. Cassar, K. Tracz-Krupa, F. Bezzina, and S. Przytuła, "'THE TIMES THEY ARE-A-CHANGIN': RECONSTRUCTING THE NEW ROLE OF THE STRATEGIC HR MANAGER," Manag. Sci., 2018, doi: 10.15611/ms.2018.3.01.

[5] S. Iyengar and A. F. Simon, "New perspectives and evidence on political communication and campaign effects," Annual Review of Psychology. 2000. doi: 10.1146/annurev.psych.51.1.149.

[6] B. Becker, "the Hr Scorecard," Order A J. Theory Ordered Sets Its Appl., 2001.

[7] V. Carragher and M. Peters, "Engaging an ecovillage and measuring its ecological footprint," Local Environ., 2018, doi: 10.1080/13549839.2018.1481021.

[8] F. Basbeth and N. Che Nawi, "Does Experience Co-creation (XCC) Change Entrepreneurial Intention?," Int. J. Bus. Stud., 2020, doi: 10.32924/ijbs.v4i3.167.

[9] L. Fogarty, "FROM SOCIAL LEARNING TO CULTURE: MATHEMATICAL AND COMPUTATIONAL MODELS OF CULTURAL EVOLUTION," Univ. St Andrews, 2012.

[10] J. Venkatesh, C. Aarthy, S. Thenmozhi, and P. Balasubramanie, "Operation of enterprise resource planning system implementation compatibility towards technical advancement," J. Comput. Sci., 2013, doi: 10.3844/jcssp.2013.169.175.

[11] V. Sahu, Jk, Ramanujam, "TRIGUNA PHILOSOPHY : AN ARMED FORCES PERSPECTIVE," IMPACT Int. J. Res. Humanit. Arts Lit. , 2019.

[12] P. Skehan, B. Xiaoyue, L. Qian, and Z. Wang, "The task is not enough: Processing approaches to task-based performance," Lang. Teach. Res., 2012, doi: 10.1177/1362168811428414.

[13] L. R. JACOBS and M. BURNS, "The Second Face of the Public Presidency: Presidential Polling and the Shift from Policy to Personality Polling," Pres. Stud. Q., 2004, doi: 10.1111/j.1741-5705.2004.00211.x.

Intellectual Dynamism and Collegiate Life

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Abstract— Psychologically speaking, an instinct would be a propensity that is innate and present in every member of a certain species. In this sense, our intellectual dynamism may be referred to as a "instinct" since it is the primary force behind all of our actions and is a direction that is inborn in all humans. Academic life and intellectual dynamism playout plan and availability, planning space, locational awareness, place awareness, and salem college, financial capacity and plan, this chapter discusses financial information, cost-effectiveness, and hitting the wall.

Index Terms— Academic, Education, Financial, Intellectual, Leadership

I. INTRODUCTION

Higher education must comprehend and implement its student life programmes using the available theoretical, conceptual, and empirical resources if this strategic challenge and opportunity are to be taken. The information and conclusions are available, as shown, for instance, in the extensive study and publications by Alexander Astin or, more recently, in the work of George Kuh and his colleagues. The developmental ideas of authors like Arthur Chickering, Douglas Heath, and William Perry have educated generations of thinkers and practitioners in the past and present. Throughout the years, Pascarella and Terinzini have examined several research on the effects of college on students [1]–[3].

These academics, along with several others, provide conceptual frameworks and touchstones that give students' intellectual and personal growth a holistic educational meaning. They expose some of the campus culture's infrastructure and routines in the process, which helps students participate successfully in higher education. Terms like "personal growth," "intellectual maturity," "responsibility," "commitment," "autonomy," "democratic citizenship," "leadership," and "community" that one frequently sees in mission statements or hears on campus are made understandable and actionable when they are connected to coherent models of human development that view education as the development of fundamental human powers and possibilities. They provide the integrative viewpoints required to make strong learning a strategic goal and institution-wide commitment.

Once again, the strategy-making process takes on a leadership role. It achieves this by encouraging connections between the many components of a system and by searching for conceptual resources that may adequately capture the richness and diversity of education as a means of empowering people within an intentional community. "We think the six values described in this study—purposefulness, openness, fairness, discipline, caring, and celebration—may constitute the basis on which a thriving community of learning might be established," Ernest Boyer wrote in his famous report Campus Life: In Search of Community. Colleges and universities should be inspired by a bigger vision now more than ever.

Most accrediting requirements stipulate that colleges must have a campus master plan. A plan that specifies where future structures will be located and how campus space will be used would appear to be a typical example of long-term planning rather than strategic thinking. After all, the main determinants are the physical masses and spaces, which are in the hands of the designers. Whatever the driving forces of the world may be, they may be reduced to accurate sketches and blueprints.

Room for Strategy

On a strategic level, however, it is evident that the campus and building designs are a part of a set of principles and unique educational goals. The planning of today's colleges and universities show a keen awareness of how the locations, configurations, and formats of learning should be determined by the objectives of an involved educational community. Campus areas are set out to support collaborative learning in small groups, to foster social interaction and technological connectivity, and to allow for the location of labs where staff and students may do joint research. Physical space is more visible in terms of the educational objectives it supports.

A sense of location

The campus is a lived location, which is why it often serves as a prominent topic in the institution's history in strategic plans and related studies of campus life. Many students, employees, and alumni have close ties to the campus, its landmarks, and its unique natural and architectural elements. A sense of place is often a defining aspect in the shared values of a community. Locations have meanings that support the overarching goals of education.

A sense of place and Salem College

Old Salem, a restored Moravian hamlet in Winston-Salem, North Carolina, is home to Salem College. Old Salem dates back to the mid-1700s when German-speaking Moravian immigrants from Pennsylvania came in Salem to establish an

intentional community of religion and work. The college and the nearby academy, which evolved from a school for girls that the Moravians began before the American Revolution, are intertwined with the village's sense of its historical identity. Both the college and the town have a similar architectural style that is characterised by straightforward geometric shapes, pitched tile roofs, arched windows, Flemish bond brick buildings, repetitive green areas, and worn brick paths. The campus extends from the expansive village centre into quaint quadrangles made of buildings that primarily reflect the architecture of the town from the eighteenth century onwards. There are historical antiques all around us, from old furniture to embroidered samplers made by young girls more than 150 years ago. The setting is characterised by a feeling of intimacy, community, historical integrity, and authenticity. These exact ideals influence the interpersonal interactions and ties of individuals who live there as students, strengthening their links as accountable members of a long-standing community of women and leaving a lasting impression on their experience [4]–[6].

Similar experiences may be found on several campuses, giving them a voice in their own school identities. Hence, master plans and choices on significant upgrades are also essential components of future educational initiatives. A building's influence on the local population and the environment is a crucial consideration in today's facility selections. Its physical structure and infrastructure are important factors to take into account for its efficacy, sustainability, and efficiency, as well as the messages it conveys. The architecture of a campus grounds a community's identity and tradition. In all of these ways, campus layout and architecture are essential components of a strategy that advances the company towards the self-defined goal.

Financial resources and strategy

One quickly learns a startling fact after studying papers and documents from college strategic planning. Many plans lack either a financial model to estimate the cost of the suggested initiatives or a mechanism to pay for them within a certain time frame. This is more than a bit strange considering that strategic planning is all about setting objectives and allocating resources to make them a reality. Many of the objectives in a strategic plan become wish lists or safe havens for the extra baggage of campus opinion and want without any sense of financial capability, which is what opponents argue they are anyway. A plan loses its effectiveness as a tool for decision-making and leadership when it lacks financial viability.

As defining financial capabilities and goals might include political risks, many institutions are hesitant to do so. It is risky to suggest that certain programmes or units may be more important than others. Setting priorities may cause a flood of conflict in situations where there are enemies. Even while the implementation of an ideal procedure may need to be adjusted for a number of different situations, these

difficulties shouldn't stop us from considering the possibilities.

II. DISCUSSION

The usage of an analytical financial model is a crucial necessity for successful strategic planning. While the model might be very simple, it must include the important leverage points that affect the institution's financial status. These leverage points must be well understood and meticulously documented, including the important ratios that represent financial situation, in order to allow for effective decision-making. Our recommended dashboard of strategic indicators displays information that need to be used in a model or in a companion financial situation study. It is crucial to comprehend both operationally and strategically important ratios and indications including debt to assets, debt payments to revenues, net tuition after discounts, and unconstrained net income. For schools and universities, the majority of accounting companies can provide a set of analytical and comparative ratios, and bond agencies develop potent sets of metrics when giving ratings. Strategic leaders and thinkers concentrate on these comparative trends and ratios and pay close attention to their financial indicators' danger zones as well as marginal revenue and cost. The interplay of an institution's most crucial variables—revenue and cost, assets and liabilities—drives outcomes exactly for each one. Strategic leaders are often adept at connecting the engine's dynamics to the important success criteria in the educational programme. While the majority of revenue and expenditure streams have varying rates of growth and decline, they may be converted into a quantitative and analytical model that can be used to analyse the financial effects of different strategic choices and prevailing market conditions [7]–[9].

The financial outcomes of each of the primary task forces and groups generating plans should be tested using the model, and these findings should be highlighted in the report for each group. With a thorough understanding of the resources they will need and the actions they will take in the event of unfavourable conditions, such as high inflation or a severe recession, the SPC will choose solutions for further discussion and execution. It cannot fulfil these obligations without a clear sight into the inner workings of its own financial universe.

Facts on finances and transparency

The institution's fundamental financial status must also be made apparent in order for a financial model to forecast feasible future possibilities. The governing boards and presidents do well to publish all the fundamental financial data that is pertinent to the task of strategy, as we stated in our discussion of SPCs. In the long term, it is far preferable that these difficulties be communicated than than kept hidden, even though it might be challenging if the institution is in a weak or particularly powerful position. Part of the same unhealthy pattern is the propensity for certain faculty

members to divert difficult financial decisions to administrators and for administrators to hide troubling financial information from the faculty. Both shared knowledge and shared accountability are necessary for a credible process. One of the traits of good leadership is the capacity to deal honestly with the possibilities and limitations as they are defined by the setting. In discussing schools that started their academic turnarounds by being open about their sometimes-fragile financial conditions, MacTaggart emphasises this point several times.

Strategic Objectives

Each institution will need to regularly restructure the linkages between its resources and its aims in an environment where resources for higher education are permanently constrained and unreliable. Institutions will naturally use their strategy processes to redefine a lot of the presumptions about the programmes they deliver, to whom they give them, and how. The operational budget's priorities will need to be determined by more clear and consistent strategic criteria. For a while now, educational institutions have used standards that assess programmes based on factors including quality.

cost, demand, and centrality. The execution of strategic plans should explicitly include the more methodical use of such criteria. These must develop into the continual decision-making tenets that maintain a strategic equilibrium inside an institution and with the external forces influencing it. Robert Dickeson states that "Balance might be defined as 'bringing into correct proportion,' and such is the essence of the ultimate goal of institutional leadership" in constructing a helpful sequence of specific processes to attain continuing strategic balance. A new point of strategic gravity must be established for the endeavour to think and act ethically and responsively in all decision-making contexts, from the most cost-effective design of individual courses and programmes to the optimal combination of all programmes.

Excellence Selected at Yale University

These principles will be better understood with an example. Despite the fact that institutions often use terms like "selected excellence" to characterise their targeting efforts, their choices haven't always led to either quality or clarity. Does selective excellence imply that we will flourish in certain areas while failing miserably in others, or what? Richard Levin, Yale University's president, provided an insightful strategic interpretation of the term when he predicted the university's destiny many years before its three hundredth anniversary. He said that Yale will focus on its strengths while pursuing excellence in all it does. Yale should strive to comprehensive competence across most specialisations in certain subjects, such as the humanities and the arts. Nevertheless, in other subjects, like the physical sciences and engineering, it would need to choose numerous specialisations and focus its resources on a select number of illustrious faculty groups. Even a prestigious university cannot hope to provide thorough treatment of every topic

deserving of study due to the breadth and diversity of human knowledge.

Financial choices bring the unique qualities of strategic thinking into stark perspective. The persistent propensity to see budgets only in terms of their operational or political implications must be addressed by the analytical, integrative, and systemic aspects of strategy as a discipline. Financial choices lack a strategic viewpoint and are instead motivated by a variety of urgent needs. The capacity to combine facts and figures with objectives and meanings is a necessary component of strategic thinking. Annual budgets must be included into strategic aims and plans, or the institution would lose its focus. As purpose is at the heart of leadership, it must manifest itself as a guiding force in prudent and well-thought-out financial choices.

Financial Stability

A strategic perspective emphasises on substance in addition to providing a framework for thinking about financial difficulties. Having the firm attain long-term financial stability is one of the objectives of a successful plan. Achieving financial equilibrium is what most schools and universities mean by this. Although the characteristics of this are most simply exemplified for private colleges and universities, they are also becoming directly comparable at state-sponsored institutions. Maintaining equilibrium entails maintaining a balanced operating budget, keeping the rates of increase in expenditures and revenues equal while accounting for financial aid discounts, making annual provisions for the depreciation of physical plant and equipment that should eventually reach 2% of replacement value, creating annual budgetary flexibility by adding contingencies for enrollment changes and other factors, and usi

Financial equilibrium establishes a strict norm to which many institutions can only aspire. Nonetheless, the idea highlights the structural heights that strategy must attain to be a useful kind of leadership. Within a long-term horizon of desire, all choices and instruments for policy and decision making are on the table to reach balance. Every decision and matter, from raising tuition to the success of the president and board's financial leadership, is a component of the strategic equation of financial equilibrium. The goal is to create a financial engine that can operate indefinitely at the greatest levels of effectiveness and efficiency and pass the test of sustainability. The engine will always want more gasoline, but it must be designed such that it can run under challenging circumstances, switch to robust tactics when fuel supplies are low, and continually refill part of its internal resources. From a strategic standpoint, the objective remains constant: to build an organisation that can control its environment by making decisions about its future and is financially self-renewing.

Cost-effectiveness: Hitting the Wall

As our environmental scan revealed, fundamental changes in the affordability of higher education have made it more difficult for virtually all institutions to achieve financial

balance during the previous 10 years. In the present environment, strategic thinking and the pursuit of financial sustainability are demanding taskmasters. College costs have risen for years above inflation rates and far outpaced increases in typical family income. Just a few thousand dollars separated the average room, board, and tuition costs at top private institutions in 2007 from the median family income before taxes. As a consequence of an inescapable trend towards privatisation and dwindling state funding, many public colleges must contend with similar difficulties as tuition increases.

In response, colleges have reduced their fees based on need and merit assistance. This has led to a vicious fiscal cycle where higher fees result in lower marginal new revenues as more and more families qualify for discounts. As a consequence, many universities have started to "hit the wall" financially since the cost of tuition has beyond what can be afforded by families structurally. If current trends continue, it won't be long until all students—aside from those from families earning in the top 5 percent—receive ever-larger discounts, which would gradually reduce net tuition revenue and starve many schools to death [10], [11].

Several schools have found new income sources that expand on current administrative and faculty overhead as a deliberate and creative response to the new restrictions. These institutions have the necessary locations, programmes, and inventive capabilities. They establish adult education centres around the area, develop graduate programmes with a focus on professional development, increase enrollment and offers in low-cost disciplines with a practical orientation, and often use online learning to reach a wider audience. The academic core of the institution has often grown to rely on the cash generated by these programmes, despite the fact that the core is actually becoming smaller. At big research institutions, undergrad tuition, research expenses, and initiatives with substantial net income are used to finance both research and instruction in the humanities and arts.

But, in certain circumstances, the new financial engine won't last because of the fierce competition it faces from other institutions and free or inexpensive educational options, as well as quick changes in demographic and economic trends. These problems are brought into the light by strategic leadership, which also examines the resilience and longevity of financial models. The "brutal facts" and systemic weaknesses must be faced in order to make the best decisions. To solve these problems, structural adjustments must be made in addition to financial reallocations. Options like the three-year degree, partnerships between community colleges and four-year universities, programmes that alternate between work and study, new educational services for a growing retirement population, and increased educational alliances with organisations in workforce education and management development are examples of options that alter the financial model more fundamentally. Also, a significant amount of philanthropy is required to meet the ongoing demand for fresh funding to launch and maintain programmes and scholarship budgets, which leads us to our next subject.

Fund-Raising

No matter how well a campus manages its spending via the use of a framework of strategic priorities, it will always need to increase its resources. Cost rises for facilities and financial assistance are inevitable, particularly in today's fiercely competitive market, and inflationary pressures on wages and benefits may only become worse over time. Funding will always be needed as new strategic demands and objectives are created and authorised. These goals are closely related to the institution's ability to raise significant amounts of capital and operational funding from sponsors and donors when they are developed through the systematic methods of strategic planning. The strategic position and goals of the institution rely on this capability, thus both public and private colleges and universities are under pressure to make it a core skill.

Ability to Give

The ability of an organisation to produce gift and grant money is one of the most important strategic indications of that institution's ability to achieve its objectives. Think about, for instance, the amount of gift and grant money for all purposes received by an institution annually during a ten-year period in comparison to a set of institutions with comparable missions. Unless the school can create resources from other means, such as tuition, the management of physical assets, or endowment returns, it will ultimately lose its competitive position if it is unable to earn similar monetary donations per student.

Suppose institution A, which has 3,000 students and a reasonable level of donation capacity, will receive $15,000,000 year, or $5,000 per student, over the next 10 years, for a total of $150 million. Comparing those data to school B's, which enrols 3,000 students and has a greater gift capacity of $15,000 per student per year, both have 3,000 students, but B's enrollment is higher. These estimates are based on real contributions that twelve schools and institutions received between 1998 and 2001. Institution B gets $450 million overall and $45 million yearly throughout the course of the ten-year period. Institution B has a $300 million resource advantage over Institution A without compensating from other sources, and the disparities will only widen over time. The ability to produce resources, which is the most basic component of strategic and competitive capability, is clearly significantly influenced by gift and grant revenue.

Creating a Narrative

The fundraising schedule is determined by strategy in a number of ways. Sorting out initiatives that could be eligible for funding from various sources, including the government, businesses, foundations, alumni, and significant contributors, is helpful. By doing this, it also distinguishes the

organization's staffing and skill levels for success in these several areas. The plan most critically provides a methodical justification for the initiatives that the institution wishes to fund. The strategy paper should be given to the development team, who should utilise it as a resource for ideas that will help them structure and even write many requests for assistance.

A capital campaign or other equivalent long-term development programme may and should often be planned to coincide with the end of an extensive strategy process. In doing so, a well-written planning document presents the main points and outlines the key components of a case statement. Donors want to be convinced of the importance of the initiatives they are requested to fund in determining the future's trajectory. A strong strategic plan outlines clearly how the project will contribute to the institution's overall goals, both directly and via the synergies it will foster.

Giving to charity relies on a variety of factors, including sound concepts, trustworthy information, interpersonal connections, a well-run staff, and an enthusiastic team of volunteers. But, it is also influenced by the causes and beliefs that individuals profess to support. Friends, trustees, and past students' pride and devotion are strategic assets that must be mobilised into personal financial support and a commitment to enlisting the help of others. An organisation develops a potent source of incentive when it weaves its narrative and strategic argument together.

A skillful tactic may encourage charity by winning over the intellect and uplift the soul. It serves as a kind of direct communication with everyone who takes part in the organization's identity story and upholds the ideals that underpin it. It challenges people to assume responsibility for the health of a company that has become intertwined with their lives and meets essential human needs. One of the main responsibilities of strategic leadership in the work of colleges and universities is knowing and presenting the narrative.

Conceptual and Integrative Leadership via Strategy

A strategy process is more complex than it first seems to be. Strategic thinking accepts current issues but looks beyond them, even though it may not be aware of its own depths and potential. In addition to addressing particular problems and choices, strategy also contains underlying assumptions, forges connections, and creates a framework for action that has broad relevance as a type of leadership. These aspects of leadership have been linked to the development of a contextual mindset for deliberating academic choices as well as integrated forms of reflection that combine the quantitative and qualitative facets of problems. At crucial junctures, we have also discovered that strategy transforms into leadership because it gives conceptual viewpoints that are unified and serve as resources for the creation of educational practises and programmes.

Since it highlights the systemic linkages among diverse initiatives and programmes, strategy as leadership also fosters the propensity to link decision-making to action. The

cycles of connection link different administrative and pedagogical procedures and acts to one another, demonstrating patterns of interconnectedness that operational thinking alone does not see [12], [13].

III. CONCLUSION

A feeling of potential is given shape, and motivation is made explicit, via the objectives that characterise strategic endeavours. Strategy gains credibility when information is made available and difficult decisions are presented in every priority. It is reasonable to design strategy as an applied discipline of reciprocal leadership for all of these reasons. It must be able to make choices and carry them out if it is to fulfil this demanding potential. We will now discuss the schedule for putting the approach into action.

REFERENCES

[1] A. Ahmed, S. H. Bhatti, I. Gölgeci, and A. Arslan, "Digital platform capability and organizational agility of emerging market manufacturing SMEs: The mediating role of intellectual capital and the moderating role of environmental dynamism," Technol. Forecast. Soc. Change, 2022, doi: 10.1016/j.techfore.2022.121513.

[2] M. Montemari and C. Nielsen, "The role of causal maps in intellectual capital measurement and management," J. Intellect. Cap., 2013, doi: 10.1108/JIC-01-2013-0008.

[3] A. A. Lashitew, M. L. Ross, and E. Werker, "What Drives Successful Economic Diversification in Resource-Rich Countries?," World Bank Res. Obs., 2021, doi: 10.1093/wbro/lkaa001.

[4] S. Popa, P. Soto-Acosta, and D. Palacios-Marqués, "A discriminant analysis of high and low-innovative firms: the role of IT, human resources, innovation strategy, intellectual capital and environmental dynamism," J. Knowl. Manag., 2022, doi: 10.1108/JKM-04-2021-0272.

[5] C. Monagle et al., The Intellectual Dynamism of the High Middle Ages. 2021. doi: 10.5117/9789462985933.

[6] M. A. Ali, "The Rise of the Liberal Islam Network (JIL) in Contemporary Indonesia," Am. J. Islam. Soc. Sci., 2005, doi: 10.35632/ajiss.v22i1.451.

[7] M. Rosamond, The Frankish Kingdoms under the carolingians 751-987. 2018. doi: 10.4324/9781315836973.

[8] C. P. Hart and A. E. Navarro, "Translation in early press: Gaceta de guatemala (1797-1807) and its foreign sources," Mutatis Mutandis, 2021, doi: 10.17533/UDEA.MUT.V14N1A01.

[9] J. Krige, "Regulating the Academic 'Marketplace of Ideas': Commercialization, Export Controls, and Counterintelligence," Engag. Sci. Technol. Soc., 2015, doi: 10.17351/ests2015.001.

[10] J. Lopes, M. Oliveira, P. Silveira, L. Farinha, and J. Oliveira, "Business dynamism and innovation capacity, an entrepreneurship worldwide perspective," J. Open Innov. Technol. Mark. Complex., 2021, doi: 10.3390/JOITMC7010094.

[11] S. Frickel and N. Gross, "A general theory of scientific/intellectual movements," Am. Sociol. Rev., 2005, doi: 10.1177/000312240507000202.

[12] J. Kearney, "Memory's Library: Medieval Books in Early Modern England," J. English Ger. Philol., 2011, doi: 10.5406/jenglgermphil.110.3.0417.

[13] The Intellectual Dynamism of the High Middle Ages. 2021.
    doi: 10.1515/9789048537174

From Strategic Leadership to Strategic Management

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Abstract— Strategic leadership is the capacity of a leader to envision, plan, direct, and make the most of the available resources to carry out plans effectively and successfully. Strategic planning and management are married by strategic leaders. Executives that practise strategic leadership create a vision for their company that will allow it to adapt to or stay competitive in a changing economic and technical environment utilising various management techniques.

Index Terms— Authority, Leadership, Plan, Management, Strategic

I. INTRODUCTION

According to the popular literature on leadership, management is uninspired and resistant to change, but leadership is virtuous and forward-thinking. Yet professionals are aware that the connection between the two is far more intricate. In explaining strategic leadership, I've made an effort to insert fresh leadership imagery into the management framework of strategy. But, it also aimed to demonstrate that a leadership vision needed to provide a clear image of the implementation duties. In conclusion, management without leadership is shortsighted, whereas leadership without execution generates a hollow vision [1]–[3].

The first step in creating a mutually beneficial relationship between strategic leadership and management is to examine an organization's resources, processes, structures, and culture to identify channels for the execution of strategy. A fresh intentionality that constantly looks for methods to integrate a strategic orientation into the operations of the institution is the key to strategic effectiveness. Nearly every aspect of college and university operations offers room for rethinking and reformulating. In her discussion of a variety of effective measures adopted by the University of Wisconsin in Madison to put the plan into reality, Kathleen A. Paris makes the following observation: "For the plan to be taken seriously, teachers, staff, and students must view it as permeated throughout the organisation. It must be a regular element of academic life. Her ideas are consistent with contemporary trends in the literature on strategy, which highlight the value of tying institutional research to quality improvement initiatives, plans to budgets, objectives to teams in charge of achieving them, and strategies to control mechanisms. Modern strategy programmes now place a strong focus on putting strategic thought and planning into practise.

We analyse numerous crucial situations, actions, and connections and show how they might turn into resources for the application of strategic leadership in the sections that follow. On each campus, there are innumerable more chances, but these are the most prominent ones that often emerge in the literature on the implementation of strategy.

We'll concentrate on
1. Strategy discussion communication
2. Organizational culture and strategy: customs, legends, rites, and ceremonies
3. Systems of management, direction, and control
4. Plan and certification
5. Strategic evaluation
6. Reviews of strategic programmes
7. The steering committee and the application of strategy
8. Strategic momentum and integration

Speaking About Strategy

The role of communication in engaging and motivating followers is emphasised in most leadership philosophies. With successful communication, strategic leadership ultimately has an impact on the intents and deeds of people and organisations. Since it connects to people's personal and cultural identities and, therefore, their beliefs and behaviours, narrative leadership is effective. The vital element in creating these ties is communication.

Communication Objectives in Strategic Leadership

Some well-known topics will surface as we examine the function of communication. It will become clear that communication must pass a number of conditions in order to support a process of strategic leadership. The following characteristics of communication will emerge both during and after a strategy process:

Reciprocity: The majority of the values and tactics created throughout the process originate from the campus community itself and are returned to it in the final vision and objectives of the plan, maybe in novel ways.

Participation: There are many possibilities for true give-and-take throughout the strategy-development process.

Urgency: Good communication attracts attention, demonstrates the importance of plan, and calls for effort and dedication to overcome challenges.

Learning: Throughout a successful strategy process, everyone gains knowledge about the institution, its operations, and the environmental issues it encounters.

Narrative: The method makes use of the narrative voice and the tale to represent the institution's identity, capture its spirit, settle problems, and establish a link between the past

and the present.

Validation: The plan's assertions may be clarified and validated by inviting experts from on and off campus to write and talk about them.

Inspiration and motivation are always central to leadership, and communication is one of the main means through which this is accomplished.

Repetition: It is essential to communicate the strategy's core points repeatedly and consistently in a range of circumstances.

It should come as no surprise that several strategic planning manuals and research consistently stress the need of strong communication. In keeping with this theme, George Keller, one of the most important voices in higher education on strategic issues, frequently affirms the necessity of effective and continuous communication in the development of strategy: "The communication must be effective and continued, from the inception of planning through the several years of its implementation." He encourages us to communicate and to do it again. This message seeks to accomplish a number of objectives, including instilling a feeling of urgency in readers to react to difficult external pressures and grabbing their attention when they are concerned with the many other demands on their time as busy academics. Decisions "depend on the ecology of attention: who pays to what and when," as March puts it. Strategic concerns must be articulated effectively, repeatedly, and, at times, movingly if they are to engage the academic community [4]–[6].

II. DISCUSSION

There should be a range of ways of communication both before and throughout a rigorous cycle of strategic planning. In order to raise awareness regarding strategic planning, institutions should employ the methods that best suit their cultures, such as Web sites, newsletters, huge public meetings, smaller gatherings, casual discussions, important speeches, and agenda items for regular meetings. In these situations, as well as many others, there should be strong opportunity to discuss the strategy initiative and gather opinions about both its techniques and substance. The attempts to raise awareness of the process and create a feeling of its significance should be seen as strategic goals in and of themselves. The SPC will have accumulated a collection of articles and materials for its own use once the planning process gets started. The collection's information may be made freely accessible, and a website should include some articles and reports. Everyone from across campus will be asked to weigh in on surveys and questionnaires at different points throughout the process, as well as to attend meetings, roundtables, or workshops to share ideas or comment on a task force or council draught. A draught of the SPC's final report should be disseminated for feedback as the process progresses, or it should be the topic of official or informal conversations or open gatherings. Personal invites should be

issued from the SPC chairman, the president, the appropriate dean, or the relevant director in order to enhance attendance at these events. Through these contacts, a sizable portion of the university will feel educated about and participating in the key topics being thought about. A leadership process will have successfully reached reciprocity [7]–[9].

Building an effective communication system will be more difficult for larger campuses than for smaller ones, but contemporary information technologies make the aim attainable. Each academic division or unit becomes a crucial spoke in the communication wheel at major universities. The success of the approach will rely on how deans of schools and colleges are involved in the process and subsequently disseminate the outcomes. The SPC chairman and staff should oversee and support that process, using the president's or chief academic officer's authority as necessary.

This report on strategy

Every strategy process's leaders must make a crucial choice about the kind of reports or papers that will result from the project. One often hears that the process itself matters far more than the final product. Reports, according to some, have a limited shelf life and aren't reviewed by anybody. Several authors advise that a final strategy document should be no more than twenty to twenty-five pages for these and other reasons.

There isn't a simple formula for determining the right kind or length of a final strategy paper. The tone and length of the document are a result of the objectives each institution sets for the procedure and the functions it wants the report to serve. Typically, it should take on a variety of shapes and lengths to fulfil its objectives. While the report is not an aim in itself, it may be a powerful tool for achieving a number of important objectives. It is crucial for the report to serve as a main source for teaching and learning about the institution's strategic future, in keeping with our focus on the duties of leadership. As a result, there is a compelling argument for making the final report a lengthier, more formal document that contains fifty to seventy-five pages of text in addition to charts and statistics. Many aims, many of which are connected to leadership-related concerns, may be achieved via well chosen language. Despite the fact that certain parts may benefit from using bullet points and summaries, the most crucial themes should be covered in precise and concise writing. There should be a priority on well-reasoned and documented reasoning rather than extreme brevity when discussing strategic initiatives requiring the use of resources, or involving conflict and change. By employing the institution's narrative to support its arguments and the narrative form to engage the audience as participants or stakeholders in the process, the document's persuasiveness is greatly enhanced.

The ability of a report to educate and motivate individuals who were not involved in the planning process is often on the line, therefore the document bears a heavy duty. The study demonstrates. What do we mean when we ask to become a

nation? What is the ratio of tradition to change? What does becoming the top in our class imply? What particular elements make up diversity? What does the future look like in terms of resources? Why were these building or repair projects selected and not others? Why are we being expected to choose priorities and make budget cuts once more? The final report serves as a tool for generating the feeling of urgency and importance needed to propel the plan into realisation.

Techniques for Sharing the Strategy

Of course, a final report cannot be considered the only outcome of a strategy process. It serves as the foundation for a wide range of additional communications as well as a collection of focal points and activities that together make up the strategy's communication techniques. Instead of the generic "Strategic Plan, 2005-2010," it is much simpler to complete these steps if the final report has a suggestive name that describes its major themes. Centre College named one of its plans "Education as Empowerment," a theme that captured some of the objectives of a transformative liberal education.

A communications strategy may comprise the following steps:

1. The creation of appealing summary reports that will be sent to particular audiences, such as advisory committees and the press, and included in publications for alumni, maybe as a pullout section.

2. The creation of articles, often as a series, for academic, staff, and alumni periodicals.

3. The creation of articles and features for the admissions and development offices based on an examination of suggested programmes and resources.

4. The development of websites that provide information on the strategy, updates on its implementation, and coverage that may have occurred in press releases, stories, and articles.

The methodical dissemination of the whole report to the university itself forms the cornerstone of the communications campaign. As we will see, it takes on a cohesive set of directions and objectives in the hands of several important decision-makers for their own interests and ambitions. Everyone will pay attention if it is made clear that financial choices will be made in light of the strategy's priority areas. A strong final report encourages vice presidents of development, directors of communications, and directors of admissions to highlight important concepts and storylines in the document. It gives them a compelling narrative to share about the institution's future course. The concepts and even the language of the plan influence how these important divisions interact with a broad range of university constituents. The organization's identity and communications thereby become considerably more distinct and cohesive.

Website of Brown University

In addition to the "Plan for Academic Enrichment," Brown University's excellent Web site also has various backup reports on the campus master plan, financial resources, and other strategic concerns. The website has a few standout and useful features. Links to the most current updates in each of the university's 10 strategic objectives are included in this list. The reader gets a vivid sense of the plan's substance and advancement because to the great visuals, photos, news releases, articles, grant announcements, and descriptions of new academic programmes.

Organisational culture and strategy: norms, stories, rituals, and ceremonies, the fact that college organisations operate as cultures in addition to being formal organisations is a major subject of our work. Campus communities adhere to rules and values, practises and rituals, and tales and traditions that outline what members of the community should know and do to belong in. As we've seen, corporate culture has a significant impact on how successful leadership is as a formal position as well as an engaged process of influence. Knowing the customs, routes, and areas of leverage to influence culture is essential for putting strategy into practise. In order to integrate strategy with the organization's awareness of itself and its methods of operation, strategic leadership is always seeking for ways to interpret the significance of these lived realities. In doing so, it adopts a methodical and narrowly defined approach to the cultural leadership duties.

The formal and informal rituals and ceremonies that a community uses to commemorate its history and identity are another more obvious way that it expresses its culture. On certain campuses, there are numerous traditions and rituals, whereas on others, there are less. Yet almost every school has formal events to mark the beginning and end of the academic year, a founder's day, to present honours to professors and students, and to welcome newcomers to the community. As new students attend Traditions Night at the University of Kansas, they experience a potent initiation into campus legend and culture as they learn songs and chants and hear tales about the Jayhawk, a mythological bird that symbolises the difficulties of the early Kansas settlers. All of these events serve as platforms for celebrating and presenting different facets of the institution's history. Rituals and customs reinforce and enrich the formal definitions of identity and vision included in a planning document by connecting teachers, staff, and students with a living manifestation of the community's history and goals. Strategic leadership respectfully uses these resources to connect its objectives to the community's intertwined cultural facets.

Authority: Management, Control, And Leadership Systems

To put a strategic plan into action, more is needed than just communication and cultural resonance. A feeling of the legitimacy of the whole process and the successful use of power to achieve predetermined objectives are also necessary. Faculty and staff will be motivated to adopt and own a strategic objective that has been produced jointly and honestly, unless they are prevented by antagonistic animosity. The strategic agenda develops legitimate power in the academic community through suitable forms of

consultation and engagement, opportunities to participate and be heard, and reaction to any signs of dissatisfaction with the process. It will be considered as complying to the norms of shared governance if the leaders of the strategy process exposed the academic problems in the report to open faculty discussion and deliberation.

In the administrative domain, ownership and authority are as important to success as legitimacy is in the academic world. Strategic leadership encapsulates the finest thoughts and goals of the teachers and staff in terms of their careers. Many of the key proponents of the strategic planning process and its outcomes will need to come from the top levels of the company, and others will be found throughout. Public expectations for the implementation of the strategies will be set by the identification of specific academic and administrative roles and offices in the framework of objectives and accountabilities.

Nonetheless, the authority of individuals in positions of leadership also affects the everyday task of implementing objectives. Even while authority does not define reciprocal leadership, institutionalising strategy fully and consistently relies on it. Nothing is conceivable without people; nothing is lasting without institutions, according to Jean Monnet, one of the EEC's architects.

The President's and Other Executives' Responsibility

For strategic ideas and goals to be successfully implemented, the president and other top officials' authority and dedication are prerequisites. There is no question that the president has the primary duty for putting the plan into action, regardless of what part he or she may play in the process itself. According to Douglas Steeples, who examined eight case studies of effective strategy initiatives at various institutions, "successful strategic planning demands presidential leadership of the highest degree."

Much more is needed than just official presidential agreement for strategic leadership to take root. The president's appreciation for the strategy process and aptitude for using it as a form of participatory leadership will be immediately apparent to other top officials and faculty members. They will draw signals from the president's behaviour and expectations, giving the strategy's objectives more or less importance depending on how they interpret the president's intentions. The strategy process will be ongoing, and its aims will be evident in how conversations are conducted, speeches are delivered, priorities are established, resources are allotted, and choices are taken if the president is genuinely devoted to strategic leadership and strategic management. If the president merely gives it lip service and chooses to handle matters politically or via a rigorous line of management control, that will be as obvious.

For the procedure to be successfully implemented, the highest ranking officer in each unit must be committed. The senior officer may incorporate the strategy into the organization's daily choices using the instruments of authority. Even in the world of independent knowledge

professionals, those in positions of leadership may demand attention, manage resources, reward and punish, regulate communication channels, and hold individuals accountable. These abilities are the techniques via which positional power is exerted. They provide a structure within which the activity of reciprocity in leadership might take shape.

It is true that if the organization's members are not committed to the concepts and tactics of the plan, the implementation chores become much more difficult or impossible. If there is a lack of commitment, there will be low compliance, reluctant acceptance, or any of the complex strategies of resistance, avoidance, and delay, particularly in the academic setting, but also across the company. In the creation and execution of a strategic plan, power over others must be converted into authority with and for others.

Control Systems for Results Monitoring

The president and other officers' usage of the creation of control mechanisms to monitor the execution of the plan will also demonstrate their dedication to strategic management. Priority is given to strategic goals above operational ones, which are progressively rearranged to carry out the plan. The academic deans may accomplish one portion of this responsibility by clearly incorporating the strategy's objectives into the yearly planning and operational cycle, which is a simple but effective method for the top administration. As a consequence, the status of each strategic aim would be emphasised heavily in each senior officer's and division head's yearly report and budget plan. Reports on the measures taken to get around hurdles would be anticipated, together with commentary on the issues and triumphs encountered in achieving the objectives. If circumstances call for goal adjustments, one way to suggest them is in the annual report. The report aligns with current public expectations since several of the vice presidents and their staff will explicitly be responsible for putting plans into action. The yearly review may also be included in the employee's personal performance assessment and used to determine remuneration. The annual report is not simply paperwork in a strategic environment; it is also a leadership tool that may connect strategy and operations. Also, it becomes sense to update the campus each year on how the institution is doing with respect to achieving the objectives of the plan. The report may be verbally delivered at the annual opening faculty meeting, in other campus presentations, in written summaries, in analyses and materials put on websites, and, as we will see, in reports to the governing board. If the aims have changed, these modifications and the reasons behind them may be stated. Whether straightforward or intricate, the reporting procedure itself conveys the impression that strategy matters, as do the people whose opinions formed it [10], [11].

Some presidents and administrators decide to create the continuous and organised administrative process of strategic goal monitoring. One option to exercise controls is to have a midyear retreat to examine the strategy's success, which

would include in-depth review sessions with each of the vice presidents and then with their direct subordinates. Another, more bureaucratic method calls for senior officers or their subordinates to provide written progress reports on goals' achievement on a quarterly basis. These reports are often based on matrices that cross-reference problems and objectives with costs and deadlines. Due of their strategic nature, the objectives may be difficult to quantify quarterly, but the technique fosters a strong feeling of accountability and guarantees that the control system is strategically focused.

A Steering Core and Strategic Objectives

There are many methods to connect the academic and administrative units' aims with the overall institution's strategic objectives. The strategic initiatives themselves must be extensively and thematically defined at big and complex universities to take into account the roles and objectives of the many academic and administrative components. If it is accomplished successfully, each college, school, or administrative unit may be expected to carry out its own strategy work in ways that reflect the more significant educational and strategic commitments of the whole institution. The planning process is able to demonstrate how each component of the institution ultimately relies on the standing and capabilities of the others for its sustainability and success. There's a chance that the world's unrest may need solutions that no one entity can come up with on its own. One institution after another discovers the necessity for a reinforced steering core, one central body or multiple interlocked central groupings of administrators and academic staff who can properly and successfully advance the interests of the university as a whole, according to Burton Clark [12].

III. CONCLUSION

In severely decentralised institutional decision-making patterns, we may have hit the organisational logical point of diminishing returns. Academic programme duplication becomes commonplace, administrative and staffing inefficiencies increase, frequent risks go untreated, commercialism settles in certain programmes, and funders grumble about continuously being approached by several sections of the same organisationThe endeavour included funding undergraduate education as one of its top goals, making it a strategic theme emphasis applicable to almost the whole university. It resulted in new advising programmes, a push to turn dormitories into learning communities with strong linkages to teachers, and expanded possibilities for both in-class and outside-of-classroom study.

REFERENCES

[1] A. Carmeli, A. Tishler, and A. C. Edmondson, "CEO relational leadership and strategic decision quality in top management teams: The role of team trust and learning from failure," Strateg. Organ., 2012, doi: 10.1177/1476127011434797.

[2] M. M. LUCIANO, J. D. NAHRGANG, and C. SHROPSHIRE, "Strategic leadership systems: Viewing top management teams and boards of directors from a multiteam systems perspective," Acad. Manag. Rev., 2020, doi: 10.5465/AMR.2017.0485.

[3] J. D. Castellanos and B. George, "Boardroom leadership: The board of directors as a source of strategic leadership," Econ. Bus. Rev., 2020, doi: 10.18559/ebr.2020.1.5.

[4] M. A. Saad, "The relationship between strategic leadership and intellectual capital management: Evidence from the faculty members at the Northern Border University," Int. J. Adv. Appl. Sci., 2020, doi: 10.21833/ijaas.2020.05.005.

[5] O. G. Barbón Pérez and J. W. Fernández Pino, "The role of strategic educational management in knowledge management, science, technology, and innovation in higher education," Educ. Medica, 2018, doi: 10.1016/j.edumed.2016.12.001.

[6] D. Bendig, R. Wagner, C. Jung, and S. Nüesch, "When and why technology leadership enters the C-suite: An antecedents perspective on CIO presence," J. Strateg. Inf. Syst., 2022, doi: 10.1016/j.jsis.2022.101705.

[7] [K. Phornlaphatrachakorn, "Effects of transformational leadership, organisational learning and technological innovation on strategic management accounting in thailand's financial institutions," Asian J. Bus. Account., 2019, doi: 10.22452/ajba.vol12no1.6.

[8] E. C. Kurucz, B. A. Colbert, F. Lüdeke-Freund, A. Upward, and B. Willard, "Relational leadership for strategic sustainability: practices and capabilities to advance the design and assessment of sustainable business models," J. Clean. Prod., 2017, doi: 10.1016/j.jclepro.2016.03.087.

[9] B. K. Berger, "Leadership," in Public Relations: Competencies and Practice, 2019. doi: 10.4324/9781315148106-2.

[10] J. Yu, Z. Ma, and W. Song, "New venture top management team's shared leadership and its indirect effect on strategic performance: findings from SEM and fsQCA," Leadersh. Organ. Dev. J., 2022, doi: 10.1108/LODJ-05-2021-0234.

[11] S. A. Richter, E. P. Dos Santos, D. E. Kaiser, C. Capellari, and G. E. Ferreira, "Being an entrepreneur in nursing: Challenges to nurses in a strategic leadership position," ACTA Paul. Enferm., 2019, doi: 10.1590/1982-0194201900007.

[12] S. Ma and D. Seidl, "New CEOs and their collaborators: Divergence and convergence between the strategic leadership constellation and the top management team," Strateg. Manag. J., 2018, doi: 10.1002/smj.2721

An Overview on Human Resources and Strategy

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Abstract— A company's overall plan for managing its human resources to match its commercial operations is known as a human resource strategy. All of the important aspects of human resources, including as recruiting, performance reviews, professional development, and remuneration, are guided by the human resource strategy. A people-centric approach to tackling an organization's main problems is outlined in the HR strategy. This strategy emphasises the significance of hiring, talent management, remuneration, succession planning, and and necessitates HR engagement during policy formation..

Index Terms— Culture, Human Resources, Leadership, Strategy, Strategic.

I. INTRODUCTION

The impact that strategic leadership has on a college or university's human resource program, particularly its system of faculty appointment and tenure, is another crucial contribution. A more focused sense of identity and vision results in clearer profiles of the individuals required to carry out the plan and aids in the definition and improvement of performance standards and expectations, including those for the president. The processes of hiring, keeping, assessing, and developing personnel become more deliberate. Programs for management and leadership development as well as faculty and staff orientation become increasingly distinct and focused. The inner workings of the strategy system itself may turn out to be an interesting topic for research and a point of emphasis for leadership training. Several of its techniques may be taught, acquired, and incorporated into organisational decision-making processes. Strategy will become dormant and ineffectual if the proper individuals without the necessary abilities are not involved in its implementation [1]–[3].

Planning and Accreditation

Several strategic objectives in the academic setting will be delegated to certain committees or departments for follow-up and eventual execution. Others will affect several academic programmes more broadly. For instance, strategic plans frequently call for implementing international and multi-cultural studies, expanding interdisciplinary work, encouraging the use of technology in the classroom, creating new pedagogies, revising the general education curriculum, improving the advising process, and developing efficient tools for learning assessment. These methods cannot be boiled down to the efforts of a single or two academic committees. These kinds of broad academic endeavours must be connected to the continuing activity of academic departments and programmes. Academic administrators sometimes get upset while attempting to establish the linkages since they are typically difficult to do. The department's specific concentration and the demands of daily tasks compete with the time and effort needed for new

endeavours. When change is pushed from the top in the wrong way, it is met with instant opposition and contempt.

Strategic leadership constantly seeks for tried-and-true techniques and procedures to aid in completing its tasks when faced with problems of this kind. Examples of cross-cutting academic endeavours include programme reviews, self-studies for accreditation renewal, and continuous evaluation efforts. These proposals will grate on many people's nerves since a sizable portion of the faculty disdains each of these procedures, and for good reason. The process of accreditation has mostly consisted of tedious labour required to comply with requirements, scripted and ineffective programme evaluations, and assessment that has never captured the faculty's creativity or interest. Nonetheless, each action offers the possibility of a strategic shift.

More recently, schools have been permitted or mandated to expand the scope of their self-studies and concentrate on the quality of student learning via the accreditation procedures of both specialised and regional associations. Jon Wergin tracks the recent formation of the seven regional accrediting agencies' significant focus on student learning. Ann Dodd analyses the parallel trend of accreditation that is placing more and more emphasis on leadership, curriculum development, and educational quality. The focus is on enticing institutions to connect their existing strategy processes to a self-objectives. study's The strategy makes perfect sense for a number of reasons. One is that it prioritises problems of strategic importance to the whole institution in accreditation assessments, and another is that it concentrates emphasis on a serious set of obligations that the entire campus must meet.

These themes are specifically emphasised in the 2002 recommendations of the Southern Association of Schools and Colleges' Commission on Colleges. Every institution undergoing review is required to create a quality improvement plan and to show that it is a part of an ongoing planning and evaluating process. The quality improvement plan is based on a comprehensive and in-depth review of the efficacy of the learning environment for sup- porting student accomplishment and achieving the institution's goal with a focus on student learning, engaging the larger academic

community.

Institutions clearly need to have an ongoing strategic programme in place to meet these objectives. Strategic initiatives that are already in place or are being considered give the context and guidance needed to design a quality improvement strategy. As stated, the strategy may consist of one or more of the issues currently on the institution's strategic agenda. If a subject is selected that crosses over into the curriculum, teaching, and learning, it must be taken into account at the departmental level and transformed into plans and activities that constitute a part of the official obligations of the institution. The overall educational and strategic goals of the organisation, which are ultimately endorsed by the governing board, are inextricably linked to the aims of each department. Accreditation requirements may be turned into a chance for integrative decision-making.

Strategic Evaluation

Strategic indicators have a significant role in the institutional self-definition, as we have previously shown. When an institution's strategic objectives are readily quantifiable, such those pertaining to admissions, enrollment, finances, and fund-raising, those same indicators often serve as the foundation for assessing and monitoring the institution's performance of those goals. Effective quality evaluation methods that open up avenues of enquiry into the institution's performance help with goal execution. Strategic indicator performance provides a variety of vital information. It raises crucial questions regarding the significance of the data and the accomplishment of strategic objectives that define the vision [4]–[6].

II. DISCUSSION

Similar to this, every major administrative service and programme should regularly evaluate its own performance using surveys and interviews and link those assessments to both the institution's and its own strategic goals. Knowing how effectively the organisation is carrying out its job in all sectors, which is one aspect of what it means to be a learning organisation, is necessary for making continual progress towards achieving ever-higher levels of service and achievement. Quality is interconnected. The drive to raise standards throughout the campus leads to a sense of accomplishment and pride that snowballs and gathers strength. Recent research has focused on the significance of a strategic approach to measurement and goal formulation, including studies on initiatives at the University of Iowa and Rutgers [7]–[9].

The evaluation of student progress

The evaluation of academic and student learning objectives often relies on assessments that are difficult to quantify or on trends that are readily quantified. A common misunderstanding that prevents clear thinking about the several types of assessments that are feasible is the desire to limit students' intellectual growth to a straightforward set of

comparable measures or the outcomes of high-stakes examinations. The bigger and most significant aims of a liberal education—a love of study, critical thinking, moral purposefulness, civic duty, and a robust imagination—would have to be abandoned in order to search for easy solutions since they cannot be accurately measured.

It is ideal to evaluate student learning using a range of techniques, many of which are beneficial even if they are not strictly scientific. They may provide proxies and accomplishment indicators that are meaningful in the context of the investigation and serve as a tool to delve further into the problems within an institutional framework. For instance, institutions should and do collect information on how alumni and students perceive their campus and academic experiences via surveys and interviews. The outcomes of teacher evaluations, student course selection and grade trends, retention statistics, and many more sources that are a regular component of the operations of most institutions provide a lot of information. Alumni accomplishments in the workplace and graduate school are often the subject of useful data collection. The importance of the data may be determined using a variety of analytical and quantitative approaches. All of this information may be used to create a culture of evidence regarding student learning with the appropriate methods and disposition.

Colleges may also decide to take part in significant initiatives like the National Survey of Student Engagement, which, as we've seen, aims to gauge how actively engaged students are in their education. In order to provide a range of quantitative analyses and institutional comparisons of the many elements of student participation in learning, it gathers and analyses data from thousands of students at hundreds of different institutions. When carefully understood, the results of these types of investigations may be used to evaluate broad strategic efforts and goals in relation to significant elements of the quality of student learning, as opposed to memorization of the studied material.

Some more modern techniques for evaluation are particularly suitable in a strategic setting. The use of student learning portfolios, which are more popular and often made electronically to serve as extensive transcripts of students' experiences, accomplishments, and skills, is encouraging for a number of reasons. As evidenced by a variety of experiences and accomplishments both inside and outside the classroom, they can serve as the foundation for student, peer, and faculty assessments of a student's intellectual skills and competencies. Alternatively, they can significantly increase a student's self-awareness and sense of purpose as they set and accomplish academic goals that highlight the institution's unique strengths.

The capacity to judge the value that a certain educational programme brings to the student's intellectual growth is the gold standard for evaluation when it comes to strategic concerns. Absolute metrics of student achievement only offer a partial picture of the educational effectiveness of a certain

programme or institution since students enter college with such a wide range of motivational, talent, and readiness levels. But, if we had a mechanism to gauge how far a student had come, teachers would be able to alter their lessons and programmes in response to evaluations of student development. Also, they can discover crucial proof to back up their assertions about their unique accomplishments and strategies for adding worth to schooling. Value-added assessment should be driven by the potential that strategic assessment has to establish, strengthen, and promote real competitive advantages and core skills. The results must to validate and represent the institutional story, and they ought to be included into continuing strategy development.

As we've seen, a promising avenue of enquiry into the nature and culture of student learning is provided by the National Survey of Student Engagement. The cognitive abilities that pupils acquire are a further factor in the learning equation and lead to the evaluation of individual variations in intellectual development. The Rand Corporation has created a test to assess acquired intellectual capacities in communication and in critical, analytical, and integrative thinking, echoing the emphasis on cognitive skills, in collaboration with the Council for Financial Assistance to Education. It is known as the College Learning Assessment, and it presents students with a genuine issue that they must examine and answer utilising many sources of data and lines of reasoning. Students instead compose a lengthy prose essay outlining their analysis and suggested solutions to the issue in place of answering to multiple-choice questions. The exam may be given to students at both the beginning and later phases of their academic careers, allowing researchers to trace and compare how each student's intellectual development has provided value. Other indicators of student aptitude, such as test results and college grades, may also be connected with the findings. Most schools and universities include measuring cognitive abilities as one of the goals of liberal education, which is what the College Learning Assessment seeks to do. Both the Educational Testing Service's Measure of Academic Proficiency and Progress and the ACT's Collegiate Assessment of Academic Proficiency provide exams that seek to gauge academic abilities, however the emphasis is less pronouncedly placed on real-life scenarios [9], [10].

Assessment Embedded

It matters whether or not certain administrative and academic objectives are accomplished if strategic leadership is to be effective. The most important success of strategic leadership, however, is the establishment inside the institution of a system of effective self-evaluation and strategic decision-making, one that consistently feeds into initiatives to raise the bar of organisational and academic performance. By assessing whether educational objectives are being reached and utilising the outcomes of the process to advance to the next level of performance, strategic assessment then emerges as a distinctive activity of a learning

organisation. The institutional research office's student learning data must move into the self-evaluation of academic departments and individual faculty members.

Although this is no easy process, it may be accomplished over time by creating a strategic framework for disaggregating, analysing, and exploiting the data. To compare the outcomes of various kinds of assignments and classroom tactics, small-scale research and experiments conducted by instructors themselves might be included in the data. In Our Students' Best Work, the Association of American Colleges and Universities offers ten suggestions for fostering campus cultures of accountability and assessment. These suggestions emphasise the importance of liberal education as a benchmark for excellence, the necessity of clearly defining learning objectives for each department, the creation of benchmarks for student achievement, and continuous assessment that includes external reviews and open disclosure of student accomplishments.

Assessment, when done well, adds to the culture of evidence that defines strategic leadership. These difficulties ultimately relate to the strategic dilemma of presenting solid proof of educational excellence. A college or university must first obtain accurate data regarding whether or not it is succeeding in its goal of fostering students' intellectual development before it can take any further action. Next, it must have ways to make its results visible and to share them with other programmes, departments, and people. In order to implement what it has discovered about itself, it must also have strategic connections.

Institutions cannot escape the problem, particularly from the standpoint of strategic leadership, notwithstanding how challenging and unpopular evaluation is among many faculty members. It will be impossible to concentrate its efforts on achieving greater standards of educational quality unless it is clear about what its intellectual hallmark will be and can evaluate the effect it has on pupils. Instead of being excited about ways it can make a larger impact in the education of the students it has, it may fall into the typical strategic pitfall of regretfully declaring that all it needs are better pupils.

Program Reviews, Strategic

By examining changes that have been made in the practise of academic programme evaluations, we may demonstrate some of the difficulties and potential of institutionalising a new strategic approach to assessment. The annual examination of each academic department and programme, often with relation to its distinct graduate and undergraduate offerings, is one of the main modes of assessment, particularly in bigger institutions. A departmental self-study and a campus visit by a panel of two or three faculty members from another university often make up programme evaluations, similar to how accreditation is done. When utilised effectively, there is a defined review procedure, active involvement by the academic leadership of the institution, and prompt reporting of the findings back to the department.

Unsurprisingly, the quality and utility of the process and the outcomes of programme review vary. Most academics take part in the procedure with attitudes ranging from reluctant approval to abhorrence. Nonetheless, if useful data regarding the department's professors, students, and programme have been gathered and perceptive consultants have been hired, the recommendations may be helpful for the department's self-understanding and its future objectives.

From a strategic self-assessment perspective, the process provides a significant potential on a number of fronts, many of which haven't always been present in programme review procedures. In the first place, it offers a chance to link the strategic vision of the institutional or unit-wide plan with the internal reflection and planning of each department. It also provides a continuous process that may be focused on strategic planning, goal-setting, and constant self-evaluation, particularly with reference to the standard of student learning, a subject that is not often the process's main concern. The relationship to strategy is real.

The suggested strategic alterations in the viewpoint and aim of programme review should not be taken to imply that they will be simple to implement, even if certain processes do exhibit these traits. The departmental level is where the academic autonomy culture that makes leadership so challenging is at its most pronounced. It is understandable why ideas for academic change that do not come from inside the department, like reform in general education, are often seen as a threat to departmental autonomy.

Program evaluations and pupil learning

Program evaluations are properly the product of the opinions of experts in their domains, so one shouldn't anticipate or even want to drastically alter them. Nonetheless, it is possible to try to change the process such that it blends more easily into a process of strategic thinking and self-evaluation. This might imply that each programme would be required to concentrate on improving the quality of student learning while paying close attention to the university's overall strategic objectives. Protocols and techniques would be included into the procedure to accomplish this objective, allowing the department to create or alter evaluation techniques that it would find useful to enhance its own work with students.

A significant portion of the self-study would be focused on issues that the programme faculty would define and deem significant. What are the department's learning objectives? Zemsky, Wegner, and Massy write about an intriguing experiment in academic quality assurance at the University of Missouri that might help answer some of these concerns. What do we hope that our pupils will understand and be able to accomplish? What unique aspects of the department's and the institution's purpose and vision do our objectives reflect? What should the curriculum's layout look like? Does the program's interaction between its courses follow a logical pattern? What connections do the courses make with the learning objectives? What are the main teaching and learning

strategies used by the department? How are our pupils taught? Do learning and teaching take place in groups or individually? Just how is technology used? What predominant assignment kinds, learning opportunities, and levels of expectation are there? How can we tell whether students are meeting the departmental and institutional learning objectives? How do we evaluate our learning? The faculty person, the department, the school, or the institution are all accountable for the assessment. What supports a student's decision to pursue this programme as a major? How might the quality of student learning be improved using the findings of our evaluations? Are the outcomes genuinely being applied well? What are our top priorities given what we understand about teaching, learning, and our programme? What should be altered?

Using this strategy, the department would next produce a self-study that would provide external reviewers examples of student work, including papers, projects, and tests. There would include assessment information regarding student achievements, as well as the findings of exit interviews and alumni surveys. The visiting team would study a lot of this content beforehand and spend a lot of time on campus speaking with students and maybe hearing and seeing the findings of student research. The process would become more purposeful and fruitful if an effort was made to establish a culture of evidence for student learning as a foundation for programme evaluations. Departments would discover that they were taking part in the discipline and process of strategic leadership by methodically employing the programme review process to react more swiftly to change and the university's mission [11]–[13].

III. CONCLUSION

All programme reviews would more obviously become strategic exercises if the questions alone were made the primary focus of each one. Similar question formats may be used for other institution wide strategic objectives relating to graduate programmes or research. Regardless of the area of concentration, they would serve as crucial bridges connecting the program's aims with the broader institution's strategic goals and would integrate the strategic self-assessment into the department's continuing work. The method of strategic human resource management aids the human resources division in maximising the potential of its employees via organisational design, talent management, leadership development, and performance management

REFERENCES

[1] M. R. Azizi, R. Atlasi, A. Ziapour, J. Abbas, and R. Naemi, "Innovative human resource management strategies during the COVID-19 pandemic: A systematic narrative review approach," Heliyon, 2021, doi: 10.1016/j.heliyon.2021.e07233.

[2] F. Wang, S. Chich-Jen, and T. Mei-Ling, "Effect of leadership style on organizational performance as viewed from human resource management strategy," African J. Bus. Manag., 2010.

[3] M. A. Kareem, "The Impact of Human Resource Management Strategies on Organizational Performance," Int. J. Manag. Commer. Innov., 2015.

[4] M. Kateb and A. A. Ahmadi, "Aligning human resources and business strategy," Manag. Sci. Lett., 2018, doi: 10.5267/j.msl.2018.9.001.

[5] L. C. Huang, M. Gao, and P. F. Hsu, "A study on the correlation among human resource flexibility strategy, organizational citizenship behavior, and organizational performance in ecotourism industry," Ekoloji, 2019.

[6] E. Nafari and B. Rezaei, "Relationship between human resources strategies and organizational performance based on the balanced scorecard in a public hospital in Iran: a cross-sectional study," BMC Health Serv. Res., 2022, doi: 10.1186/s12913-022-07767-z.

[7] S. Ngaka and Z. Mtshokotshe, "The implementation of human resources management strategy within restaurants in East London, South Africa," African J. Hosp. Tour. Leis., 2020.

[8] J. M. Buck and J. L. Watson, "Retaining staff employees: The relationship between human resources management strategies and organizational commitment," Innovative Higher Education. 2002. doi: 10.1023/A:1017916922194.

[9] V. Shala, "The role of Human Resources in Strategy Formulation," Eur. J. Bus. Manag. Res., 2020, doi: 10.24018/ejbmr.2020.5.4.417.

[10] D. M. Mahmoud, "The relationship between human resource management strategies and regulatory restraint: Evidence from Iraq," Acad. Strateg. Manag. J., 2019.

[11] S. Mariappanadar, "Sustainable human resource strategy: The sustainable and unsustainable dilemmas of retrenchment," International Journal of Social Economics. 2003. doi: 10.1108/03068290310483779.

[12] J. Gonzalez-Benito, I. Suárez-González, and D. González-Sánchez, "Human resources strategy as a catalyst for the success of the competitive strategy: an analysis based on alignment," Pers. Rev., 2022, doi: 10.1108/PR-04-2020-0254.

[13] S. Shahanipour, A. Amindoust, K. Sahraian, and S. Beiranvand, "Identification and prioritization of human resource strategies with employees' creativity approach in administrative organizations using SWOT–ANP," OPSEARCH, 2020, doi: 10.1007/s12597-019-00416-w

Strategic Leadership: Opportunities and Limitations

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Abstract— Using strategy to manage personnel is another way to describe strategic leadership. It has the capacity to implement organisational change and influence organisational members. Organizational structure, resource allocation, and strategic vision are all functions of strategic leaders..

Index Terms— Academic, Education, Leadership, Strategic, strategy

I. INTRODUCTION

Change and conflict are at the core of leadership, as we have discovered, and these problems have moulded both the backdrop and the foreground of this work. If there is anything about strategic leadership at colleges and universities, it is about methodically managing the realities of structural conflict and the forces of change. It is time to examine how these difficulties operate on a conscious level and how strategic leadership may be used to address them.

Identifying the organizational situations and periods when strategic leadership will be a more or less beneficial form of decision-making is one of the main goals of this section. The reader will be aware of the possibilities, restrictions, and circumstances under which each strategy is most or least successful. The same is true of strategic leadership. Our goal is to evaluate the impact that strategic leadership has in a variety of transformation, crisis, and conflict situations. A campus will be able to have realistic expectations about what the process can and cannot achieve if we can precisely comprehend the ability of strategic leadership to cope with change and conflict [1]–[3].

Conflict in the Structure and Strategic Leadership

Colleges and universities are rife with conflict, just like any other institution. The phrase itself conjures up conflict between and among people and organisations throughout a social and political spectrum that varies from civil disputes to fierce personal hostility, from political infighting to acrimonious public confrontations, and from negotiation to bloodshed. Since there are individuals everywhere with different beliefs, interests, personalities, and points of view, there is conflict both on campuses and elsewhere. Conflict will always remain at the heart of the human experience as long as there are finite resources and human beings.

The traits, abilities, and knowledge that people with leadership responsibilities should have in order to cope with conflict are shown by all of these conflict-related factors. A leader's important tools include communication, negotiation, and conflict resolution techniques. But, it has become evident in our research that there are deeper structural problems in the administration of academic institutions that defy simple reconciliation, regardless of how competent a leader may be

in resolving political, policy, and interpersonal disputes. Structural conflict is a tension between the ideals that an organisation is dedicated to and does not always necessitate animosity between the participants. It manifests in conflicting perspectives on what should matter when making decisions as well as in the conflicts entangled in the process of making such decisions. Disputes between fundamental paradigms and ideals cannot be resolved by a leader's political acumen and administrative prowess alone; rather, it calls for leadership and strategic thinking.

Resolving Values and Paradigm Conflicts

In a recent investigation of leadership in international company, we may look at certain facets of the dynamic of balancing conflicting principles. While the writers we discuss use language other than ours, their work provides several instances of how strategic leadership may be used to resolve conflicts between opposing corporate ideals and cultural paradigms.

Fons Trompenaars and Charles Hampden-Turner investigate conflicting cultural value systems, such as the well-known struggle between societies that define success in terms of individualism vs communitarianism. Although most Asian cultures place a strong emphasis on collective successes, Western nations, particularly the United States, place a strong emphasis on individual achievement. Creative managers who work with a multicultural workforce are aware that cultural value systems and paradigms are too ingrained to be radically altered since they encompass a complete way of looking at and comprehending the world. Effective managers attempt to resolve disparities across value systems rather than confusing employees by imposing an incentive scheme from a different culture. For instance, they can aim to create a system of rewards that assesses and values individual success in terms of what it means for the team. The team's interactions may then be planned to provide chances for personal development and innovation. New ways of recognising the group's accomplishments as a team, maybe in competition with other teams, then energise and motivate them.

Circles of Evil and Circles of Good

In a vicious circle, a single cultural system is imposed on another, and the results are a reinforcing downward spiral of

problems. Trompenaars and Hampden-Turner analyse a series of conflicts in cultural and organisational values and their resolution in terms of what they call "vicious circles" and "virtuous circles." For instance, when teams are required to complete tasks, performance suffers for both the individual and the group if only individuals are acknowledged. On the other hand, in moral communities, a brand-new "third thing" emerges from the clash. Since it has incorporated advantageous traits from other value systems to produce better levels of performance—in this example, a team with unique and fruitful cultural norms of its own—it has its own reinforcing patterns of success. The solution lies not in a series of haphazard compromises between the many cultural systems, but rather in a fresh fusion of beliefs and values.

Trompenaars and Hampden-Turner demonstrate how value reconciliation works in a range of different difficult organisational circumstances, in addition to cultural value conflicts, via a number of case studies. Several of these are concerned with concerns of vision and purpose. For instance, we discover that the brilliant business concept of Dell Computer entails the reconciling of opposites. Dell joined the personal computer industry after its rivals had already dominated a large portion of the consumer supply chains. In response, it discovered a novel concept for the computer industry: direct consumer sales. The difficulties were many. How might less individualised service attract reasonable prices? How might the methods of mass manufacturing be blended with the customer's need for a machine constructed to order? In accordance with conventional strategic thinking, there would only have been two options. Either you sell inexpensive items or pricey luxury versions made to suit the desires of the buyer. Dell, nevertheless, accepted both perspectives on the issue. It can maintain a price edge since its cost structure is less than half that of its rivals. Also, it provides customised items via direct, distinct interactions with clients, which is greatly facilitated by the Internet. Dell purchases its components in bulk from its vendors, obtaining economies of scale, and also co-designs its computers with its intended customers in special, tailored configurations, which is one crucial factor in how it is able to accomplish both. This is a mass customisation virtuous circle that seems to be in conflict.

What does higher education have to do with businesses that produce goods or provide commercial services, even sophisticated ones? The reply is yes—more than one may anticipate. In each of these instances, there is proof of a conceptual analysis and problem-solving approach that is closely linked to a collection of strategic master pictures pertaining to the mission and future direction of the business in a dynamic context. The resolution of the value conflicts demonstrates intellectual depth and complexity, nuanced distinction, and creative insight by relying on these sources of self-definition and purpose, which often revolve around narratives of identity. They demonstrate participants' capacity to remove themselves intellectually from their

difficulties, to reframe their own thoughts, and to reflect on their own thinking—all of which are traits of learning organisations. Just such intellectual prowess is a component of the field of strategic leadership in higher education. An organization's ability to think creatively and strategically expands as this sense of strategic direction becomes strong. In order to build constructive circles of understanding, settle disagreements, and identify common commitments, it is necessary to address the ongoing tensions in policies and aims [4]–[6].

II. DISCUSSION

In governance, purpose, and vision, strategic thinking at colleges and universities constantly runs into a number of implicit or explicit conflicts. Some of them represent the tension between autonomy and authority, intrinsic and instrumental values, or the paradigms that go along with them, while others trace the basic value conflict inside the decision-making system itself. Although certain regulations, like those governing social and intellectual student life, straddle two or more decision-making spheres, others are solely academic in nature. Many institutions of higher learning balance their organisational cultures and missions between diverse goals, such as the following, which show different types of conflict, tension, and complementarities, particularly in the context of a changing world [7]–[9].

Few instances to show how a method of strategic enquiry might be used to settle disputes. Nobody in higher education will contest the possibility of a separation between teaching and research. The relevance and vitality of teaching and student learning depend on scholarship in some shape or another, whether it be published or not. Virtually all academics would also argue that a professor's research or creative output ultimately has to be made public so that peers may evaluate its relevance.

The link between scholarship and teaching and learning becomes more complicated when the value of scholarship is determined by the originality, quantity, and impact of publications. The debate is on the kind and amount of scholarship that a specific institution will reward, rather than the significance of scholarship to successful teaching, which is a given. The faculty member's time and the resources of the institution that are accessible for research are only two of the conflict's many facets. For instance, it would appear to follow that academics at institutions with a focus on doctoral and advanced professional education must produce novel and significant work. As a result, graduate instructors may depend on a robust research infrastructure even if they may only teach a few courses each year, often with the aid of teaching assistants. But, whether or not they are eager to do so, college instructors who teach solely undergraduates in three or four major courses each semester will struggle to find the time and the means to perform a significant amount of research and publishing on a regular basis.

A vicious spiral develops if institutional missions

involving research and teaching are not differentiated and translated into the proper resources, rules, and expectations. With less time and energy available for teaching and the improvement of student learning, which may suffer as a consequence, the dominant paradigm of the profession and the prestige of research shift the circle towards a dedication to publishing. But so does scholarship, as little of broad impact can typically be accomplished when it is squeezed in between other taxing tasks and when it lacks time, money, and incentives. Most crucially, the current approach discourages the kinds of scholarship that may enhance instruction and make the most contributions to the growth of the professor.

A clear conceptual analysis that is strategically differentiated in terms of institutional purpose and environment will reveal the opportunities for breaking the vicious cycle. The first step in accomplishing this is to remove the teaching and scholarly paradigms that have been unintentionally imported from other schools. The next step is to identify the relationships between them that the institution's unique strategic profile suggests are most beneficial.

Scholarship Reconsidered, the well-known research by Ernest Boyer that was published some years ago, serves as an example of the advantages of eliminating incorrect assumptions via clear and convincing conceptual analysis. Boyer elicited a strong response from the faculty by classifying the many types of scholarship and reaffirming them in light of diverse institutional purposes. He did this by contrasting the prevalent concept of the scholarship of discovery with applied scholarship, the scholarship of integration, and the scholarship of teaching. In doing so, he also helped many academics expand their minds to recognise new patterns of how teaching and scholarship interact. He highlighted the path towards constructing virtuous cycles of connection between scholarship and teaching, which goes beyond matching regulations with practises that honour various types of study. Scholarship, teaching, and student learning may be enhanced and complemented in positive ways if expectations are expressed in terms of institutional goal and vision, such as student involvement in faculty research.

Faculty Positions and Duties

These scholarly and educational observations go in a variety of interconnected directions, highlighting the systemic nature of strategic thinking. Redefining and redefining the tasks and responsibilities of each faculty member is one of the challenges they involve. Several institutions have already started the process, although generally piecemeal. There must be a precise description of responsibilities in terms of what Linda McMillin refers to as a "circle of value" between the faculty member and the institution if faculty members are to have diverse workloads in teaching, research, and service. In terms of workload difficulties, a faculty member offers value to a department via their teaching, research, and service, which in turn adds value

to the institution. The institution adds value to the faculty member by offering resources and support for the person's growing duties and developing professional interests in the last turn of the cycle. In conclusion, the concept of varied workloads won't function if it is just focused on a person's preferences and goals; rather, it must also take into consideration the demands and opportunities of the person, the academic unit, and the institution.

Strategic conceptualization provides a method for precisely finding the problems at the point where the institution and its environment converge. It raises the issue of the unique ideals, goals, and capabilities of academic institutions as they have evolved through time in the actual world. Strategic leadership identifies the requirements, potentials, and relationships between the organization's academic experts and its own demands. It establishes a system of strategic differentiation capable of defining commitments that resolve the ongoing tension between professional autonomy and organisational demands. Even while there will always be a structural conflict between ideals, it may be transformed from a frustrating cycle into one of opportunity.

Professional and Liberal Education

Academic decision-making involves a wide range of conflicts where strategic leadership might provide fresh perspectives. For instance, there is room for significantly more innovative solutions to the ongoing conflict between liberal education and professional studies than are normally used to address it. Liberal education is an educational concept rather than a body of information, a set of courses, or a particular kind of institution, as stated in Greater Expectations. The distinction between liberal arts and professional disciplines looks less important if one views rigorous learning as the development of intellectual capacities, cognitive skills, values, competences, and attitudes via a range of topics. The articulation of a common set of challenging educational goals might be used to build links between the two. From this perspective, professional studies entail a number of important theoretical questions, whereas liberal education reveals itself to be highly practical. Examples of contexts for interdisciplinary work involving the social sciences, humanities, and professional fields include studies of theoretical and practical issues in leadership, professional ethics, quantitative reasoning, organisational culture and behaviour, policy development, problem solving, and decision making. An institution could achieve a long-lasting objective that turns a traditional area of conflict into a constructive circle if it develops a significant strategic initiative to excel in forging a fruitful and distinctive relationship between the theory and practise of liberal and professional education. It will undoubtedly discover that its enthusiasm for the undertaking stems from connections to its own past, present, and future activities as well as from the distinctive qualities that are ingrained in its identity.

These conflicts between research and teaching, and

between liberal and professional education, illustrate a strategy that may be used to resolve a wide range of conflicting polarities. The process of strategic leadership is capable of satisfying a number of difficult criteria by developing a genuine and compelling sense of institutional purpose and vision. It requires self-awareness and conceptual depth on the part of the reader, appeals to the human desire for coherence, fosters a feeling of community, examines shifting educational trends, and articulates worthy future possibilities that stem from a heritage. By doing this, it encourages and binds organisation members to unite around shared objectives. Conflict resolution falls within the purview of leadership, as it must. Being strategic, it adds a sense of the bigger picture and the institution's role in it to every kind of dispute. These insights are gathered into a structured process of sense-making that results in fresh integrations that put an end to repetitive arguments and new expressions of values that go beyond the disagreement. Academic commitments to autonomy and excellence are reflected in organisational structures and procedures that are required for them, and those structures in turn carry values that are essential to them. The institution's story of identity and ambition encourages the ongoing struggle to build new forms of genuine balance, synthesis, and commitment by serving as a source of both responsibility and shared meaning. Even though we don't do it consciously or deliberately, we often apply its consensus-building techniques [10], [11].

Limitations to strategic leadership that are adverse

Every strategy practitioner will immediately see that the process relies on factors that it cannot control to be successful. In the presence of intense animosity and distrust, strategic leadership may not perform well or perhaps at all. Strategic leadership won't work if the governing board is in disarray, the faculty and administration have assumed combat postures, or if significant portions of the faculty are at odds with one another. The requirements include a base of fundamental goodwill and a semblance of trust, which may come about as a consequence of the many investigations, discussions, and partnerships that underpin the process. It is often preferable to delay beginning the task of strategy until the proper conditions are established rather than having it fall victim to dysfunction. A basic agreement over the principles that the company was founded to uphold is ultimately what makes strategic leadership possible. While there may be huge differences in how such principles are interpreted, a common commitment to them is required. Without a shared commitment to the institution, a high esteem for academic method and ideals, and respect for one another, the various leaders and players in the strategy process will find it difficult to profit from strategic leadership. Although a solid strategy process may accomplish a lot, it cannot be counted on to alter the identities that people have built for themselves out of their interests, ideals, or values [12], [13].

III. CONCLUSION

Positive effects of excellent leadership are shown in how well a company performs. Descriptive analysis is the approach used in the research. This essay suggested, among other things, that leadership styles be used flexibly according to the circumstances at hand rather than rigidly.

REFERENCES

[1] R. Subramaniam and R. K. Shankar, "Three Mindsets of Entrepreneurial Leaders," J. Entrep., 2020, doi: 10.1177/0971355719893498.

[2] M. Asif, "Exploring the role of exploration/exploitation and strategic leadership in organizational learning," Int. J. Qual. Serv. Sci., 2019, doi: 10.1108/IJQSS-04-2018-0038.

[3] E. F. Goldman, A. R. Scott, and J. M. Follman, "Organizational practices to develop strategic thinking," J. Strateg. Manag., 2015, doi: 10.1108/JSMA-01-2015-0003.

[4] L. M. Gillin and L. M. Hazelton, "Bringing an entrepreneurial mindset to health-care: a new tool for better outcomes," J. Bus. Strategy, 2020, doi: 10.1108/JBS-03-2020-0049.

[5] G. Farrugia, C. K. Zorn, A. W. Williams, and K. K. Ledger, "A Qualitative Analysis of Career Advice Given to Women Leaders in an Academic Medical Center," JAMA Netw. Open, 2020, doi: 10.1001/jamanetworkopen.2020.11292.

[6] M. J. Lebrón, D. Brannon, D. Sanford, and L. Ellison, "Applying Theory to Practice: Implementing a Live Case Competition in a Capstone Strategic Management Course," J. Manag. Educ., 2020, doi: 10.1177/1052562919876006.

[7] R. Fox, "The true cost," Digit. Libr. Perspect., 2016, doi: 10.1108/DLP-07-2016-0018.

[8] K. Park and F. Wallace, "Multicultural leaders from emerging markets: transforming international acquisitions and corporate social responsibility," Int. J. Emerg. Mark., 2022, doi: 10.1108/IJOEM-01-2019-0074.

[9] G. Robinson, "Organizations are people: reflections, obstacles and learning opportunities," Learning Organization. 2020. doi: 10.1108/TLO-07-2020-0122.

[10] A. Prenestini, M. Sartirana, and F. Lega, "Involving clinicians in management: assessing views of doctors and nurses on hybrid professionalism in clinical directorates," BMC Health Serv. Res., 2021, doi: 10.1186/s12913-021-06352-0.

[11] [R. Lopes and B. Mota, "Innovative Local Policies in Portuguese Low-Density Rural Areas," Eur. Countrys., 2021, doi: 10.2478/euco-2021-0024.

[12] K. Malewska, M. Ratajczak-Mrozek, and M. Sajdak, "Opportunity Exploitation in Times of the COVID-19 Pandemic – The Importance of Dynamic Capabilities and the Entrepreneur's Characteristics," Probl. Zarządzania - Manag. Issues, 2021, doi: 10.7172/1644-9584.92.5.

[13] D. Hack-Polay and P. A. Igwe, "Beyond words and rhetoric – small voluntary organisations and effective refugee integration in the communities," J. Enterprising Communities, 2019, doi: 10.1108/JEC-11-2018-0084.

The Change and Strategic Leadership

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Abstract— Processes for establishing the organization's direction, objectives, and priorities in a changing environment, concentrating internal energy and resources to accomplish the goals, and coordinating internal and external stakeholder alignment are all part of strategic leadership and change management. This chapter discusses the scope of strategic change, strategic transformation through time, what it looks like, and built-in leadership.

Index Terms— Academic, Education, Leadership, Strategic, Transformation

I. INTRODUCTION

As we have seen throughout this investigation, there is a growing awareness of the pervasiveness of change and the need for higher education to effectively respond to it. This is evident in a wide range of recent studies and projects, including a significant project by the American Council on Education called "On Leadership and Institutional Transformation," which resulted in a series of five reports, On Change, from 1998 to 2002. Then there are the numerous initiatives and works by the Pew Roundtables and the Knight Collaborative, which, starting in the early 1990s and lasting for more than a decade, provide reports and analyses on important matters of educational policy and practise, particularly those connected to new market realities. These projects and works serve as the foundation for the work by Zemsky, Wegner, and Massy. Alan Guskin and Mary Marcy contend that colleges and universities must accept the challenge of change by lowering skyrocketing instructional costs themselves, or others will do it for them, in a number of essays and research connected to the "Project on the Future of Higher Education."

Each of these research places a dramatically different focus on transformation. Although some focus more on overarching external factors like information technology, international competition, and proprietary educational providers, others are more interested in institutional transformation as a deliberate process. Some of the research seem to be aimed at policymakers, while others appear to be aimed at university administrators or faculty members. Above all, no one who reads these papers, together with the many others like them, could ever come to the conclusion that American higher education today is a unique intellectual preserve free from the full-bodied realities of economic, social, cultural, educational, and technological change. They demonstrate that colleges and universities are entangled in social force nets and webs of responsibility, echoing a viewpoint that has been presented often throughout this study [1]–[3].

Intolerance of Change

There has been enough said on the challenges of planned change in higher education, both here and abroad, that there isn't much more to say. One of the ironies of change at colleges and universities is that it doesn't happen consistently throughout all of the academic units, individual faculty members' work, or even the work of individual faculty members. Yet, the institutions that support these micro-level changes often experience painful macro-level shifts, particularly with regard to academic programmes and regulations.

We have shown how organisations that exhibit the well-known traits of professional autonomy, loose coupling, shared governance, and fragmented decision-making end up being resistant to change, particularly when the change was not brought about by academic professionals themselves. In academic settings, the propensity for people to avoid the danger of the unknown is particularly noticeable. Change often undermines significant sources of self-respect since academics identify themselves with their professional identities.

The papers and initiatives we've cited include incisive diagnoses of the need for change, commendable recommendations for enhancing institutional performance, and descriptions of effective change processes. Yet, one must question if they have recognised the crucial significance of efficient techniques of interactive and integral strategic leadership as the facilitator of deliberate and long-lasting transformation. The duties of official leaders are often discussed in most studies, but little is said about how change happens as part of a reciprocal direction-setting leadership process. Bok wisely discusses the methods presidents and deans may use to develop a vision for enhancing undergraduate education, including the evaluation of student learning. Top-down techniques may not be effective or lasting if faculty passion for these activities does not spread across the institution. As the study is primarily concerned with the change process, On Change V tends to discuss change as if it were a goal in itself, despite the fact that it insightfully depicts certain parts of a reciprocal leadership process [4]–[6].

Many of the actions taken by official leaders to promote

and bring about change are really vital parts of a strategy-focused approach, which supplies the change's substance. By establishing a solid foundation of trust and taking the long view, they help change be anchored in valued academic traditions and principles. By stimulating introspection on underlying presuppositions, beliefs, and ingrained practises, they also assist individuals in developing new ways of thinking. Successful change agents pay attention to everyone participating in the process and take advice from opposing viewpoints. Moreover, they are attentive to problems with collaborative processes, instill a sense of urgency for change, and engage in extensive communication about the problems. Their use of power is grounded on a relational leadership approach.

Eckel and Kezar describe how six of the twenty-six American Council on Education institutions reached the level of what they refer to as transforming change—change that was pervasive, deep, and intentional and changed the institution's culture over time—in an insightful subsequent study titled Taking the Reins. The book lists the following five fundamental qualities as being necessary for transformation: "senior administrative support, collaborative leadership, flexible vision, staff development, and visible action."

Observe the importance of the themes of action, cooperation, vision, and senior administrative support on this list of elements that we have determined to be essential to strategic leadership. In addition to these, the authors examined further interconnected traits in the organisations' decision-making culture that supported transformative transformation. The way that participants developed new strategies for creating meaning regarding change, or what is sometimes referred to as sense making, may be the crucial component.

While the terminology used in the Change reports and Taking the Reins differs from ours, many of the elements of holistic and integrated strategic leadership are exactly paralleled in their conclusions. This conclusion relies on a thorough grasp of strategy, not on using it to shift the market position of a programme. While interactive leadership is acknowledged, a systematic definition of the potential of leadership as an engaging reciprocal process that may mobilise commitment to accomplish strategic change appears less important in their narratives. While the efficacy of persons in positions of authority is crucial, more must be done to develop a leadership strategy that can be ingrained in the organisation and is not simply used when change is necessary. Implementing leadership as a system of interaction that is structured by an integrative discipline and collaborative strategic decision-making process is the ultimate objective [7]–[9].

II. DISCUSSION

By its techniques and substance, strategic leadership may be used as a tool to bring about change in higher education institutions. It can be the missing link between proposed changes and their implementation. It integrates the change agenda into the leadership process through which an institution determines its future in a difficult environment by making deliberate change a function of strategic change. To create and maintain the change, leadership must be ingrained in organisational relationships and procedures, for instance, if evaluation is to enhance the calibre of student learning. Unless they are involved in a decision-making process that is related to the values, convictions, and conditions of their own institution, a faculty will discard out of hand all the attractive models of evaluation at other institutions. It is obvious from the viewpoints offered in this research that strategic leadership offers a wide range of resources to the demands and challenges of college reform. As we've seen, they consist of:

1. A focus on awareness and reflection patterns that identify the context-specific identities of institutions of higher learning, particularly their interactions with change-drivers

2. A view of leadership that emphasizes questions of human agency and sense-making, establishes a course for change while cognizant of the dangers it poses to values in both the personal and professional spheres

3. An awareness of the institution's history, identity, and legacies, preserving the past while preparing for change.

4. A cooperative method for strategic thinking and decision-making that establishes the legitimacy of change and incorporates it into a planned procedure for making decisions.

5. A transparent procedure for exchanging all types of information about the institution, which increases understanding of the institution's strengths and flaws.

6. the creation of a future vision that inspires people and lowers uncertainty

7. The creation of a set of quantifiable objectives that provide a clear contour to change and offer a comprehensive sense of direction.

8. A strategy for communicating change and carrying out objectives that inspires trust and credibility and creates forward momentum

It's crucial to be aware of the many types and dimensions of change in order to minimise ambiguity and uncertainty about a strategy process and to precisely outline expectations for strategic change. It is helpful to achieve this by taking into account two key features of change: the extent of the change and the time it takes to take effect. Each element operates according to its own dynamics, which results in varied degrees of change. Regarding timing, the polarities of quick vs slow change may be used to describe the pace of change, while lasting or transient change can be used to describe its length. Regarding its extent, we may categorise change into two categories: the breadth of change, which can be ubiquitous or limited, and the depth of change, which takes into account both deep and superficial change. Needless to

say, many comparable words and expressions may be used in place of those listed here [10], [11].

Strategic Change's Range

These categories aid in our understanding of the distinctions between operational, experimental, crisis-response, and other types of change on a campus, such as strategic change. Many operational changes include just little or insignificant modifications to regular management rules and procedures, such changing the requirements for a course or changing the software in one office. Even if the project may just be a surface-level change, it would become a large change if the software system changes affected the whole campus. Many individuals are impacted by it, yet most very little. Deep changes impact fundamental organisational capacities and traits, but their reach may be limited and they may only have an impact on one or two administrative or academic groups. A change becomes a strategic problem if it is sufficiently profound in both breadth and depth as to become an institution-wide fundamental skill. The meaning of change in the college environment is fluid and metaphorical, thus it is impossible to identify issues of strategic change with accuracy and finality. The many types of change make it easier for us to comprehend how strategic change leads to the complex problems with change that an institution must deal with.

Strategic Transformation Throughout Time

We find aspects of strategic change that are paradoxical when we take the reference points of the moment of change into account. Although business sector strategy change is often swift, extensive, and long-lasting, this is typically not the case for academic programmes and identities at colleges and universities. There is no reason to believe that slow change cannot be long-lasting, significant, and ubiquitous in and of itself. Burns utilises these criteria to characterise transformative change and adds that it may take place over a lengthy period of time. Even after five and a half years, according to Eckel and Kezar, institutions undergoing transformational change still see the process as ongoing. Burton Clark found that it took many decades for entrepreneurial colleges to change, while Adrian Tinsley found that incremental change is more common than transformative change after looking at various turnaround scenarios.

Although the proper comparison may be with quick, transient, operational change that has a strategic focus, some authors on change often compare transformative leadership with incremental change. Take our previous illustration of the internationalisation of a university as a case in point. An accomplishment that is really strategic and transformative signifies a broad, profound, and long-lasting transformation. As it is widespread or comprehensive, it affects the majority of the institution's departments and programmes. As it is profound or significant, it will change the way that many courses are created and delivered, as well as the experiences

of many staff members and students. Its extent will become apparent in a shift in the student body at the institution and, over time, in significant changes to the organization's norms and culture. Nonetheless, the process of transformation will be progressive rather than abrupt. Many of the key objectives of a strategy change of this kind will take the institution at least a decade or two to complete, and the job will never be completely finished since changes in the external environment will continue to call for changes inside the organisation.

What Strategic Transformation Looks Like

Several of the defining aspects of strategic leadership that we have considered, such as the ideas of strategic vision and strategic intent, may be used to explain some of the characteristics of strategic transformation. The idea of intent is a good one since it encompasses the themes of purpose and self-awareness, which are essential elements of human agency. Themes of dedication and will are also included, as is the drive to achieve worthwhile objectives in order to realise the full potential of the organisation. When seen in this light, a vision effectively encourages long-lasting change that will be as substantial and extensive as is necessary to address the current strategic situation. Strategic leadership will work to mobilise resources and commitment in order to achieve that objective if the challenges and possibilities create a compelling vision that calls for profound, long-lasting, and widespread change. The outcome will be transformative transformation over time, with clearly identified benchmarks of ongoing development.

Strategic transformation may take many different shapes and have many different outcomes given the wildly different circumstances and identities of each organisation. Because of the resources they control and the positions they occupy, certain schools and universities rule their surroundings. They must adapt to change, but they often do it with a degree of adaptability, thought, and caution that others just cannot afford. It is impossible to avoid the need to adapt to change, but this requirement is often obscured by conservative and adaptive tendencies, particularly in the academic environment.

On the opposite end of the spectrum are schools that may quickly launch new adult programmes in several locations, job-related offers, or technologically sophisticated distant learning programmes due to a creative vision or financial or enrollment vulnerabilities. So, the rate, breadth, and scope of change necessary for a certain institution or university to accomplish its goals might vary greatly. Rapid, daring, and significant reforms are not always necessary for certain institutions, nor are they always on the horizon. Institutions usually undergo cycles of change for all of these reasons. A phase of rapid invention is followed by a period of consolidation, which sets the stage for the subsequent cycle of rapid change. Intentional change will thus be legally changeable by location, time, and circumstance if it is really strategic. Nevertheless, woe to the institution that

misunderstands its position in the change cycle or utilises its seeming power to ignore the kind of change that it must address. Both leaders and those being led deny their leadership via self-delusion and complacency. If serious threats to institutions are ignored or suppressed out of timidity, crises may result. A style of awareness known as strategic leadership is specifically created to recognise the most compelling and dangerous indicators of the times and to transform them into chances for change. It may be true, contrary to popular assumption, that crises are often when the most profound transformations take place. Yet, efficient strategy programmes provide people the means to head off crises before they get out of hand. When the situation calls for it, strategy can and must be decisive, employing its techniques and insights to identify dangers and opportunities as they arise.

A cursory look into institutional histories might help to demonstrate some of these ideas about strategic transformation. The most typical pattern of fundamental change may include colleges and universities making a number of small but significant adjustments that result in an evolution of organisational purpose. For instance, development generally followed a pattern as big universities evolved over time from minor "colonial" institutions in the latter few decades of the nineteenth century. The foundation of pre-existing classical areas was expanded with new disciplines and new professional schools, ultimately giving rise to the multi-universities we know today. The modifications were limited in one way since a new school or programme did not directly impact already-existing activities. Nonetheless, the gradual adjustments throughout time led to the creation of institutions that underwent significant alterations. With the addition of research institutes, multidisciplinary centres, professional education programmes, satellite campuses, and overseas affiliations in more recent decades, many universities have undergone analogous transformations. The examples demonstrate that a transformative degree of strategic change is possible even if it may take many decades to achieve.

The limitations of strategic leadership include change, crisis, and as strategy, as we have learned, aims to identify and avert imminent crises, it ought to demand that risk management plans be created methodically in order to be ready for emergencies. Risk management is becoming more and more dependent on paying attention to potential catastrophes, which also serves as a valuable tool for determining the capabilities of an organization's organisational capacities. A deep understanding of an organization's strategic identity involves heightened awareness to risks to its standing, resources, campus infrastructure, people, and leadership. Long-term planning, however, is replaced by crisis leadership when a state budget allocation is abruptly reduced by 20%, "Old Main" is destroyed by fire, the campus is plagued by a crime wave, the president is embroiled in scandal, or the school is devastated

by storms and floods. It will be necessary to put the vision on wait so that the potential crisis and associated anguish may be addressed.

These examples demonstrate how the analytical and structured protocols of strategic leadership operate in a distinct sphere than the quick, symbolic, and unilateral actions that are often necessary in times of crisis or emergency. Some individuals and organisations may, without a doubt, be successful in both strategic leadership and crisis leadership, while others cannot. Undoubtedly, it will also be necessary to evoke a place's history and future goals in order to soothe a community during a crisis and assist it in regaining its bearings when the emergency has passed. Yet, unplanned and disruptive lone occurrences do not drive strategic leadership, despite the fact that strategy outlines the necessity to plan for them.

It has also become clear that strategic leadership has additional limitations. Strategies seldom serve as the engine for revolutionary change because they grow from legacies and aspirations that rely on the unique talents of an academic community. The con- tent and the job of strategy have logical boundaries. The suggested modification is not a strategy of that community but rather of some other actual or imaginary organisation if the proposed substance of the strategy invalidates the organization's identity and the abilities of the current faculty and staff. The same is true with tales; they may be changed and transformed but not replaced. This kind of radical transformation denotes the transition to a new identity and may take place, for instance, when a state governing body chooses to quickly transform a technical college into a large university. Despite the shape and type of change, there comes a time when the conversation should rationally shift from possibilities within a certain strategy to transition to a whole new identity. As doing so would go against the organization's beliefs and identity, strategic leadership is unable to quickly or drastically transform higher education. It can figure out how to quickly transplant certain essential organs, but not the institution itself.

Built-In Leadership

When considered together, these remarks on strategic change imply that for it to be effective and ongoing, a number of fundamental requirements must be met. The creation of leadership and decision-making mechanisms for colleges and universities that are far more robust and responsive to change than is now the case must get significant and sustained attention.

Higher education institutions must distribute and integrate accountable and responsive strategic decision-making procedures across committees, teams, and communities throughout the whole organisation in order to practise leadership for change. This effort is crucial to repairing the jumbled patterns of decision-making that define today's institutions. To make this happen, the enterprise's collaborative governance culture must be shaped by a new sense of shared responsibility for successful leadership and

governance. All parties involved in the process are aware of their obligations in such a situation. The duties of leaders and followers sometimes overlap because leaders empower followers and react to their needs while followers are also accountable for doing the same for leaders. The professors, administration, students, and governing board will need to make a commitment to hold one another accountable for the standard of their shared leadership and followership in collaborative systems of decision-making. A feeling of shared responsibility that is frequently absent in academic communities is created when participants in the process give designated leaders—whether the president or the chair of a committee—a opportunity to be heard. The long-term challenge of leadership is to improve people's adaptive ability for dealing with a continuing stream of difficult challenges, according to Heifetz when talking about leadership and the anguish that often accompanies the adaptation to change.

All companies have challenging and complicated difficulties with leadership and change, but institutions of higher learning are particularly affected. For academic professionals to continue to deeply respect the potential of learning as their core value, organisational resilience is required. The incursion of managerial and commercial forms of decision-making will make that future more difficult and painful than it needs to be without new ways to governance, leadership, and management. As Clark reminds us, much is at stake in preserving the vibrancy of academic labour and in keeping its sense of mission. It "constitutes a practical ideal of action and character that makes a person's job ethically inseparable from his or her existence," according to the definition of a calling. It integrates the individual into a group of people who exercise rigorous practise and solid judgement, and whose work is valuable and meaningful on its own terms rather than only in terms of the production or financial gain it generates. To maintain the strength and vigour of this vision inside the academy, strong and widely dispersed leadership is required [12], [13].

III. CONCLUSION

Better and more flexible decision-making processes will lead to more efficient and responsible choices. Burns concludes that in the end, with such a pattern of embedded leadership, "we understand the entire process as a system in which the function of leadership is tangible and essential yet the players shift in and out of leader and follower roles." The ultimate goal of strategic management in strategic change is to promote effective personnel management throughout the process of change in order to guarantee that the change process achieves its goals

REFERENCES

[1] F. Graetz, "Strategic change leadership," Manag. Decis., 2000, doi: 10.1108/00251740010378282.

[2] J. L. Denis, A. Langley, and L. Cazale, "Leadership and strategic change under ambiguity," Organ. Stud., 1996, doi: 10.1177/017084069601700406.

[3] C. Carter, C. Spence, and A. McKinlay, "Strategic change, leadership and accounting: A triptych of organizational reform," Public Adm., 2020, doi: 10.1111/padm.12550.

[4] A. Taylor-Bianco and J. Schermerhorn, "Self-regulation, strategic leadership and paradox in organizational change," Journal of Organizational Change Management. 2006. doi: 10.1108/09534810610676662.

[5] O. Coban, S. Ozdemir, and J. Pisapia, "Top managers' organizational change management capacity and their strategic leadership levels at ministry of national education (Mone)," Eurasian J. Educ. Res., 2019, doi: 10.14689/ejer.2019.81.8.

[6] C. Sirén, P. C. Patel, and J. Wincent, "How do harmonious passion and obsessive passion moderate the influence of a CEO's change-oriented leadership on company performance?," Leadersh. Q., 2016, doi: 10.1016/j.leaqua.2016.03.002.

[7] M. Riwo-Abudho, Lily Njanja, and I. Ochieng, "The Role of Strategic Leadership during Change," KCA J. Bus. Manag., 2012.

[8] M. R. Rianto, F. Jasfar, and W. Arafah, "Mediating Effect of Organization Learning on the Relationship Between Strategic Change, Knowledge Management and Transformational Leadership ; Case of Indonesia Islamic Banks," J. Econ. Dev. Environ. People, 2021, doi: 10.26458/jedep.v10i3.697.

[9] S. H. Appelbaum, N. St-Pierre, and W. Glavas, "Strategic organizational change: The role of leadership, learning, motivation and productivity," Manag. Decis., 1998, doi: 10.1108/00251749810220496.

[10] J.-A. Johannessen, "Communication and Strategic Change Leadership," in Continuous Change and Communication in Knowledge Management, 2021. doi: 10.1108/978-1-80117-033-820211001.

[11] M. Hana Arrfou and M. Al-Edeinat, "Leadership and management strategic change: A conceptual framework," Int. Bus. Manag., 2016.

[12] Ş. Aslan, A. Diken, and A. A. Şendogdu, "Investigation of the effects of strategic leadership on strategic change and innovativeness of SMEs in a perceived environmental uncertainity," 2011. doi: 10.1016/j.sbspro.2011.09.009.

[13] J. L. Denis, L. Lamothe, and A. Langley, "The dynamics of collective leadership and strategic change in pluralistic organizations," Acad. Manag. J., 2001, doi: 10.2307/3069417..

Advancement of Strategic Leadership

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Abstract— The significance of strategic leadership and its crucial function in businesses is that they carry out a number of goals: Effective strategic leadership helps to improve productivity and creativity while streamlining operations. permits workers to be autonomous producers and capable of coming up with fresh ideas. A strategic leader must be adept at gaining consensus and buy-in from stakeholders who have contrasting opinions and agendas. The outreach required here is active. Proactive communication, development belief, and regular participation are necessary for success.

Index Terms— Governance, Leadership, Power, Strategic, Techniques

I. INTRODUCTION

It is now necessary to evaluate the strategic leadership business. As previously said, this study is an attempt to reinterpret strategic decision-making processes, which take place in some capacity in every organization. Strategic thought might be implicit or conscious, disjointed or methodical, and intermittent or ongoing. Nonetheless, it would be difficult to argue that an institution could operate without determining who it is and how it fits into the world via judgements about the future. For academic groups to operate at all, some types of strategy and reciprocal leadership must be in place [1]–[3].

Recapitulation

On the basis of an understanding of leadership as a technique for defining direction and creating meaning that is anchored in narratives, values, and paradigms, an effort was made to reconceptualize the strategy-development process starting with these givens. On the basis of those definitions, to demonstrate how a methodical approach to strategic leadership gives a clear and encouraging way to approach decision-making in colleges and universities.

The process of developing a strategy is reformulated as a result of reconceptualization. It was more important to find new meanings, connections, and opportunities in current behaviors than to create a new set of them. The collaborative governance procedures and frameworks must include the discipline and process of strategic leadership. By giving a thorough, methodical, systemic, and integrated agenda for execution, the reformulation alters the shape of strategy. The process has the potential to become both embodied and ingrained in the organization's existence and activity as it develops. By fostering trust and loyalty among organization members, it does this in a way that exhibits and puts into practice many of the traits of relational leadership.

The Conduct of Strategic Leadership

We may isolate the elements of strategic leadership to get a deeper understanding of it, even if doing so is always somewhat artificial when they are cut off from their natural relationships in practise. We may also summarise and organise the facts and assertions made in the earlier portions of this study by doing this. In order for an organisation to comprehend, define, and accept common objectives, priorities, and goals that are founded on the group's identity and vision, it must engage in a collaborative and integrative process known as strategic leadership. Certain components and presumptions are included:

Human choice and principles. When pursued as a discipline of leadership, strategy becomes a crucial element of human agency. Strategic leadership thus requires a critical knowledge, articulation, and implementation of values as organisational patterns of identity and commitment.

The paradigms and organisational culture. The discipline of strategic leadership makes an institution's culture, which is a system of ideas, values, and practises, conscious as part of the process of identifying an institution's identity. It aims to openly recognise organisational paradigms—the presumptions that inform choices, the standards that direct behaviour, and the presumptions that inform beliefs.

Vision and storytelling. The organisational story's potency as a sense-making and sense-giving narrative of identity and ambition is tapped by strategy to extract the leadership potential. In order to resolve structural conflicts in the academic system and decision-making culture, the narrative and the vision define shared ideas, commitments, and objectives that foster a feeling of shared accountability and purpose.

Information and data. Data-driven and information-rich strategic leadership. It describes the features of an institution and highlights its contextual opportunities and challenges using a range of strategic indicators and quantitative reasoning techniques.

Being responsible and responsive. The mindset that underpins strategic leadership and thinking is contextual responsibility. It is always trying to learn more about the trends in the larger social, political, economic, educational, and technical settings. The paradigm of responsive interpretation and responsible involvement with the world as it is and will be determines the aims and priorities of strategic leadership.

Conceptual thought. Strategic leadership demands a thorough conceptual grasp of the meaning of the changing environment, corporate goals and values, and the institution's distinctive features, educational initiatives, and commitments—many of which are at odds with one another.

Think holistically. Strategic leadership is a fundamentally integrative subject because of all the many types and levels of knowledge and understanding it entails. It makes claims and establishes objectives that call for the synthesis of data, ideas, and meanings that arrive in all shapes and sizes from several sources.

Making choices. Strategic leadership is a decision-making methodology that downplays the choices' unusual integrative and sovereign power. They happen as enactments that combine many different elements. Decisions seldom result from logical reasoning or rational calculation alone; they often have a strong cultural, moral, and political effect.

Systematic thought. Making strategic decisions is not only integrative at the two information and decision levels, but it is also systemic. It is aware that ideas and choices made in one area of an organisation are interconnected and form a system.

When we think about the organizational structures and procedures that support and implement it, this summary of strategic leadership as a discipline is expanded, deepened, and shown. We have seen that the process of strategic leadership involves a number of different processes, techniques, phases, and procedures.

Collaboration: To grasp the significance of the organization's context and purpose, reciprocal leadership and decision-making involve communication and engagement between groups and people. Collaboration is the key to achieving many strategic insights and opportunities that are often unavailable to those working alone.

Governance: In order to overcome the complexity and fragmentation of decision-making in higher education, efficient methods of governance are needed. To suggest a cogent strategic plan for the institution's future, a strategy council or its equivalent must be given authority.

Legitimacy: The strategic governance framework must fulfil campus norms for collegial decision-making in addition to being efficient. The governing board and the president are ultimately responsible for making sure that the procedures for strategic leadership, management, and governance adhere to the standards of legitimacy and efficacy.

Design: To guarantee efficacy, the strategy process and its procedures need to be well planned and arranged. The president and other senior officials must be dedicated to the responsibilities of strategy, and those who are given important jobs should have the necessary levels of enthusiasm, talent, and expertise.

Systemic techniques: Strategic leadership is systemic as both a discipline and a process, and it recognises how the organization's operations and programmes are interconnected. As a consequence, it encourages strategic management to be integrative and aims to create an achievement momentum via ongoing evaluation and quality improvements as a learning company.

Process embedded: The methods of strategic leadership foster connections among participants that foster trust and respect as well as confidence and empowerment in both leaders and followers. The techniques of strategic leadership are gradually ingrained in organisational structures of responsibility and initiative.

II. DISCUSSION

In addition to highlighting how to combine some of the main approaches to the study of leadership and decision-making in higher education, this description of the components of strategic leadership also shows how to do so. We have looked at the implications for understanding the relevance of symbols, storytelling, and sense making from studies of college culture at different periods. We have looked through the research and advice of people who consider strategy as a collection of management techniques in various contexts. We have also concentrated on the research on collegial governance as well as conceptual and empirical studies of presidential and other types of leadership. In order to create a model of leadership as a mutually reinforcing process of sense making, sense giving, and sense enactment, we have attempted to integrate these various and valuable threads of research, theory, and practice [4]–[6].

Returning to Burton Clark's analysis of entrepreneurial colleges may be the best way to demonstrate how these theoretical and practical elements may be combined. In these situations, he draws attention to the way that a potent institutional notion unites individuals and extends to behaviours and decision-making processes that produce durable and unique ideas, ultimately producing a new culture. Strong cultures support behaviours and develop an identity that, over time, may take on the form of a tale that captures the essence of unique organisational accomplishments. These administrative, intellectual, and cultural dimensions that Clark referred to as parts that may be combined via a methodical approach to strategic leadership.

The characteristics of leadership

This approach for strategic leadership is open to criticism from a variety of angles. Some people won't agree with our strategy because they don't agree with its theoretical underpinnings and reasoning techniques. Others will be sceptical because they oppose any types of strategy, and yet others will wait for a thorough empirical research to prove the value of the approach—which is hard and challenging given the numerous factors at play. Some people will discover that the suggestions for changes in gov- ernance, the strategy process, and management systems are not feasible nor realistic, at least not in their particular situation. Others will continue to feel most at ease with how well they have continuously employed strategic planning as a management

tool. For all of these and other reasons, many decision-makers can propose that different mixtures of the political, symbolic, collegial, or administrative models of leadership are most beneficial and efficient. The collaborative system required in a discipline of leadership does not suit all leaders, including many presidents, who prefer to be more independent and impulsive.

The assertion that a crucial aspect of leadership may be exercised as a process and an applied discipline will prompt one of the most frequent queries concerning strategic leadership. As we return to some of our previous topics, we see once again how we continue to be conditioned to view leaders as special individuals who occupy significant positions of authority, often due to the extraordinary talents or credentials they possess. On a daily basis, we tend to reflect within inherited ways of thinking, despite the fact that the bulk of contemporary scholarship focuses on very different ideas of leadership. As a result, we take issue with assertions that some aspects of leadership may be a process and a discipline when it seems so obviously to be a matter of unique skills and traits. If it were a discipline, one could study and learn it.

Even those academics who enthusiastically support the study of leadership do not always attempt to prove that it is a science of activity as opposed to contemplation. They make the contentious claim that teaching leadership as a method of enquiry, as a "multidiscipline," or as "leadership studies" is possible. While some academics' works may imply it, it is quite another to assert that we may expressly teach the practise of leadership as a discipline of decision-making.

However, as I've tried to demonstrate, strategic leadership is a way to incorporate proven practises, tried-and-true techniques, insightful observations, and leadership-related knowledge into a practical discipline for the practise of leadership. It is true that the circumstances on which strategic leadership rests and the resources it requires for effectiveness should be defined as authority and the qualities, skills, and behaviours of leaders. In order to use a common but useful distinction on which we will rely, strategic leadership can only be effective when these prerequisite conditions are met. Whereas many of the latter are what strategic leadership offers as a discipline and method of decision-making, essential circumstances alone are not enough.

Authority, talent, and the tasks of leadership as resources

We can use authority, a subject we've thought about a lot, to illustrate the dimensions of the relationship between necessary and sufficient conditions. To be successful, strategic leadership in colleges and universities definitely needs to have power. Authority alone, however, cannot be considered leadership because it is a reciprocal process that ultimately depends on the agreement, participation, and dedication of a wide range of the campus community that has a significant amount of decision-making autonomy. It can be considered an important tool for leadership.

The way that a wide range of skills and traits that are connected to leadership actually work within a leadership process demonstrates how necessary and sufficient are related. Leaders have the ability to influence others, have courage and tenacity, are able to resolve conflicts and find solutions, and have specialised knowledge and experience, among other qualities. Again, it is obvious that while these qualities are necessary for leadership, they are not sufficient. Because they risk becoming confused and distorted in the absence of a value-centered structure that can help them focus on a shared goal and achieve it. These priceless personal assets can turn into the traps and delusions of a demagogue or dictator if the leader's desire for power and self-aggrandizement becomes the primary motivation for leadership. As a moral standard for the process, a defining commitment to achieving human needs and potential emerges as crucial to leadership. The criteria enable to distinguish between the unique traits and dynamics of leadership as a discipline of purpose, rather than just of power.

Similar to the recent focus on leadership practices and interpersonal interactions, discipline-specific systems must be added to the recent emphasis on these areas as a valuable resource. Many modern theorists advocate using strategies that are sensitive to the needs and values of followers, call for the development of a vision, and encourage the willingness to question accepted wisdom. The effectiveness of the leadership relationship depends on all of these tasks, which are aspects of the relationship itself. But without a more organised intellectual framework and methodical procedure to place them in, they risk turning into a list of unconnected, haphazardly related acts and practises. They are prone to being lost in the urgency of implementation or being overtaken by the rapid pace of events. They can also be forgotten in the institutional business crush.

The Integration of Leadership into Strategy

Returning to a subject we previously discussed, the various frames or styles of presidential leadership in colleges and universities—the political, administrative, collegial, and symbolic—we can see some of these same patterns of relationships. We discovered that while each of them provides an essential viewpoint for comprehending and practising leadership, none of them is up to the task of integration if it operates independently or sequentially.

Political leadership and strategic leadership

Consider the ability to persuade, forge alliances, reward and punish, splinter the opposition, use power creatively and occasionally coercively, all of which are characteristics of traditional political leadership, as an example. These are necessary tools for any organisational setting, and many college and university leaders rely on them as strategies and competencies for a large portion of their effectiveness. Because they provide a safety net of authority, the political and/or administrative frames of leadership frequently take precedence when on-campus relationships become hostile or

adversarial. There might not be an alternative.

Since it must be incorporated into a real world of political relationships and influence patterns, the process of developing and executing a strategy requires political deftness. Furthermore, a well-executed strategy can be a potent source of political legitimacy in and of itself. It emphasises issues and tasks using collegial methods, uses information in a transparent manner, and is highly collaborative. The most important values of the academy, process and substance, are made clear by collaborative strategy insofar as it exists. It gives people the ability to deal with important issues and look for new opportunities, which fosters trust. A strong strategy process reaches the political frame and gives it a new shape.

However, strategy goes beyond politics because it establishes the boundaries of the future in terms of the organization's long-term commitments. Politics becomes blind when core values are not upheld. It can turn into systematic distortions, an ugly ego test, and character assassination, as both our national and campus political lives teach us. Both on some campuses and in the nation's capital, these weapons are prevalent. Politics must be redeemed by a purpose for its practises to remain moral, and that purpose must be a reflection of core values. Strategic leadership that incorporates politics operates within a framework that is constrained by a legacy, focused on a vision, and infused with real values.

Administrative, collegial, and symbolic leadership in addition to strategic leadership

We notice patterns of relationship with strategic leadership as we discuss the other leadership frames or styles—administrative, collegial, and symbolic. When the other forms are integrated into the larger dialectic of integration that strategic leadership offers, they provide the necessary conditions and resources that are then reshaped and reoriented. For yet another illustration, a strategy will fail in the absence of a strong administrative framework. To achieve goals, it is necessary to have adequate administrative control systems, good data, effective staff support, and organisational capabilities.

At its most basic, a strategy is just a collection of operational procedures. However, it is obvious that administrative effectiveness is insufficient to foster the engagement and motivation necessary for strategic leadership. It struggles to resolve the structural conflict to which it is a party, does not always welcome or comprehend change, and is easily swayed by routine. To meet the changing needs and opportunities of academic organisations, more is needed than administrative proficiency and sound management. The management framework reshapes its understanding of the world, gains a grasp on change, and discovers more integrated and motivating tools with which to carry out its work under the influence of strategic leadership.

Collegial and symbolic leadership are the other two leadership philosophies, and both are crucial. Collegiality is a

crucial requirement of the process because, as we have repeatedly seen, strategy must be effective and legitimate in order to secure the benefits of shared governance. The organisation must be led by academics with expertise in teaching, learning, and scholarship. Our case has emphasised forcefully that symbolic leadership, particularly in its use of institutional narratives and in its consistency with organisational cultures, is the foundation of strategic leadership.

Each of these factors is present in strategic leadership, but they each change as a result of a larger process of decision-making and meaning. Strategic leadership offers structure and systems of responsibility to its symbolic and collegial forms while giving purpose to political and administrative leadership styles. These other strategies may continue to be ineffective in the absence of an integrated system of decision-making.

Collegiality provides the form of decisions needed to respond to change, but not the content; therefore, strategic leadership modifies its forms while upholding its norms. The complex rules of governance can occasionally become unmanageable or serve as a sophisticated justification for inaction. Symbolic thinking heavily relies on the significance and power of institutional stories and culture, but it is unable to organise or put into practise what it believes on its own. It frequently uses images of a glorious past that will never return to resist change.

Strategic leadership integrates the other types of leadership into a system that results in a powerful fusion of purpose and action. It goes beyond applying various leadership techniques in a sequential or serial manner, dealing with some issues in one way and others in another, and moving from situation to situation with uncoordinated skills and insights. Without an internal logic, combining different styles can result in one approach taking the lead and distorting the others to conform to its reality-perception. Leaders frequently tolerate misinterpretations of their organisations for extended periods of time and suppress information that contradicts their main frame of reference. Their predominate models of perception frequently become linked to their perception of their own leadership effectiveness. Changing models and allowing fresh ideas to germinate pose a threat to one's sense of worth on both a personal and professional level [7]–[9].

Incorporating leadership

On the other side, strategic leadership looks for a true synthesis of the many leadership paradigms. It unifies all the harsh facts of an institution's decisions and circumstances around a narrative that makes sense and a vision that makes sense of the goals it pursues, with the organisation acting as the agent of that vision. The many frames then work as components of a methodical approach that employs, adapts, and changes them to carry out an integrated plan. Strategic leadership establishes the mechanisms of governance, types of power, and administrative systems it needs to carry out its duties, as we have seen during the course of our investigation.

Power and purpose are systematically combined, as are shared values and shared governance, as well as identity narratives and administrative systems. Strategic leadership's integrative framework of meaning enables us to perceive what is inherently there but sometimes obscured: the intricate but genuine integration and interpenetration of an institution's decision-making mechanisms.

Finding out about strategic leadership

Strategic leadership operates as an applied discipline, which is one of the reasons it is a process with wide applicability. This implies that its different components—from the insights required to comprehend institutional cultures to the production and interpretation of strategic indicators to recognising and communicating the institution's story—can be taught and learnt both practically and theoretically. Undoubtedly, some practitioners of the discipline will be far more adept at applying it than others. Yet in any subject or discipline, particularly ones that incorporate a variety of practises, it is always the case. Skill and ability are essential. They account for a significant portion of leadership. Yet very few of us will ever be able to distinguish ourselves as visionary leaders or clever strategists, and even fewer will be able to do it by virtue of having remarkable natural talents. But, the majority of us may acquire a method and discipline that significantly increases our natural capacity to control an organisation or a specific area of it. It is possible to institutionalise good leadership methods that would otherwise be vulnerable to the whims of circumstance since it is a rigorous and methodical procedure.

In stating these assertions, we use the assumption that organisations choose different people with some discernment to fill official leadership and responsibility roles, such as president or head of a committee. Many of the abilities, traits, and values that we briefly discussed at the beginning of our research are exactly the qualities that influence the selection of certain people for these distinct leadership roles. It is reasonable to believe that many of the characteristics we identify with leadership are present across the population, but not uniformly. Finding someone who meets the requirements of a role at various times and under varied conditions is an important and difficult undertaking. At the same time, we are often delighted and astonished by how most individuals accept the difficulties posed by the obligations placed upon them.

The nagging questions get more intense when the person's leadership is first tested, sometimes in a way that is less helpful and pertinent than it would initially seem to be. Under stress, leaders may get preoccupied on whether they possess the range of perceptions, traits, and skills required for the position, even if the majority of those cannot be changed fast or easily. While they consider whether and how to establish their authority, they can also resort to in-depth examinations of the formal authorities and prerogatives of their position. These questions are often inappropriate, despite the fact that

they may be sincere and well-intentioned and sometimes pertinent. The approach and practises of strategic leadership show themselves as a logical and promising alternative in answer to exactly these problems. It provides a method for organised and integrated decision-making that may be taught via practise, study, and reflection.

This arrangement of the issue also brings into perspective the dialectical relationship between the characteristics of effective leaders and strategic leadership as a discipline. We can see once again that they define the distinction between undesirable and acceptable ranges of leadership ability and establish a threshold that must be passed for strategic leadership to be performed successfully. The procedure will fail if the fundamental requirements are not fulfilled. Nowhere is the need that a leader meet fundamental criteria and possess certain traits more obvious than in the area of values. To accomplish anything, leaders must stand for something. Decisions in the applied discipline of leadership must have the signature of the decision maker.

Naturally, those who fall short of these requirements are usually not chosen to assume positions of power and, if they are, are likely to be rapidly removed. Most of the time, people are picked for leadership positions because they exhibit qualities and abilities that go above and beyond what is necessary. Under these circumstances, the structure and rigour of a collaborative process activate and amplify the individual's leadership skills. An expert in the art and science of strategic leadership learns new methods to interpret individual and group experience and shape the path of events. The procedure then becomes more successful as a result of a leader's exceptional skills, sincere virtue, or intense level of dedication.

Leadership as Common Sense

Yet, heroic, faultless, or remarkable leaders are not necessary for strategic leadership to succeed. It demonstrates what leadership really means when it becomes ingrained in an organization's culture of decision-making. As human social identities and organisational capabilities expand, leadership is increasingly seen as an essential component. Leadership has its origins not in power structures but in ways of making sense that are inherent to the human condition. They are connected to human wants and values because such things inevitably manifest themselves in cultural systems and interpersonal interactions. A natural result of the great diversity of human social experience is the profoundly varied political and cultural artefacts that surround leadership in various communities and organisations across the world. But, they come from a more fundamental source than just variety itself. Humans make sense of their world via social and cultural systems that maintain and strengthen the institutions, ideas, and relationships they invest themselves in to provide meaning to their efforts. In the end, leadership in organizations—including schools and universities—is about upholding the principles by which people identify with one another and get meaning from social structures. Strategic

leadership is an ongoing storytelling process that seeks to uncover the deeper meanings behind well-known concepts, events, ideals, and goals. It allows the soul to return home to its greatest extent. Narratively, reiterating T. We "arrive where we began, and know the area for the first time," according to S. Eliot.

This viewpoint makes it more obvious why at institutions of higher learning, leadership and responsibility must be effectively and evenly distributed. The principles it upholds and the vision it gives take centre stage when holistic strategic leadership takes root in a college or institution. Distractions and disputes about procedure are consigned to the periphery. People feel the strong norms of a society that serves a great common purpose because the educational job of altering human capabilities, the pursuit of knowledge, and the imperative of addressing human wants are so engrossing. It becomes practically hard to distinguish clearly between those who lead and those who follow in such a group. There is more than enough labour to go around and more than enough responsibility to be distributed among various people, organisations, and occasions [10]–[13].

III. CONCLUSION

Character, intelligence, compassion, and bravery are qualities that make a good leader. These personality traits are what enable a person to effectively steer a group of followers in the proper way. You can make wise decisions thanks to your character

.REFERENCES

[1] M. Samimi, A. F. Cortes, M. H. Anderson, and P. Herrmann, "What is strategic leadership? Developing a framework for future research," Leadersh. Q., 2022, doi: 10.1016/j.leaqua.2019.101353.

[2] M. Lehto and J. Limnéll, "Strategic leadership in cyber security, case Finland," Inf. Secur. J., 2021, doi: 10.1080/19393555.2020.1813851.

[3] N. R. A. Rahman et al., "Impact of strategic leadership on organizational performance, strategic orientation and operational strategy," Manag. Sci. Lett., 2018, doi: 10.5267/j.msl.2018.9.006.

[4] C. Kurzhals, L. Graf-Vlachy, and A. König, "Strategic leadership and technological innovation: A comprehensive review and research agenda," Corp. Gov. An Int. Rev., 2020, doi: 10.1111/corg.12351.

[5] M. Hunitie, "Impact of strategic leadership on strategic competitive advantage through strategic thinking and strategic planning: A bi-meditational research," Bus. Theory Pract., vol. 19, pp. 322–330, 2018, doi: 10.3846/btp.2018.32.

[6] J. D. Castellanos and B. George, "Boardroom leadership: The board of directors as a source of strategic leadership," Econ. Bus. Rev., 2020, doi: 10.18559/ebr.2020.1.5.

[7] R. Ucar and S. Dalgic, "Relationship between school principals' strategic leadership characteristics and school teachers' organizational commitment levels," Eurasian J. Educ. Res., 2021, doi: 10.14689/ejer.2021.91.6.

[8] C. Nwachukwu and H. M. Vu, "Strategic flexibility, strategic leadership and business sustainability nexus," Int. J. Bus. Environ., 2020, doi: 10.1504/IJBE.2020.107500.

[9] Z. Shao, "Interaction effect of strategic leadership behaviors and organizational culture on IS-Business strategic alignment and Enterprise Systems assimilation," Int. J. Inf. Manage., 2019, doi: 10.1016/j.ijinfomgt.2018.09.010.

[10] O. Coban, S. Ozdemir, and J. Pisapia, "Top managers' organizational change management capacity and their strategic leadership levels at ministry of national education (Mone)," Eurasian J. Educ. Res., 2019, doi: 10.14689/ejer.2019.81.8.

[11] S. Ma and D. Seidl, "New CEOs and their collaborators: Divergence and convergence between the strategic leadership constellation and the top management team," Strateg. Manag. J., 2018, doi: 10.1002/smj.2721.

[12] T. Prasertcharoensuk and K. N. Tang, "The effect of strategic leadership factors of administrators on school effectiveness under the Office of Maha Sarakham Primary Educational Service Area 3," Kasetsart J. Soc. Sci., 2017, doi: 10.1016/j.kjss.2016.09.001.

[13] S. N. Ismail, F. Muhammad, A. G. Kanesan, and A. Yaacob, "Teacher collaboration as a mediator for strategic leadership and teaching quality," Int. J. Instr., 2018, doi: 10.12973/iji.2018.11430a..

Flagship Commission's Report Authority and Responsibility

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Abstract— On the president's advice, the governing board should properly appoint a Strategic Planning Council and provide it authority to create and oversee the university's execution of an integrated and continuous plan process. The SPC will provide reports and studies that outline the possibilities and difficulties that the institution confronts in the larger environment, as well as interact with the campus community on a regular basis about its activities. The SPC will provide recommendations for plans, initiatives, and priorities that will help the university achieve its purpose and realise its long-term objectives..

Index Terms— Academic, Authority, Leadership, Responsibility, Strategy

I. INTRODUCTION

In order to handle a wide variety of institutional policies and initiatives, the SPC will often carry out its duties via the periodic creation of several task forces and subcommittees with combined professor, staff, student, and board participation, as relevant to the subject. Each task group will provide its findings and recommendations to the SPC after analysing information and opinion and using strategic indicators, surveys, roundtable discussions, open meetings, and its own deliberations. The SPC will meet with each subgroup to receive its report and debate its findings while acting as the steering committee. In creating its own report, the SPC will expressly refer to each set of recommendations, but it is not constrained by the interpretations, phrasing, or findings of the subgroups [1], [2].

The SPC will work with the institution's executive and academic leaders to ensure that strategy and planning activities are in place at each of the institution's key academic and administrative divisions in addition to drafting an institution-wide plan every few years. These procedures will concentrate on the particular strategic concerns that various units must solve, even if they should reflect the basic goals of institution-wide plans. Following rounds of the institution-wide strategy process will be shaped and defined by the results, issues, and priorities presented in the different units and divisions.

The SPC will assist in monitoring and reviewing the objectives set throughout the process after an intense cycle of strategy creation has been completed and a strategy report has been published. Periodic public updates on progress towards strategic objectives, as well as presentations to faculty and staff bodies on the rationale behind any new or updated goals, shall be issued by the SPC and/or pertinent administrative officials. The vision and objectives of the university's strategy will serve as the framework for meetings of the governing board and the committees that make up it.

The SPC will be an institution-wide group that answers to the president, who will then suggest the governing board's plans, objectives, and priorities. It is a university-wide council rather than a faculty or administration committee since it deals with matters of finances, buildings, educational programmes, and administrative policies that include both academic and administrative power. The SPC's findings or recommendations do not establish programmes or policies that call for the approval of the several faculties, the faculty senate, or other governing bodies of the institution. Instead, it will outline strategic concerns and goals in the context of a wide range of internal and external factors. By establishing a plan for the university's future with the support of the governing board, its work will act as a tool for integrative and collaborative leadership.

The SPC will operate within the framework of Flagship's traditions of shared governance and collaborative decision making, even while the substance of strategy papers is not subject to the legislative oversight of the faculty or of faculty or staff committees. As a consequence, the SPC will submit its key periodic strategic plans for review and approval to the faculty senate. The Faculty Senate, other faculty councils, and important administrators' discussions serve as a testing ground for the initiatives before they are presented to the governing board, even if the SPC owns its findings. In the event that the faculty senate votes to modify the SPC's priorities and recommendations, the SPC will think it over and either revise its report or incorporate any unfavourable faculty action as a dissent to be included in the report.

Several faculty committees, administrative organisations, and officials will be asked to examine the implementation of new academic or administrative initiatives that have been highlighted in the plan after the governing board has finally embraced the SPC's aims and priorities. The suggested adjustments will be examined and presented by the SPC in the context of incorporated strategic goals. As the faculty will continue to have legislative control over academic programmes, the procedure won't interfere with the standard academic system of decision-making.

Budgeting and planning

Also, the SPC may be very important in the crucial task of continuously tying strategy to operational budgets. The commission is aware that one of the ongoing difficulties in making decisions at colleges and universities is connecting strategic objectives with the practical realities that often direct the yearly budgeting process. The SPC in particular will be in a position to help shape the general guidelines and priorities of each budget cycle and connect them to the objectives of the strategic plan and the financial model that is included into the strategy process. As a result, the SPC will examine and consider each year's major sources of income and expenditures for the institution. It will be able to advise the president on how much money should be set aside for new roles and initiatives as well as how expenditure should be constrained or cut down to reflect strategic goals.

The panel feels that a permanent subcommittee made up of academics and administrative officials would be the most effective way for the SPC to handle some of these financial obligations. Based on information obtained from the different academic and administrative departments, the subcommittee would consider recommendations or define broad criteria for increased spending for programmes and staff and do the same if savings are required. The president will make the final choices about the budget after the receipt of recommendations from the subcommittee and the SPC.

Membership and Direction

The research suggests that the SPC should be relatively modest since its leadership and membership will be crucial to its effectiveness. The president of the institution, the top academic and business officers, and two more executives will be appointed by the president to renewable rotating three-year terms. After consulting with the chief academic officer, the faculty membership committee will suggest five faculty members—no more than two from the same unit—who will then be voted on by the senate. The president will choose the other two deans after consulting with the dean's council and one will be picked from each of the two major schools. Three deans will rotate on the board. The director and another member of the planning and research team will need to provide staff support for the SPC. One undergraduate and one graduate student serving two-year terms should be included in the maximum membership, which is limited to sixteen members overall, excluding staff members.

II. DISCUSSION

The SPC is a permanent organisation, hence its leadership is a crucial matter. A candidate for chairman should possess significant academic or administrative power, as well as significant communication and integrative thinking skills. The SPC will operate at the intersection of governance, strategy, leadership, and management, thus the chairperson must be able to conceive the institution's identity and vision intelligently and have the power to guarantee that objectives are carried out. The majority of the commission members agree that the provost or the vice president for planning and administration would be the appropriate chairpersons for the SPC. Several members have claimed that the president should serve as chair or co-chair of the SPC since they have the greatest power to create connections amongst the various levels of decision-making [3], [4].

President's Position

The panel is in agreement that the president must define the SPC's work as one of his or her primary responsibilities, whether they are carried out as chair, co-chair, or ex-officio members. This entails participating in meetings, closely collaborating with the chairman, guiding reports and suggestions through the organisation and to the board, and ensuring that initiatives that have been accepted are put into action. The president will often make a significant contribution to the SPC's deliberations, particularly on matters of purpose and vision as well as the most urgent strategic problems and possibilities. An successful SPC's activity will serve as one of the main vehicles for the duty of collective university leadership.

Any proposals that are as comprehensive as the Flagship commission's findings may spark some debate on certain campuses but not others. They will need to go via numerous university forums, gathering places, and decision-making bodies for discussion, debate, and negotiation. Questions that may be used to test the Flagship report and any designs other campuses may come up with to solve the problems of successful strategic governance can help to clarify the concerns that are being discussed.

Beyond the formal considerations of administration and power, there are a number of additional concerns and doubts concerning an SPC's efficacy. From a cultural standpoint, an SPC must act as a means of bringing smart, talented individuals from all parts of the university together in teams, subcommittees, and study groups. The ability to connect persons with new and promising ideas to one another in productive ways is one aspect of strategic leadership. Excellent leaders adhere to sound principles. An SPC's primary responsibility is to identify, promote, and strategically link the top administrative and educational practises that are growing across the business.

Examining the Flagship Case

Once we bid Flagship farewell, we are left with a variety of feelings and deductions. Ultimately, the strategy's work can be successfully transformed into the leadership styles and administrative procedures of higher education institutions. When it does, it may significantly advance integrative and collaborative leadership. Whichever name it receives, an SPC provides a vital frame of reference for achieving successful strategic leadership. Even though the suggested approach won't work in every situation, the onus now falls on those who decide against exploring its potential. The issue that has

to be addressed at the very least is: If it's not going to be a strategy council, then what should it be? When the arguments are concluded and this point has been addressed, attention turns to the governing board's discretionary powers.

The Governing Board's Purpose

The governing board's duties in terms of strategy and strategic leadership are often disregarded. The governing board is an integral element of the overall strategy process, whether or not board members are technically represented on an SPC (it depends on the circumstances). The board's active support of strategic governance is crucial to the whole process, regardless of whatever role board members may have due to ability or interest in certain elements of the job of strategy. The design and monitoring of the strategy process, as well as the board's active evaluation of the reports and plans that are submitted to it for support and ultimate approval, must demonstrate the authority and prestige of the board.

The governing board should see the formation of an SPC as crucial to leadership and efficient decision-making at the institution. In these areas, the board's authority is often strangely lacking. As a result, major strategic concerns are addressed sporadicy and incoherently while academics and administration often quarrel over the details of shared governance. Without actively moulding the institution's capacity to successfully react to the outside world, how can the board's ultimate legal power and fiduciary duty have any meaning? What could be more pertinent than the board's active participation in a discussion of the factors that influence the institution's purpose, identity, and strategic position? There may be instances in which the board may legally take a proactive or even active role in the process of strategic governance. The board may and should address the problems to ensure that the processes for making strategic decisions are efficient and coherent if there is unresolved debate on the efficacy of the strategy process or the function of a body like an SPC. Chait, Holland, and Taylor said that competent boards "cultivate and focus on procedures that clarify institutional goals and ensure a strategic approach to the organization's future" in their research of the traits of successful governing boards.

Making ensuring the institution's decision-making procedures are legal, fair, and efficient is one of the board's most important responsibilities. It makes ensuring that there are effective rules and procedures in place to make choices about programmes and employees without interfering with those decisions. It has cause to be worried and to bring up the subject when it observes flaws or persistent issues such fragmentation, dysfunctional conflict, or loss of a strategic focus. It may attempt to integrate all of the elements in a cohesive framework via a process of strategic thinking and leadership, without denying that each aspect in the governance process has a suitable role.

Depending on the situation, the board will play this strategic function in a very different manner. The board will

often serve as a source of knowledge about the organization's story of identity and a beta-testing ground for new ideas. A governing board's inalienable leadership obligations include the organization's goal and vision, thus taking the initiative and participating actively in the discussion of these issues is crucial. Many board members also have a lot to contribute in terms of creating an environmental scan, analysing the financial situation, creating marketing campaigns, and identifying the institution's strengths and weaknesses. They see the institution as a whole with the president. Some boards have their own committees that are responsible for large strategic problems and long-term planning. In some situations, certain board members have a distinctive role in strategic planning based on their professional experience, such as when they take part in, serve as the chair of, or co-chair a task force or a significant new planning effort.

Regardless of how it is presented, the board should actively evaluate a strategic plan before considering and endorsing it, often in a special meeting or retreat. As we'll see in the section below, once the strategy is in place, it provides each board and committee meeting's agenda fresh relevance and focus. As part of an ongoing strategic review, evaluation, and discussion, questions may be posed and addressed with reference to a defined strategic vision, set of objectives, and metrics. The board's symbolic and actual engagement lends the accountability phase of the process of strategic leadership an air of seriousness since it serves as the institution's ultimate legal authority. To sum up, the following is a list of the board's responsibilities in strategic governance and leadership:

1. It makes ensuring that an efficient strategy process is in place and implements any necessary governmental policies.

2. It supports the process and contributes as necessary.

3. It accepts the plan that is produced as a consequence of the strategy process and considers adopting it.

4. It makes the president responsible for carrying out the plan's objectives.

5. It gets data, reports, and information that allow it to keep track on, evaluate, and guarantee accountability for the strategy's execution.

Organizing the SPC's work

We have taken into consideration a significant organisational vehicle that may lead one aspect of the process of strategic leadership while considering the potential of an SPC. Before delving into the specifics of the strategy process, it is important to focus on some of the crucial actions that must be made to set up a strategy council for success while always considering how it will contribute to leadership. Peter Senge reminds us that one of the core responsibilities of leadership is to design effective decision-making systems, not only to manage them after they have been constructed, based on his work with hundreds of executives at MIT. The tedious effort needed to create the ideal processes and tools for the tasks of strategy is where authority-based leadership is most crucial.

Faculty Participation

It is evident in a variety of ways that teachers and staff need to be prepared for participation in a strategy process. Faculty members who normally haven't studied management or taken part in official strategy procedures might make up one-third or even half of the strategy council. They may not like some of its techniques or terminology either. The fact that faculty members already work full-time jobs that take up the majority of their time is most essential. The process of developing a strategy is not routine, and it sometimes takes more time than a standard committee, particularly for individuals in leadership positions. Leaders must consider how faculty engagement in the process might be most valuable in light of these very real difficulties. Faculty members require sufficient staff assistance and time to make it practicable if they are requested to lead a significant task force. There may need to be a temporary change in their other obligations. By setting up a week at the end of the semester or just before it to focus on strategy, it may also be possible to facilitate intense faculty engagement in the process.

Introduction to the Strategic Planning Process

Starting a strategy programme without paying attention to the protocols, schedules, goals, and organisational structure is one of its deadly flaws. It is crucial that participants be provided the resources they need to contribute to the discussions and that the ground rules are made clear, especially when a committee or council is ready to start a rigorous cycle of planning. Most often, new members should receive special orientation for a one- or two-day retreat that serves as part of the preparation.

A notebook or website with articles on current issues in higher education, key information from institutional documents, excerpts from earlier plans, including mission and vision statements, and materials that convey a sense of institutional history, identity, and distinctiveness would be especially beneficial for the process' leaders and staff. Also, participants must to get a fact sheet or other documents with pertinent quantitative information about the organisation, including a comprehensive list of strategic indicators. The retreat should include a presentation on the relevance of the data, particularly the financial statistics.

Financial opportunities and limits should be openly discussed when deciding on the method and scope of planning. It seems reasonable to include in difficult financial circumstances when setting expectations for an organisation. In reality, the strategy effort may need to concentrate on developing fair methods for resource reallocation. The SPC and its many subgroups need to be aware of the institution's extensive financial capabilities if additional resources are available. While strong desire and inventiveness should not be discouraged by limitations, setting too high standards can eventually backfire.

The SPC's function and responsibilities

The SPC acts as the process' organisational steering committee and provides guidance on more important issues like strategy and leadership. Most of the time, the SPC's early attention to the critical identity, purpose, vision, and position fourfold strategic factors will be beneficial to the whole process. It is obvious at this point that the president and the council must have an ongoing, productive, and transparent discussion. As a result of a common understanding of these defining viewpoints, strategy work will be successful in igniting campus-wide commitment to common strategic objectives. If subcommittee and task force members can situate themselves in a genuine story of identity and desire, even if it is preliminary, they will find that their work becomes much more focused and productive.

It should be made clear how the SPC intends to divide the tasks of each group in meaningful ways if the council expects functioning in task groups and subcommittees, as is often the case. All of the SPC's members must be informed of their roles since often one of them will head or co-chair subcommittees. As many concerns will fit into multiple settings, the selection of themes calls for extensive examination and debate. There will also need to be some negotiation over how different topics will be addressed. Just a select few topics can be addressed in each intense planning cycle, as we highlight later, thus great consideration must be given to how each subgroup's workload is managed.

Now is also the time to start outlining the details of each group's planned report, including its format and content. In order to create shared objectives, forms, and patterns of presentation, it is important to investigate the art and science of creating scenario assessments, creating goals, and allocating responsibility for them. Realisticism will be added to the conversation by acknowledging that often only two or three persons produce the first draught of committee reports. The procedures for the several subgroups to work with the SPC must be established, and it must be made clear what happens to their reports and suggestions when they are submitted, as indicated in the Flagship SPC case. They should anticipate that although their suggestions will be thoroughly considered, they will be significantly reformulated in the SPC's final decisions and reports.

Group Method

The SPC will want to take into account the dynamics of positive group work and relationships, as will the numerous subcommittees. How can group interaction be beneficial and effective, inspiring participants to contribute to discussions? How can the group transform into a productive collaborative unit built on communication rather than never-ending arguments? How will leadership and group process facilitation take place? Answering these issues may be done by assuming that the group is a team and not just a committee. Team members should be selected not just based on their position but also on their capacity to consider the bigger organisation and the major problems it confronts. They should be well-respected, familiar with the campus, know how to get things done, and have the time and

dedication to devote to the task of strategy and transformation. Teams must act as a unit rather than as individuals in order to be productive. They must also follow the proper procedures and get coaching as needed. In their analysis of successful executive teams, Bensimon and Neumann provide a cognitive viewpoint that also applies to strategy teams. A team is a collective sense creator, meaning that its members work together to perceive, analyse, learn, and think about the future of the company.

It may be advantageous for the members of a strategy group to look into methods to improve their shared problem-solving and strategic thinking abilities with the aid of a properly selected consultant. Senge explains how to develop teams' abilities in the art of conversation, as opposed to debate or argumentation, in The Fifth Discipline. He uses the example of a business that invites its top executives to a retreat to talk about the latter stages of creating a strategic plan. The president challenges the group to practise discourse by adhering to these ground rules:

1. Putting preconceptions on hold. People often choose a stance, support it, and stick with it. Others adopt opposing viewpoints, which causes polarisation. Instead of attempting to defend them in this session, we would want to look at some of the assumptions that underpin our direction and approach.

2. Pretending to be colleagues: All attendees are kindly requested to vacate their positions at the entrance.

3. Inquisitive Nature: We want individuals to start questioning the assumptions that underlie their beliefs, the reasoning behind those beliefs, and the evidence that supports those beliefs. It will be appropriate to start by asking them, "What makes you say or think this? " .

In academic decision-making, an emphasis on group dynamics is not very frequent, maybe because so much of the work is influenced by professional knowledge. The concept of conversation, however, as the suspension of preconceptions and authority, nonetheless, provides a useful contribution to the structuring of collaborative work when strategic thinking is in play.

It is worth the SPC's effort to consider professional assistance with the right kind of questionnaires, discussion protocols, and processes to get issues related to mission, vision, and other complex subjects on the table, even though in my experience many faculty members do not respond well to the exercises and group work that consultants use in other organisations. Before to their widespread implementation, suggested methods should be tested with a number of SPC members. Strategic Planning for Public and Nonprofit Organizations by John Bryson and the accompanying manuals are great resources for ideas and methods.

It is also critical that the whole strategy process be supported by competent employees, some of whom should have planning-related education. Staff assistance will be crucial in setting up any interviews, surveys, open meetings, or roundtables that the SPC or its subgroups may wish to arrange. Coordinating the work of subcommittees and task

forces with that of the SPC, which serves as the steering committee, requires a significant amount of staff time. Effective staff work serves as the foundation for successful strategy initiatives. A strategy process is a useful setting for increasing the visibility and impact of planning officers' work, both as tactical planners and as strategic leaders. There are valid reasons to include strategy and planning among the official tasks of a vice president or director who has the authority and aptitude to successfully carry out such difficult obligations [5], [6].

III. CONCLUSION

More significant than any of these recommendations is the SPC leaders' determination to devote systematic attention to the initial task of developing a productive process that is compatible with the manner in which their organization does its finest work. Being a member of the SPC should be seen as a prestigious and welcoming job, and the process itself should be more fulfilling than difficult.

REFERENCES

[1] E. Steyn, "Collective rights management: multi-territorial licensing and self-regulation," Entertain. Law Rev., 2014.

[2] A. Brandolini and J. Micklewright, "Editors' Preface," Polit. Econ., 2019, doi: 10.1429/95404.

[3] "29.F. Workshop: The Health Systems and Policy Monitor network: reforms and health system changes in the spotlight," Eur. J. Public Health, 2020, doi: 10.1093/eurpub/ckaa165.1337.

[4] O. Mashta, "Hospital trust sacrificed patient care to financial matters, commission says," BMJ, 2009, doi: 10.1136/bmj.b1141.

[5] C. Purcell, "The Labour Leadership and Children's Policy," in The Politics of Children's Services Reform, 2021. doi: 10.46692/9781447348788.004.

[6] M. Sengupta, "The Sustainable Development Goals: An Assessment of Ambition," Global Policy Journal, 2016.

Aquaculture Fisheries and Fish Farming

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Abstract— Fish, crustaceans, mollusks, and aquatic plants are all raised in aquaculture, commonly referred to as aquafarming. Contrasted with commercial fishing, which is the capture of wild fish, aquaculture includes the controlled breeding of freshwater and saltwater populations. In general, the relationship between aquaculture and finfish and shellfish fisheries is comparable to the relationship between agriculture and foraging. Aquaculture carried out in aquatic and marine ecosystems is referred to as maricultural.

Index Terms— Aquaculture Systems, Farmed Salmon, Million Tonnes, Wild Fisheries, Wild Fish.

I. INTRODUCTION

The cultivation of aquatic species, such as fish, mollusks, crustaceans, and aquatic plants, is regarded to be aquaculture, according to the FAO. In order to increase output, farming entails some kind of rearing process intervention, such as frequent stocking, feeding, predator protection, etc. Moreover, farming implies either private or corporate ownership of the crop stock. One-half of the fish and shellfish eaten by humans directly would be supplied by the claimed production from worldwide aquaculture operations, however there are doubts regarding the accuracy of the data. The products from many pounds of wild fish are also utilised in the present aquaculture method to generate one pound of a piscivorous fish like salmon [1]–[3].

History

Eels may have been grown by the native Gunditjmara people in Victoria, Australia, as early as 6000 BC. Evidence suggests they constructed a network of canals and dams in the region of Lake Condah, covering an area of roughly 100 km2, and they utilised woven traps to catch and store eels for year-round use. Catfish are taken out of the Delta Pride by workers. Farms for catfish in Mississippi in 2500 BC, aquaculture was used in China. During river floods, some fish, mostly carp, were stuck in lakes. The first aquaculturists consumed their brood after feeding it silkworm excrement and nymphs. During the Tang dynasty, the genetic mutation of a carp resulted in the development of goldfish.

Japanese people grew seaweed by giving spore anchoring surfaces like bamboo poles, subsequently nets, and oyster shells. Early Christian monasteries in central Europe adapted Roman aquacultural techniques. As fish had to be salted away from the seacoasts and the major rivers in order to prevent rot, aquaculture grew across Europe at this time. Aquaculture declined in popularity as a result of the 19th century's advancements in transportation, which made fresh fish conveniently and affordably accessible, even in inland places. The Trebon Basin fishponds from the fifteenth century are still being cared for as a UNESCO World Heritage Site in the Czech Republic. Hawaiians built fish ponds in the ocean. In Alekoko, there is a fish pond that dates back at least 1,000 years. It was allegedly built by the legendary Menehune dwarf tribe.

German scientist Stephan Ludwig Jacobi tested salmon and brown trout external fertilisation in the first half of the 18th century. Von der künstlichen Erzeugung der Forellen und Lachse was the title of an essay he authored. Oyster farming had started in estuaries throughout the Atlantic Coast of North America by the latter decades of the 18th century. An 1855 newspaper story about the harvesting of ice used the term aquaculture. In the late 19th century, term also made an appearance in descriptions of the terrestrial agricultural practise of subirrigation before coming to be predominantly connected with the cultivation of aquatic plant and animal species.

Stephen Ainsworth of West Bloomfield, New York, started brook trout research in 1859. Seth Green developed a business fish hatchery in Caledonia Springs, close to Rochester, New York, around 1864. Artificial fish hatcheries had been established in both Canada and the United States by 1866, according to Dr. W. W. Fletcher of Concord, Massachusetts. The Dildo Island fish hatchery in Newfoundland was the biggest and most sophisticated in the world when it was opened in 1889. The trials with cod and lobster conducted by hatcheries in 1890 were described using the term aquaculture [4]–[6]. The 1870s-founded American Fish Culture Corporation in Carolina, Rhode Island, which was one of the top trout producers by the 1920s. The technique for influencing fish's day-night cycle so that they may be artificially produced all year round was developed in the 1940s. About 1900, Californians tried to control the quantity of wild kelp by harvesting it and eventually classified it as a military resource.

21st-century Practice

When the demand for high-quality protein increased and wild fisheries' harvests stagnated, popular marine species were overfished, which prompted aquaculturists to domesticate additional marine animals. Many believed there would be a "Blue Revolution" in aquaculture at the dawn of modern aquaculture, much as the Green Revolution of the

20th century had changed agriculture. Despite the long-standing domestication of land animals, the majority of seafood species are still taken directly from the wild. Famous ocean explorer Jacques Cousteau expressed his concern in a 1973 essay, saying that "with earth's rising human populations to feed, we must turn to the sea with fresh knowledge and new technology."

The majority of the 430 species that were domesticated as of 2007 were done so throughout the 20th and 21st centuries, with the decade leading up to 2007 accounting for around 106 of them. In contrast to the 0.17% of known maritime plant species and 0.13% of known marine animal species that have been domesticated, just 0.08% of known land plant species and 0.0002% of known land animal species have been domesticated to far, despite the long-term significance of agriculture. Around ten years of scientific investigation are usually required for domestication. Domesticating aquatic creatures carries less danger to humans than domesticating terrestrial animals, which cost many lives. A majority of the main human illnesses have their origins in domesticated animals, including smallpox and diphtheria, which, like the majority of infectious diseases, spread from animals to people. No comparably virulent human infections have yet been discovered in marine organisms. There are existing biological parasite management techniques in use, such as cleaner fish to regulate sea lice numbers in salmon farms. To minimise effect, models are being utilised to assist in the spatial design and positioning of fish farms.

The demand for farmed fish has soared as wild fish populations have decreased. Yet, in order for the aquaculture business to develop sustainably, alternative natural sources of protein and oil are required; otherwise, there is a significant danger of overfishing forage species. Finding ecologically benign, but still effective, chemicals with antifouling properties is a current concern as a result of the International Maritime Organization's 2008 prohibition on organotins. Every year, a great number of new natural chemicals are found, but it is almost hard to produce them in sufficient quantities for use in commerce.

Future advancements in this sector are almost certainly going to depend on microbes, but more money and study are required to make up for the knowledge gap in this area. Aquatic emergent plant cultivation in floating containers the bulk of cultured algae are microalgae, also known as phytoplankton, microphytes, or planktonic algae. While macroalgae, usually referred to as seaweed, have several industrial and commercial applications, they are most frequently harvested from the wild because of their size and unique cultivation needs.

Fish

The most typical kind of aquaculture is fish farming. It entails breeding fish for sale in ponds, tanks, or ocean cages, generally for human consumption. A fish hatchery is often referred to as a location that releases young fish into the wild for recreational fishing or to increase the population of a species. Carp, salmon, tilapia, and catfish are the top four fish species raised for food across the world. Young bluefin tuna are caught in the Mediterranean by being netted at sea and then dragged gently ashore. After that, they are raised in offshore enclosures so that they may be sold. In 2009, Australian researchers succeeded in encouraging southern bluefin tuna to reproduce in land-locked tanks for the first time. In the southern Spencer Gulf of South Australia, southern bluefin tuna are also taken in the wild and fattened in grow-out sea cages.

The salmon farming sector of this business follows a similar procedure; young fish are harvested from hatcheries and given a range of maturation aids. Salmon, one of the most significant fish species in the market, may be cultivated utilising a cage technique, as shown above. This is accomplished by housing the salmon in netted cages, ideally in open water with a strong current, and giving them a particular diet combination that promotes growth. Since the fish may develop all year long thanks to this procedure, there is a greater harvest when the time is right.

Crustaceans

Production of shrimp increased dramatically once commercial shrimp farming started in the 1970s. In 2003, the global output was over 1.6 million tonnes and was valued nearly $9 billion. Asia, namely China and Thailand, produces around 75% of the world's farmed shrimp. Brazil is the top producer in South America, where most of the remaining 25% is produced. The major exporter is Thailand. From its historic, small-scale form in Southeast Asia, shrimp farming has evolved into a worldwide business. Broodstock is exported over the globe, and technological advancements have allowed for ever-higher densities per unit area. Penaeids, or shrimp of the family Penaei- dae, make up the majority of farmed shrimp. Just two species—Pacific white shrimp and gigantic tiger prawns—represent roughly 80% of all farmed shrimp. Due to illness, which has wiped off shrimp populations over large areas, these industrial monocultures are very prone to it. Throughout the latter part of the 1990s, the business underwent changes, and regulations were usually more stringent as a result of growing ecological issues, frequent disease outbreaks, and pressure and criticism from both consumer countries and nonprofit groups. Governments, business leaders, and environmental groups launched the Seafood Watch initiative in 1999 with the goal of advancing more environmentally friendly agricultural methods [7]–[10].

Freshwater shrimp farming and marine shrimp farming both share a number of traits and issues. The principal species' developmental lifecycle, the giant river prawn, introduces special issues. In 2003, there were roughly 280,000 tonnes of freshwater prawns produced annually worldwide, with China producing 180,000 tonnes, followed by India and Thailand with 35,000 tonnes each. A further 370,000 tonnes of Chinese river crab were produced in China.

Molluscs

Several varieties of oyster, mussel, and clam are raised in aquaculture. These bivalves feed on ambient primary production rather than inputs of fish or other feed because they are filter and/or deposit feeders. As a result, aquaculture for shellfish is often seen as innocuous or even advantageous. Bivalve molluscs are either cultivated on the beach, on longlines, or hung from rafts and collected by hand or by dredging depending on the species and local circumstances.

In Japan and China, abalone cultivation started in the late 1950s and early 1960s. This industry has shown rising success since the mid-1990s. Due to overfishing and poaching, natural populations have declined to the point that most abalone flesh is now produced in farms. The World Wildlife Fund, Seafood Watch, and other organisations may certify mollusks that have been sustainably farmed. In order to provide quantifiable and performance-based criteria for seafood that is ethically farmed, WWF started the "Aquaculture Dialogues" in 2004. To oversee global standards and certification systems, WWF and the Netherlands Sustainable Trade Initiative co-founded the Aquaculture Stewardship Council in 2009. A commercial "sea ranch" to cultivate abalone was established in Flinders Bay, Western Australia, after experiments in 2012. The ranch is built on a man-made reef that consists approximately 5000 distinct concrete structures known as "habitats". Each of the 900-kg habitats can house 400 abalone. From an onshore nursery, baby abalone are introduced to the reef. The abalone graze on seaweed that has naturally grown on the habitats, and as the bay's environment has been enriched, other species including dhufish, pink snapper, wrasse, and Samson fish have also become more numerous. The company's Brad Adams has highlighted the similarities to wild abalone and distinctions from shore-based aquaculture. Since once they are in the water, they take care of themselves, we are not an aquaculture company; rather, we are a ranch.

Extra Groups

Aquatic reptiles, amphibians, and other invertebrates, such as echinoderms and jellyfish, are among the other categories. Since they do not add enough volume to the main graph, they are separately graphed at the top right of this section. Sea cucumbers and sea urchins are two echinoderms that are harvested for commerce. Sea cucumbers are raised in artificial ponds up to 1,000 acres in size in China.

Aquaculture supplied 66.6 million tonnes, or roughly 42%, of the 158 million tonnes of fishery products produced globally in 2012. In contrast to the catch from wild fisheries, which has largely remained steady over the last ten years, the growth rate of aquaculture globally has been consistent and robust, averaging around 8% per year for over 30 years. In 2009, the aquaculture industry generated $86 billion.

In China, aquaculture is a particularly significant economic sector. According to the Chinese Department of Fisheries, aquaculture harvests increased from 1.9 million tonnes to over 23 million tonnes between 1980 and 1997, growing at an average rate of 16.7% year. China was responsible for 70% of global production in 2005. Nowadays, one of the sectors of food production in the United States with the highest growth is aquaculture. The majority of shrimp consumed in the United States is farmed or imported. Salmon aquaculture has recently grown to be a significant export from southern Chile, particularly from Puerto Montt, the city with Chile's fastest population growth.

According to a United Nations study from May 2014 titled The Status of the Global Fisheries and Aquaculture, fisheries and aquaculture provide a living for almost 60 million people in Asia and Africa.

Aquaculture techniques are governed by national laws, regulations, and management laws, which vary widely from country to country and are sometimes not strictly enforced or transparent. Federal and state regulations oversee land-based and nearshore aquaculture in the United States, but there are no federal laws that regulate offshore aquaculture in the oceans of the United States exclusive economic zone. Nationwide aquaculture policy were announced in June 2011 by the Department of Commerce and National Oceanic and Atmospheric Administration to address this problem and "meet the rising demand for healthful seafood, to generate employment in coastal communities, and to restore key ecosystems." The National Sustainable Offshore Aquaculture Act of 2011 was proposed in 2011 by Congresswoman Lois Capps "to create a regulatory structure and research programme for sustainable offshore aquaculture in the United States exclusive economic zone," however the legislation was not passed into law.

Over-reporting

China far outperforms the rest of the world when it comes to reported aquaculture production, claiming a total output that is twice the amount of the rest of the world combined. But, there are problems with China's returns' accuracy. Reg Watson and Daniel Pauly, two fisheries experts, complained in a letter to Nature in 2001 that China had overstated their 1990s harvest from wild fisheries. They said that made it seem as if the worldwide catch had been growing yearly by 300,000 tonnes since 1988 while in reality it had been declining by 350,000 tonnes. Watson and Pauly hypothesised that this could be connected to Chinese policy, where government agencies in charge of overseeing the economy are likewise urged to boost production. Also, until recently, promotions for Chinese officials were determined on gains in output from their home provinces.

China contests this assertion. Yang Jian, director general of the Department of Fisheries under the Agricultural Ministry, was reported by the government-run Xinhua News Agency as claiming that China's estimates were "essentially correct". The FAO, however, acknowledges that there are problems with China's statistical returns' dependability and now handles data from China including aquaculture statistics in a different way from that of the rest of the world.

Aquaculture Techniques Mariculture

The term "mariculture" describes the practise of growing marine organisms in saltwater, often in protected coastal waters. Mariculture includes the cultivation of marine fish, as well as the farming of marine crustaceans, mollusks, and seaweed.

Mariculture may include growing the organisms on or in artificial enclosures, such as oyster racks and floating netted cages for salmon. Although oysters on racks filter feed on naturally occurring food, confined salmon are fed by operators. Seaweed that naturally grows on the reef units has been consumed by abalone raised on a man-made reef. In integrated multi-trophic aquaculture, wastes from one species are recycled to serve as food and fertiliser for other species. Feed aquaculture is integrated with inorganic extractive and organic extractive aquaculture to produce balanced systems for social acceptability, economic stability, and environmental sustainability.

The term "multi-trophic" describes a system that includes organisms from several trophic or nutritional levels. This might be one way in which aquatic polyculture differs from the traditional practise of co-cultivating many fish species from the same trophic level. These creatures may all be involved in the same biological and chemical processes in this situation, which would have limited synergistic effects but might possibly cause big changes in the ecosystem. As broad cultures, certain traditional polyculture systems may actually include a higher variety of species, occupying several niches, inside the same pond. The word "inte- grated" describes the closer proximity and more intense cultivation of many species that are linked through the transmission of nutrients and energy via water.

An IMTA system's biological and chemical processes need to be in equilibrium. This is accomplished by carefully choosing and balancing the quantities of various species that perform various eco-system activities. The co-cultivated plants are often valuable commercial crops rather than merely biofilters. Even though the output of individual species is lower than in a monoculture for a short period of time, a functioning IMTA system may lead to increased overall production based on reciprocal benefits to the co-cultivated species and enhanced ecosystem health. When monocultures are combined via the transfer of water, the phrase "integrated aquaculture" is often used to describe it. Yet, the only real distinction between "IMTA" and "integrated aquaculture" is how descriptive each phrase is. Further adaptations of the IMTA idea include aquaponics, fractionated aquaculture, integrated agriculture-aquaculture systems, integrated peri-urban-aquaculture systems, and integrated fisheries-aquaculture systems.

Netting Supplies

Across the globe, netting for aquaculture fish enclosures is made from a variety of materials, including nylon, polyester, polypropylene, polyethylene, plastic-coated welded wire, rubber, proprietary rope products, galvanised steel, and copper. The design viability, material strength, pricing, and corrosion resistance are only a few of the factors that went into choosing each of these materials.

Since they are antimicrobial, copper alloys have recently become crucial netting materials in aquaculture. Copper alloy aquaculture cages prevent the expensive net changes required with other materials by limiting microbial development. Moreover, farmed fish may develop and flourish in a cleaner, healthier environment because to the resistance of organism growth on copper alloy nets.

II. DISCUSSION

On a local scale, aquaculture may be more ecologically harmful than using wild fisheries for fishing, although it has a lot less of an effect on the environment globally per kilogramme of output. Local issues include waste management, antibiotic side effects, conflict between domesticated and wild animals, and the use of other species to feed more commercially viable carnivorous fish. Nevertheless, between the 1990s and 2000s, advancements in commercial feed and research helped to allay many of these worries.

Aquaculture might aid in the spread of invasive species. The Nile perch and Jaitor fish instances demonstrate how this problem may harm local wildlife. The organic elements included in fish excrement are essential for all aquatic food web components. The concentrations of fish waste produced by in-ocean aquaculture are often significantly greater than usual. The garbage builds up on the ocean floor, harming or eradicating life that lives there. Moreover, waste may lower the amount of dissolved oxygen in the water column, which puts additional strain on wildlife. The building of artificial reef structures to expand the habitat niches accessible, without the need to provide anything more than ambient feed and nutrients, is a substitute for adding food to the environment. In Western Australia, this was used in the "ranching" of abalone.

Salmon Oil

It has been shown that tilapia raised in aquaculture has a greater fat content and a higher ratio of omega-6 to omega-3 oils. Fish from the wild are fed to several carnivorous and omnivorous farmed fish species. Although farmed carnivorous fish made up just 13% of the total aquaculture output by weight in 2000, they made up 34% of the whole aquaculture production by value. To match the nutrients they get in the wild, farming of carnivorous species like salmon and shrimp results in a high need for fodder fish. Fish do not naturally manufacture omega-3 fatty acids; instead, they acquire them by either eating prey fish that have accumulated omega-3 fatty acids from microalgae, as is the case with fatty predatory fish like salmon, or by ingesting microalgae that produce these fatty acids. More than half of the world's fish oil output is fed to farmed salmon in order to meet this

demand.

While production efficiency is increasing, farmed salmon still eat more wild fish than they produce as a finished product. The "fish-in-fish-out" ratio may be defined as the amount of products from many pounds of wild fish that are fed to farmed salmon in order to generate one pound of farmed salmon. The FIFO ratio for salmon was 7.5 in 1995; by 2006, it has decreased to 4.9. In addition, rather than coming from specific entire fish, a rising percentage of fish oil and fishmeal are made from residues. 28 percent of fishmeal and 34% of fish oil were derived from scraps in 2012. Fish-meal and oil made from leftovers, as opposed to whole fish, have a distinct composition that is lower in protein and higher in ash, which may restrict their potential for use in aquaculture.

Although 75% of the world's monitored fisheries are now at or have surpassed their maximum sustainable output, the salmon farming business needs additional wild forage fish for feed as it grows. The capacity of the wild predator fish that depend on them for food to survive is impacted by the industrial-scale harvest of wild forage fish for salmon farming. Switching carnivorous species to diets based on plants is a crucial step in decreasing the effect of aquaculture on wild fish. For instance, salmon diets now incorporate 40% plant protein as opposed to only fishmeal and oil in the past. The USDA has also experimented with feeding farmed trout grain-based meals. Plant-based diets may provide carnivorous farmed fish the required nutrients and equivalent development rates when they are correctly designed. The possibility of fish escaping from coastal enclosures, where they may interbreed with their wild counterparts and weaken natural genetic stocks, is another effect aquaculture operations may have on wild fish. Fish that have escaped may become invasive and outcompete local species.

Shoreline Ecosystems

Coastal habitats are increasingly being threatened by aquaculture. Since 1980, mangrove forests have been lost by around 20%, in part because of shrimp cultivation. The external expenses were much more than the external advantages, according to a comprehensive cost-benefit analysis of the whole economic worth of shrimp farming based on mangrove habitats. 269,000 hectares of mangroves in Indonesia have been turned into shrimp farms over the course of four decades. Due to the accumulation of toxins and nutritional loss, the majority of these farms are abandoned within ten years. Normal locations for salmon farms are virgin coastal environments, which they later damage. More faecal matter is released from a farm with 200,000 fish than from a city with 60,000 residents. There is also a buildup of heavy metals, notably copper and zinc, on the benthos close to the salmon farms. This trash is discharged directly into the nearby aquatic ecosystem, untreated, and often contains antibiotics and pesticides. The entire environment as well as salmon farmers along Chile's coast were harmed by catastrophic fish kills in 2016. Fish and molluscan mortality

was thought to be possibly caused by rising aquaculture output and its accompanying pollution.

Genetic Engineering

Salmon known as the AquAdvantage salmon has been genetically altered to develop more quickly, but its commercial usage has not been authorised because of opposition. Instead of taking the typical 36 months for Atlantic salmon to reach full size, the modified fish uses a growth hormone from a Chinook salmon, which enables it to do so while eating 25% less feed. After reviewing the AquAdvantage salmon in a draught environmental assessment, the U.S. Food and Drug Administration came to the conclusion that it "would not have a substantial effect on the U.S. environment."

Welfare of animals

Social views have an impact on the need for humane practises and laws in the farming of marine animals, just as they do with farming of terrestrial animals. According to the Farm Animal Welfare Council's recommendations, a healthy animal includes one that feels both physically and mentally at ease. The Five Freedoms may be used to define this:

Freedom includes: Liberation from hunger and thirst; Freedom from discomfort; Freedom from pain, illness, or damage; Freedom to act normally; Freedom from fear and anguish. The question of whether farmed fish and marine invertebrates are genuinely sentient, or have the sense and consciousness to feel sorrow, is contentious in the aquaculture industry. Recent research have shown that fish indeed contain the required receptors to perceive noxious stimuli and are thus likely to experience states of pain, anxiety, and stress. This is despite the fact that no evidence of this has been discovered in marine invertebrates. Hence, the wellbeing of vertebrates in aquaculture is focused on finfish in particular.

Standard Welfare Concerns

Many factors, including stocking density, behavioural interactions, sickness, and parasitism, may have an influence on welfare in aquaculture. The fact that these problems are often interconnected and have varied effects on one another makes it very difficult to pinpoint the exact source of impaired wellbeing. The carrying capacity of the stocked habitat and the amount of fish-specific personal space required by each species are often used to determine the optimal stocking density. High stocking densities may be advantageous for certain species due to behavioural interactions like shoaling, but they may be problematic for many domesticated species. Crowding may limit natural swimming patterns and intensify aggressive and competitive behaviours such cannibalism, feed competition, territoriality, and hierarchies of dominance and subordination. As a result, there may be a higher chance of tissue injury from fish-to-fish or fish-to-cage abrasion. Fish may consume less food or convert it into energy less effectively. Moreover, excessive

stocking densities may lead to insufficient water flow, which would lead to insufficient oxygen delivery and waste product removal. Fish respiration depends on dissolved oxygen, and concentrations below threshold levels may cause stress or even asphyxiation. Fish are very hazardous to ammonia, a nitrogen excretion product, when it builds up, especially when oxygen levels are low.

Many of these interactions and consequences lead to fish stress, which may play a significant role in facilitating fish illness. For many parasites, infestation is influenced by the host's degree of mobility, population density, and susceptibility to defences. The main parasite issue for finfish in aquaculture is sea lice, which abundance results in extensive skin erosive and hemorrhagic lesions, congested gills, and increased mucus production. Several well-known bacterial and viral diseases may also cause serious harm to the neurological and internal organ systems.

Enhancing welfare

Reducing stress to a minimum is essential for enhancing the welfare of marine farmed organisms since prolonged or recurrent stress may have a variety of negative impacts. During the whole cultural process, stress may be reduced. In order to decrease aggressive behavioural interactions during grow out, it's crucial to maintain stocking densities at optimal levels particular to each species. Maintaining clean nets and cages may help water flow positively, lowering the chance of water deterioration. Unsurprisingly, parasites and illness may have a significant impact on fish welfare, therefore it's critical for farmers to take steps to avoid disease in addition to managing affected stock. Yet, due to the additional handling and injection, preventative measures like vaccinations may also create stress. There are other biological controls, such as utilising cleaner wrasse to eliminate lice from farmed salmon, adding antibiotics to feed, adding chemicals to water for treatment baths, and other ways.

Capture, dietary restriction to prevent faecal contamination of the transport water, transfer to the transport vehicle using nets or pumps, as well as carriage and transfer to the delivery destination, are just a few of the many procedures involved in transportation. Water must be kept in excellent condition throughout transit, with a controlled temperature, enough oxygen, and few waste products. Anaesthetics may sometimes be used sparingly to relax fish before transfer.

Prospects

World wild fisheries are under decline, and important habitats like estuaries are in grave danger. Piscivorous fish, like salmon, must consume fish products like fish meal and fish oil, therefore farming or aquaculture of these species does not solve the issue. According to studies, salmon farming significantly harms wild salmon as well as the forage fish that must be harvested to feed them. Higher-order fish are less effective energy suppliers than lower-order fish.

Apart than raising fish and shrimp, other aquaculture endeavors—including growing seaweed and raising filter-feeding bivalve mollusks like oysters, clams, mussels, and scallops—are generally innocuous and even environmentally beneficial. Filter-feeders remove nutrients and contaminants from the water, enhancing its quality. Although filter-feeding mollusks may collect nutrients while they feed on particles like phytoplankton and detritus, seaweeds can take nutrients like inorganic nitrogen and phosphorus straight from the water. Sustainable methods are promoted by several prosperous aquaculture cooperatives. By reducing fish stress, using netpens, and implementing Integrated Pest Management, these techniques reduce the danger of biological and chemical contamination. More and more vaccines are being utilised to lessen the need for anti-biotics in the fight against illness [11]–[13].

To control adverse environmental impacts, facilities may be sited correctly, use polyculture methods, or use onshore recirculating aquaculture systems. Aquaculture systems that use recirculating water recycle water by pumping it through filters to remove fish waste and food before pumping it back into the tanks. This helps save water, and the garbage that is collected may sometimes even be processed and utilised on land. Agricultural Research Service scientists have discovered a technique to raise saltwater fish using RAS in low-salinity waters, despite the fact that RAS was originally designed with freshwater fish in mind. Scientists have developed healthy pompano, a salty fish, in tanks with a salinity of just 5 ppt, despite the fact that saltwater fish are generally grown in offshore cages or captured with nets in water that has a salinity of 35 ppt.

III. CONCLUSION

Economic and environmental benefits are anticipated with the commercialization of low-salinity RAS. The ocean wouldn't get unwanted nutrients from the fish food, and there would be far less chance of disease transmission between wild and farm-raised fish. There would be a decrease in the cost of pricey saltwater fish like the pompano and combia utilised in the studies. The quantity of ammonia and nitrate the fish will tolerate in the water, what to feed the fish throughout each stage of its lifecycle, the stocking rate that would yield the healthiest fish, etc. must all be studied by researchers before any of this can be done. Geothermal energy is now used in aquaculture in around 16 nations, including China, Israel, and the United States. For instance, 15 fish farms in California use warm groundwater to raise tilapia, bass, and catfish. Fish may grow year-round and develop more rapidly in this warmer water. These Californian farms generate 4.5 million kg of fish annually as a whole. menu. The style will adjust your fonts and line spacing.

REFERENCES

[1] O. Kaleem and A. F. Bio Singou Sabi, "Overview of aquaculture systems in Egypt and Nigeria, prospects, potentials, and constraints," Aquaculture and Fisheries. 2021. doi: 10.1016/j.aaf.2020.07.017.

[2]   C. Béné et al., "Feeding 9 billion by 2050 – Putting fish back on the menu," Food Secur., 2015, doi: 10.1007/s12571-015-0427-z.

[3]   R. L. Naylor et al., "Effect of aquaculture on world fish supplies," Nature. 2000. doi: 10.1038/35016500.

[4]   S. Zhao et al., "Application of machine learning in intelligent fish aquaculture: A review," Aquaculture. 2021. doi: 10.1016/j.aquaculture.2021.736724.

[5]   G. S. Grebe, C. J. Byron, A. S. Gelais, D. M. Kotowicz, and T. K. Olson, "An ecosystem approach to kelp aquaculture in the Americas and Europe," Aquaculture Reports. 2019. doi: 10.1016/j.aqrep.2019.100215.

[6]   S. Charisiadou et al., "Coastal aquaculture in Zanzibar, Tanzania," Aquaculture, 2022, doi: 10.1016/j.aquaculture.2021.737331.

[7]   H. Berg, D. Mulokozi, and L. Udikas, "A gis assessment of the suitability of tilapia and clarias pond farming in tanzania," ISPRS Int. J. Geo-Information, 2021, doi: 10.3390/ijgi10050354.

[8]   E. Amenyogbe et al., "A Review of Ghanas Aquaculture Industry," J. Aquac. Res. Dev., 2018, doi: 10.4172/2155-9546.1000545.

[9]   M. Kumaran et al., "Prospective impact of Corona virus disease (COVID-19) related lockdown on shrimp aquaculture sector in India – a sectoral assessment," Aquaculture, 2021, doi: 10.1016/j.aquaculture.2020.735922.

[10] A. T. Tamim et al., "Development of IoT Based Fish Monitoring System for Aquaculture," Intell. Autom. Soft Comput., 2022, doi: 10.32604/IASC.2022.021559.

[11] M. D. Callier et al., "Attraction and repulsion of mobile wild organisms to finfish and shellfish aquaculture: a review," Reviews in Aquaculture. 2018. doi: 10.1111/raq.12208.

[12] E. Lastauskienė et al., "The Impact of Intensive Fish Farming on Pond Sediment Microbiome and Antibiotic Resistance Gene Composition," Front. Vet. Sci., 2021, doi: 10.3389/fvets.2021.673756.

[13] R. Goldburg and R. Naylor, "Future seascapes, fishing, and fish farming," Frontiers in Ecology and the Environment. 2005. doi: 10.2307/3868441.

Various Branches of Aquaculture

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Abstract— Because to its economic viability, opportunity for entrepreneurship, and capacity to provide jobs, aquaculture has established itself as a highly popular food system. Also, it is adaptable to any area with viable fisheries. This chapter discusses the main aspects of aquaculture, including mariculture and oyster farming.

Index Terms— Mussels Grown, Multi Trophic, Oyster Forming, Open Ocean, United State

I. INTRODUCTION

Mariculture is a specialised subset of aquaculture that involves growing marine creatures for food and other goods in the open ocean, a confined area of the ocean, or in seawater-filled tanks, ponds, or waterways. The second is shown by the cultivation of marine fish in saltwater ponds, including finfish and shellfish like prawns, or oysters and seaweed. Mariculture is used to produce a variety of non-food items, such as fish meal, nutritional agar, jewellery , and cosmetics [1]–[3]. Shellfish may be grown in a variety of methods, much like algae: on ropes, in cages or sacks, or even directly on the intertidal substrate. Shellfish aquaculture, also known as "mariculture," is a self-sustaining system since it doesn't need inputs for feed, fertiliser, pesticides, or antibiotics. Moreover, shellfish may be grown using multi-species approaches, where they can consume waste produced by creatures at higher trophic levels.

A commercial "sea ranch" for raising abalone was established in Flinders Bay, Western Australia, after experiments in 2012. The ranch is built on a man-made reef that consists of 5000 distinct concrete structures, or "habitats". The 400 abalone can fit in each of the 900 kilogramme habitats. From an onshore nursery, baby abalone are introduced to the reef. The abalone graze on seaweed that has naturally developed on the habitats; as the bay's environment is enriched, more dhufish, pink snapper, wrasse, and Samson fish are becoming common. The company's Brad Adams has highlighted the similarities to wild abalone and distinctions from shore-based aquaculture. Since once they are in the water, they take care of themselves, we are not an aquaculture company; rather, we are a ranch.

Wide Ocean

A relatively recent method of marine culture involves raising marine creatures under controlled circumstances in exposed, energetic ocean environments far from considerable coastal influence. Cages, nets, or long-line arrays that are anchored, towed, or float freely are used in open ocean aquaculture. Facilities for open ocean research and commercial aquaculture are either in place or are being built in Panama, Australia, Chile, China, France, Ireland, Italy, Japan, Mexico, and Norway. Two commercial open ocean facilities were raising Threadfin near Hawaii and cobia near Puerto Rico in U.S. waters as of 2004. Bigeye tuna fishing operations just obtained final permission. Now, every commercial facility in the United States is located in seas that are governed by a state or territory. Cobia are being raised 12 km off the northern coast of Panama in the biggest deep water open ocean farm in the world.

Improved Stocking

A Japanese concept called enhanced stocking, commonly referred to as sea ranching, is based on species' migratory tendencies and operant conditions. In a harbour, the fisherman rear hatchlings in a tightly woven net while signalling each feeding with an underwater horn. The fish are released from the net when they are old enough so they may develop in the open ocean. Around 80% of these fish return to their origin during the breeding season. After blowing the horn, the fishermen catch any fish that react [4]–[6].

Ocean Ponds

Fish are produced in ponds that get their water from the sea in saltwater pond mariculture. This has the advantage of allowing for the use of the nourishment found in saltwater. Compared to conventional fish farms, where the farmers must purchase feed, this is a significant benefit. Additional benefits include the option to place water purification facilities in the ponds to reduce nitrogen accumulation from faeces and other contaminants. The ponds may also be left open to natural predators, which offers a different kind of filtration.

Impacts on the Environment

Due to new technology, advancements in formulated feeds, improved biological knowledge of farmed species, improved water quality inside closed farm systems, increasing demand for seafood products, site development, and government involvement, mariculture has quickly developed during the last 20 years. As a result, there has been considerable debate over the social and environmental effects of mariculture. Wastes from cage cultures, farm escapees and

invasive species, genetic contamination, disease and parasite transmission, and habitat alteration are the most often noted environmental effects from marine farms. The size of the farm, the species being raised, the stock density, the kind of feed, the site's hydrography, and the husbandry techniques all have an effect on how much of an impact there is on the environment. These causes and consequences are linked in the figure to the right.

Cage Cultures' Wastes

Fishmeal or other high-protein food sources may be necessary in substantial quantities for the mariculture of finfish. Due to ineffective feeding regimens and low digestibility of formulated feeds, which led to poor feed conversion ratios, a lot of fishmeal was initially wasted. Fish raised in cages are fed using a variety of techniques, from simple hand feeding to complex computer-controlled systems with automated food dispensers and in-situ uptake sensors that monitor consumption rates. In land-based farms and hatcheries, extra food is wasted and may have negative effects on the local coastal environment in addition to increasing the disposition of debris on the bottom, which may suffocate invertebrates that live on the seafloor and change the physical environment. The settling velocity of waste feed, the current velocity, and depth are all important factors that have a considerable influence on this impact, which is often quite local.

Invasives and Farm Escapees

Whether or whether there are wild conspecifics or near relatives in the receiving habitat, as well as whether or not the escapee is capable of re-producing, determines the effect of escapees from aquaculture operations. Now, a variety of mitigation and preventive techniques are being used, ranging from the creation of sterile triploids to land-based farms that are totally cut off from any maritime environment. Escapees may have a detrimental influence on local ecosystems via hybridization, genetic loss in native stocks, an increase in unfavourable ecological interactions, the spread of disease, and habitat alterations [7]–[10].

Another issue is the unintentional introduction of invasive species. After unintentional releases of farmed animals into the wild, aquaculture is one of the primary vectors for invasive species. For instance, in December 1999, a violent storm caused the Siberian sturgeon to unintentionally escape from a fish farm and into the Gi- ronde Estuary in southwest France. Another illustration of how species may be introduced to new settings by "hitchhiking" on farmed molluscs is molluscan aquaculture. Moreover, farmed mollusks themselves have the ability to transmit viruses and parasites and develop into dominant rivals or predators.

Transmission of parasites, disease, and genetic pollution

The possibility for disease and parasite spread is one of the main issues with mariculture. Selective breeding is often used on farm cattle to improve growth rates, product quality, and

disease and parasite tolerance. The genetic variety of raised stocks thus declines with each succeeding generation, which implies that if they stray into wild populations, they may do the same to those populations' genetic diversity. Such genetic contamination from aquaculture species kept in enclosures might hinder the capacity of the wild population to adapt to the shifting environment. Moreover, animals raised in aquariums may carry parasites and illnesses that, if they escape, might infect wild populations. The parasitic sea lice on Canada's wild and farmed Atlantic salmon serves as an illustration of this. Moreover, non-native animals raised for food may be resistant to or carry specific illnesses that might infect wild populations if they stray into those populations. These "new" illnesses would be terrible for those populations of wild animals since they wouldn't have any defences against them.

Alteration of Habitat

Benthic habitats just underneath marine farms are the only exception to the general rule that most mariculture has little impact on habitat. It is worrying, however, how shrimp aquaculture is destroying mangrove habitats. Shrimp aquaculture is a minor factor in the global decline of mangrove forests, but it has catastrophic local effects. Rich matrices supported by mangrove trees provide an abundance of species, mostly including young fish and crustaceans. Also, by digesting materials and "filtering" sediments, they serve as buffering systems that lessen coastal erosion and enhance water quality for in-situ creatures.

Others

Moreover, nitrogen and phosphorus from food and waste may cause phytoplankton blooms, whose subsequent decomposition can significantly lower oxygen levels. Fish are killed and shellfish are polluted if the algae are poisonous.

Sustainability

Research and development in important areas including nutrition, genetics, system management, product handling, and socioeconomics are required to support the growth of mariculture. Closed systems, which don't directly interact with the local environment, are one strategy. They are now limited to serving as hatcheries because to their costly initial investment and ongoing operating costs. Advantages Economic and environmental benefits are promised by sustainable mariculture. By producing fish at a cheaper cost than commercial fishing, economies of scale imply that ranching may improve human nutrition and gradually phase out unsustainable fisheries. In addition to offering a wider variety of species than fish maintained in ponds or tanks, maricultured fish are thought to be of greater quality. Integration in food market channels has been made possible by consistent supply and quality control.

Energizing Approach to Offshore Aquaculture Mariculture

A developing kind of mariculture or marine farming,

offshore aquaculture, also known as open ocean aquaculture, involves moving fish farms out to sea. The farms are situated where ocean currents are stronger than they are close to shore, in deeper and less protected seas. One issue with inshore aquaculture is that waste materials like fertilisers and excrement might get up on the bottom underneath the farm and harm the benthic environment. The wastes from aquaculture that have been transported offshore often are carried away from the site and diluted, according to its proponents. Putting aquaculture offshore also gives the industry more room to increase output in order to keep up with the growing demand for fish. It mostly prevents confrontations with other marine life. Offshore, there may still be disputes between resource users due to the congested inshore waterways. The continued effects of employing antibiotics and other medications, as well as the potential for farmed fish to escape and infect wild fish, are among the concerns of critics.

Similar to these inshore fish cages, offshore aquaculture utilises submerged fish cages that are transported offshore into deeper water. History Because of its lucrative industry and dwindling wild fisheries populations, aquaculture is the food sector that is growing the fastest in the world. Aquaculture generated 45.7% of the fish produced worldwide for human consumption in 2008; this percentage has been rising since 1970 at an average annual pace of 6.6%.

A group of oceanographers, engineers, and marine biologists came together in 1970 under the auspices of the National Oceanic and Atmospheric Administration to investigate the viability of offshore aquaculture, which at the time was thought to be a future endeavour. The future of offshore aquaculture technology in federal seas has drawn a lot of attention in the United States. It is now theoretically viable to cultivate finfish, shellfish, and sea weeds using offshore aquaculture technology, as several commercial operations demonstrate. Designing and installing storm-resistant cages, managing the logistics of operating far from land, and identifying species that are economically viable enough to offset the expenses of raising fish in exposed offshore locations are major hurdles for the offshore aquaculture sector. Technology Farms must be constructed to be more durable than those inland in order to resist the high energy offshore environment. Yet, the offshore technology's architecture is quickly evolving with an eye on lowering costs and upkeep.

The offshore approach often employs submersible cages, while the ranching systems now utilised for tuna use open net cages at the surface of the water. These substantial inflexible cages, which can each store thousands of fish, are attached to the ocean bottom yet are mobile throughout the water column. They are fastened to surface buoys that typically include a feeding and equipment storage mechanism. In the seas of the Bahamas, China, the Philippines, Portugal, Puerto Rico, and Spain, similar technology is being employed. Wave impacts are decreased and shipping and boating are less

hampered by submerged cages or shellfish production systems. Remote control of offshore farms may increase their productivity and safety, and new technologies are being developed, such as an 18-ton buoy that can feed and check fish automatically for extended periods of time.

Structures Offshore Currently

Aquaculture may become more sustainable "in locations that may be concurrently exploited for other industries such as energy generation" if offshore seas are used for multiple purposes. The development of operations for fish and shellfish. For instance, the Hubb-Sea World Research Institutes' plan to turn a decommissioned oil platform into an experimental offshore aquaculture facility 10 nautical miles off the southern California coast. The institution intends to cultivate mussels, red abalone, striped bass, bluefin tuna, California halibut, and California yellowtail in floating cages in addition to growing them on the actual platform.

Integrated Aquaculture that is multi-trophic

When species that must be fed, like finfish, are raised alongside species that can feed on dissolved nutrients, like seaweeds, or organic wastes, such suspension feeders and deposit feeders, this is known as integrated multi-trophic aquaculture, sometimes known as polyculture. An environmentally friendly approach might address several issues with offshore aquaculture. The technique is being developed in Spain, Canada, and other countries.

Mobile Cages

As the "next generation technique" for offshore aquaculture, roaming cages have been proposed. These are large, movable cages that can use ocean currents for propulsion and are propelled by thrusters. One theory is that young tuna raised in mobile cages in Mexico may eventually develop and be sold in Japan after a few months. Yet, putting such ideas into practise would have legal and regulatory repercussions.

Space Warfare

Conflicts between the users of marine space are growing as seas become more industrialised. Natural resources might be seen of as being publicly owned in the environment in which this struggle for sea space is emerging. Conflicts may arise with the tourist sector, amateur fishermen, wild harvest fisheries, and the placement of marine renewable energy facilities. The remoteness of many maritime regions and the challenges with monitoring and enforcement may make the issues worse. On the other side, distant locations may be selected to prevent user disputes and enable large-scale operations with associated cost savings. For nations like Spain that have few acceptable inshore locations, offshore systems may provide options.

II. DISCUSSION

Since offshore aquaculture is still mostly in the research stage, its ecological effects are not entirely clear. Similar,

well-established worries about inshore aquaculture techniques parallel many of the worries about possible repercussions of offshore farming [11]–[13].

Pollution

One issue with inshore farms is that waste materials like fertilisers and excrement might get up on the ocean bottom, disrupting the benthos. Moving coastal aquaculture offshore and into the open ocean is strongly encouraged by the "dilution of nutrients" that takes place in deeper water. The species' feed conversion efficiency, the flushing rate, and the size of the operation all affect how much nutrient pollution and dam- age to the bottom happens. Yet, nutrients that are both dissolved and particulate are still discharged into the environment. Future offshore farms will likely be considerably bigger than inshore farms are now, which will result in more trash being produced. It is yet unknown when the ability of offshore ecosystems to absorb trash from offshore aquaculture activities will be surpassed.

Feed from Wild Catch

A significant amount of the feed is derived from wild forage fish, much as in the inshore aquaculture of carnivorous fish. With a few exceptions, offshore aquaculture has mostly concentrated on high-value carnivorous fish. The supply of these wild fish will run out biologically if the business tries to grow with this concentration.

Fish Escapes Since offshore systems are expensive, it's critical to prevent fish escapes. Yet, as the offshore business develops, it's possible that there will be escapes. Even if the farmed fish are inside the natural range of the native species, this may have substantial effects on them. Since submersible cages are completely closed, escapes can only take place if the construction is compromised. Offshore cages need to be able to survive assaults from predators like sharks as well as the tremendous energy of the environment. With no slack for predators to grab, the outside netting is constructed of Spectra, a super-strong polyethylene fibre, and is securely wrapped around the frame. The cage mesh in ocean cages, however, is not a barrier to the cod eggs that have been fertilised.

Disease

Offshore aquaculture now seems to have far less disease issues than inshore aquaculture. For instance, compared to mussels grown inshore, parasite infections in mussels grown offshore are substantially less common. Yet, despite the fact that nothing is known about the ecology and epidemiology of new species, they are currently being farmed offshore. It "remains a major and unsolved topic" what it means to transfer infections between such farmed animals and wild species. Pathogen transmission across fish populations is a significant problem for disease management. Given that there may be wider distances between aquaculture producing sites, static offshore cages may reduce direct spreading. Yet, the advancement of roaming cage technology can create fresh problems with the transmission of illness. A higher need for live aquatic animals, such as bait, broodstock, and milt, is brought on by the high level of carnivorous aquaculture production. This may lead to the transmission of illness across species boundaries.

Employment

Several governments promote aquaculture as a means of creating employment and revenue, particularly when natural fisheries are depleted. On the other hand, offshore aquaculture could be an exception. Since offshore aquaculture requires expensive supplies and equipment, there will be enormous incentive to reduce labour costs via automated production methods. As offshore aquaculture expands, employment is projected to increase more in processing facilities than in grow-out enterprises.

Prospects

Currently, the two countries investing the most in the development of offshore cages are Norway and the United States.

FAO

The following assessments were made by the Food and Agriculture Organization subcommittee on aquaculture in 2010: "Most Members believed it inevitable that aquaculture would move further offshore if the world is to meet its growing demand for seafood and urged the development of appropriate technologies for its expansion and assistance to developing countries in accessing them. Other Members pointed out that debate should include inland waterways as well since aquaculture may possibly flourish offshore in significant inland water basins. Several Members advised exercising care while establishing offshore aquaculture due to possible detrimental effects. In order to minimise misunderstanding, the subcommittee suggested that the FAO "move towards clarifying the technical and legal language linked to offshore aquaculture."

Europe

The European Commission published the following policy statement on aquaculture in 2002: "Fish cages should be relocated further inland, and more off-shore cage technology research and development must be encouraged to achieve this goal. Expertise gained from industries other than aquaculture, such oil platforms, may very well be used to the aquaculture equipment market, reducing the costs associated with technology development. By 2008, European offshore systems were active in Libya, Cyprus, Malta, Norway, Ireland, Italy, Spain, and Spain. According to Ireland's National Development Plan, offshore aquaculture technology will be developed between 2007 and 2013 in Ireland, including "cage design, materials, structural testing, and modelling" as well as "sen- sor systems for feeding, biomass and health monitoring, feed control, telemetry and communications."

Regulation issues may arise if aquaculture is moved into the exclusive economic zone. Federal waters in the United States extend 200 nautical miles offshore, whereas regulatory power over coastal states often extends to 3 nm. Consequently, offshore aquaculture might be located under federal authority but beyond the purview of state law. All commercial aquaculture facilities are located in nearshore seas that are governed by a state or territory as of 2010. The development has been hampered by "unclear regulatory procedures" and "technological concerns associated to operating in offshore regions," however. All five of the United States' offshore commercial and research operations—located in New Hampshire, Hawaii, Puerto Rico, and California—are inside federal seas. To "create a regulatory structure and research programme for sustainable offshore aquaculture in the United States exclusive economic zone," the National Sustainable Offshore Aquaculture Act of 2011 was presented to the House of Representatives in June 2011.

Existing Species

By 2005, there were commercial and experimental offshore aquaculture farms operating in 25 different nations. Due to market demand, fin-fish farming represents the majority of offshore farming activities. High-value carnivorous finfish, such moi, cobia, and mutton snapper, are being raised in underwater cages by two commercial companies in the US and a third in the Bahamas. In New Hampshire's waters for halibut, haddock, cod, and summer flounder as well as in the Gulf of Mexico for amberjack, red drum, snapper, pompano, and cobia, submersible cages are also being employed in experimental systems.

Scallops and mussels are two examples of shellfish cultivated in suspended culture systems in offshore aquaculture, which is expanding. Systems where the shellfish are cultivated on a tethered rope or hung from a floating raft in net containers are considered suspended culture systems. In particular, mussels are able to withstand the high amounts of physical stress that are present in the unstable settings seen in off-shore seas. Shellfish do not need routine feeding, unlike finfish species, which may save expenses. The aquaculture of blue mussels in an open ocean setting has been studied by the University of New Hampshire in the US. They've discovered that mussels grown in less contaminated offshore waters had lighter shells and more meat.

In order to reseed the oyster beds, Monsieur de Bon began collecting oyster spawn in 1852 using crude catchers. The Hyacinthe Boeuf-built oyster farm on the Isle of Ré was a significant step towards the development of modern oyster farming. He constructed a wall to create a reservoir and weaken the current after acquiring the rights to a portion of the shoreline. A short while later, 2000 young oysters per square metre of spat produced naturally by the sea covered the wall.

Many Farmed Oyster Varieties

The Eastern oyster, Crassostrea virginica, the Pacific oyster, Crassostrea gigas, the Belon oyster, Ostrea edulis, the Sydney rock oyster, Saccostrea glomerata, and the Southern mud oyster, Ostrea angasi, are all commonly farmed food oysters.

Cultivation

Estuarine brackish water bodies are where oysters develop naturally. In aquaculture, water temperature and salinity are adjusted to encourage fertilisation and spawning as well as to hasten the maturation process, which may take several years. There are three common cultivation techniques. Oysters are raised until they reach the size of their "spat," or the point at which they connect to a substrate. A "cultch" is the name of the substrate. It is possible to let the free spat develop further to produce "seed" oysters with tiny shells. They are then let out to develop in either scenario. The cultivation method is decided upon in the maturation procedure. One technique involves spreading the spat or seed oysters over the existing oyster beds and letting them grow naturally. Thereafter, these oysters will be harvested utilising techniques for fishing wild oysters, such dredging.

The second approach involves placing the spit or seed in containers that are held above the bottom, such as racks, sacks, or cages. This kind of oyster cultivation allows for the harvest of mature oysters by raising the bags or racks to the surface, or by simply re-trieving the bigger oysters when the enclosure is exposed at low tide. The second strategy, albeit more costly, could prevent losses from certain predators. The third approach involves placing the spit or seed in a cultch within a synthetic maturation tank. Water that has been carefully prepared with the intention of accelerating the oysters' development rate may be given to the maturation tank. Particularly, the water's temperature and salinity may be somewhat impacted by surrounding ocean water. The carbonate minerals calcite and aragonite in the water may hasten the development of oysters' shells and may also be used to filter the water before it is added to the tanks. While this latter kind of cultivation may be the least vulnerable to predators and poaching, it is the costliest to construct and maintain. The species most often raised with this kind of farming is the Pacific oyster, C. gigas.

Boats

Several shallow draught sailboat designs were developed in the United States throughout the nineteenth century for oystering in Chesapeake Bay. They included the skipjack, pungy, sharpie, log canoe, bugeye, and sharpie. A powerboat known as the Chesapeake Bay deadrise was also created in the 1880s. For usage in the region's mussel and oyster farming businesses, numerous boat manufacturers in Brittany have been producing specialised amphibious vehicles since 1977. The boats are built of aluminium, have a reasonably flat bottom, and, depending on the size of the boat, either three, four, or six wheels. Boats may use their wheels to go quickly over the tidal flats while the tide is out. They utilise a

propeller to travel across the water when the tide is in. Similar boats are used by Jersey oyster producers. Constructions Maritimes du Vivier Amphibie now offers a variety of models.

Effect on the Environment

Oyster and other shellfish farms might potentially relieve strain on land-based protein sources while being environmentally neutral or even regenerative. For the ecological services, such as water purification, that oyster populations offer, restoration is recommended. nutrient cycling and sequestration, coastline protection and sediment stability, quality maintenance, and habitat for other creatures. In Washington's Liberty Bay, a native Olympia oyster restoration project is underway, while the Chesapeake Bay is home to various more oyster restoration initiatives. Delaware is the only East Coast state in the US without oyster aquaculture, although it is being thought about creating aquaculture a state-controlled sector that leases water by the acre for shellfish harvesting. Advocates of Delaware's aquaculture legislation point to financial gains, the creation of jobs, and advantages for nitrogen cycling. One acre is thought to be able to generate up to 750,000 oysters, which may filter anywhere from 15 to 40 million gallons of water every day.

According to some estimates, a single oyster may filter 24-96 litres each day. A single acre of 750,000 oysters can filter 18,000,000–72,000,000 litres of water, eliminating the majority of suspended particulates. Sand, clay, silt, detritus, and phytoplankton are among the particles that oysters transport. Any of these particles may include dangerous pollution that comes from human-caused causes. These potentially dangerous contaminants may be sequestered by oysters, who can subsequently excrete them into the sediment at the bottom of streams, as opposed to being consumed by other filter feeders, which are then digested by larger creatures. Seaweed species may be put to the sediment to absorb the toxins in their plant tissues, which can then be collected and sent to a controlled region where the pollution won't harm the ecosystem.

Pests, diseases, and Predators

Starfish, oyster drill snails, stingrays, Florida stone crabs, birds like oystercatchers and gulls, as well as people, are some of the predators of oysters. Both the farmed C. virginica and C. gigas oysters are susceptible to the pathogens Perkinsus marinus and Haplosporidium nelsoni . Yet, compared to the C. gigas species of oyster, C. virginica are significantly more vulnerable to Dermo or MSX infections. Marteilia refringens and Bonamia ostreae are pathogens of O. edulis oysters. Oyster crabs may coexist with host oysters in the north Atlantic Ocean in an endosymbiotic, commensal relationship. Oyster crabs cannot be removed from immature farmed oysters since they are considered a gastronomic delicacy and may also be collected and sold separately.

Oyster cultivation pests are known as polydorid polychaetes. Byproducts, including waste, from one aquatic species are used as inputs for another aquatic species in integrated multi-trophic aquaculture. To create balanced systems for environmental remediation, economic stabilization, and social acceptability, farmers combine fed aquaculture with inorganic extractive and organic extractive aquaculture. In the Canadian Bay of Fundy, blue mussels are grown close to Atlantic salmon. Keep an eye out for the salmon cage in the distance. It is possible to create a stable equilibrium between the biological and chemical processes involved, which is mutually beneficial to the organisms and enhances the health of the ecosystem, by choosing the right species and scaling the different populations to offer critical ecosystem services. Ideally, the co-cultivated species provide profitable economic "crops" for each other. Even if some of the crops produce less than they would in a monoculture over the near term, IMTA may enhance overall production via synergistic effects.

Term Use and Related Methods

Using water-borne nutrition and energy transmission, "integrated" refers to intense and synergistic farming. The term "multi-trophic" refers to an ecosystem in which diverse species coexist at multiple trophic levels, or distinct links in the food chain. Aquatic polyculture, or IMTA, is a specific type of the age-old practise of co-cultivating multiple species, often without consideration for trophic level. In this more general scenario, the organisms may share marginally complimentary biological and chemical processes, which might potentially result in major ecological alterations or harm. While with restricted intensity and control, some ancient systems did cultivate species that inhabited different niches inside the same pond. For the integration of monocultures by water transfer, the broader term "Integrated Aquaculture" is employed. The main distinction between "IMTA" and "integrated aquaculture," which are frequently used interchangeably, is their level of accuracy. Variations of the IMTA idea include aquaponics, fractionated aquaculture, integrated agriculture-aquaculture systems, integrated peri-urban-aquaculture systems, and integrated fisheries-aquaculture systems.

Variety of Methods

Modern IMTA is far less frequent than low-intensity traditional/incidental multi-trophic aquaculture nowadays. The majority are rather easy, such fish, seaweed, and shellfish. Real IMTA may be land-based and use freshwater or marine open-water systems, ponds, or tanks. Species combinations such shellfish/shrimp, fish/seaweed/shellfish, fish/seaweed, fish/shrimp, and seaweed/shrimp have been included.

By using buoys with lines on which the seaweed grows, IMTA in open water may be accomplished. The buoys and lines are positioned near to the cages or fishnets where the fish is being raised. In Norway, Scotland, and Ireland, this technique is already in use for commercial purposes. Future

systems are expected to include more components for other purposes, or comparable functions but with different particle size ranges. Several regulatory concerns are still unresolved.

Modern Land-based System History

Modern, intense, integrated land mariculture was developed by Ryther and his colleagues. They pioneered the integrated use of extractive organisms—shellfish, microalgae, and seaweeds—in the treatment of home effluents, both conceptually and empirically, descriptively and quantitatively. A home wastewater effluent was used as a nutrition source for phytoplankton, which in turn provided food for oysters and clams when combined with saltwater. They raised more organisms as part of a food chain based on the organic sludge from the farm. Seaweed biofilters were used to remove dissolved nutrients from the final effluent. The earliest microbes developed on human waste effluents had very little usefulness.

Huguenin advocated changes to the way intensive aquaculture effluents were handled in both upland and coastal locations in 1976. Tenore then assimilated into their community of carnivorous fish and the macroalgaevorous abalone. Hughes-Games initially detailed a usable marine fish, shellfish, and phytoplankton culture in 1977, and Gordin and colleagues did the same in 1981. At the Gulf of Aqaba, in the Red Sea, by 1989, a semi-intensive seabream and grey mullet pond system supported thick diatom populations, which were good for feeding oysters. Fish and oysters raised here in large quantities were sold. Researchers also calculated the nutrient budgets and water quality parameters in ponds for green water seabream. In general, the phytoplankton kept the water's quality tolerable and turned, on average, more than half of the waste nitrogen into algal biomass. High bivalve growth rates were obtained in experiments using intense bivalve cultures. A little farm in southern Israel was made possible by this technique.

Sustainability

By transforming leftovers and uneaten feed from fed organisms into harvestable crops, IMTA promotes economic and environmental sustainability by lowering eutrophication and increasing economic diversification. Multitrophic aquaculture that is properly handled speeds up growth without having negative impacts. By improving the site's capacity to digest the produced organisms, harmful environmental effects are decreased. By substituting bought inputs with byproducts from lower trophic levels, frequently without the addition of additional sites, IMTA allows farmers to vary their production. According to preliminary economic studies, IMTA may boost revenue and lower financial risks brought by by bad weather, illness, and market changes. Since 1985, more than a dozen studies have looked at the economics of IMTA systems.

Biochemical Flow

The upper trophic levels of IMTA are often occupied by carnivorous fish or shrimp. They expel phosphorus and soluble ammonia. Seaweed and related species may directly absorb these inorganic nutrients from their surroundings. Moreover, the organic nutrients released by fish and shrimp nourish shellfish and deposit feeders. Animals that live at intermediate trophic levels, like shellfish, often provide a dual function by filtering organic bottom-level species from the water and producing some ammonia. Additional nutrients may also be provided through waste feed, either directly or by breakdown into separate nutrients. In certain initiatives, the leftover nutrients are also harvested and utilised to supplement the diet of fish raised in ponds. This may occur by turning the seaweed that has been cultivated into food.

Effectiveness of Recovery

Technology, harvest timing, management, spatial layout, species choice, trophic level biomass ratios, natural food availability, particle size, digestibility, season, light, temperature, and water flow all have a role in nutrient recovery efficiency. Recovery effectiveness varies by location and area because of these variables, which significantly differ.

Based on pilot size research, a hypothetical family-scale fish, microalga, bivalve, and seaweed farm would get at least 60% of the nutrients added, which is roughly three times more than contemporary net pen farms. The system was predicted to provide an average annual production of 35 tonnes of seabream, 100 tons of bivalves, and 125 tonnes of seaweed on a hypothetical 1 hectare. As a consequence of the challenges in sustaining stable phytoplanton populations, these findings necessitated pre-cise water quality management and attention to appropriateness for bivalve feeding. In land-based systems, the nitrogen absorption efficiency of seaweeds varies from 2 to 100%. Unknown is the open-water IMTA's uptake effectiveness.

III. CONCLUSION

Contamination might result from feeding one species' excrement to another, while IMTA systems haven't yet seen this. Since 2001, the Bay of Fundy has been examined for pesticides, heavy metals, PCBs, and medication pollution in mussels and kelp growing next to cages for Atlantic salmon. Regulatory limits set by the Canadian Food Inspection Agency, the US Food and Drug Administration, and the European Community Directives are consistently either non-detectable or substantially below those levels. These mussels had no "fishy" flavour or odour, according to tasters who were unable to differentiate them from "wild" mussels. The increased availability of nutrients is reflected in the mussels' improved meat output. Recent research indicates that mussels raised next to salmon farms are better for harvesting in the winter because they keep high meat weight and condition index. The Bay of Fundy, where this research was conducted, produces lowcondition index mussels during the winter months in monoculture settings, and the seasonal

presence of paralytic shellfish poisoning typically restricts mussel harvest to the winter months. As a result, this finding is particularly intriguing.

REFERENCES

[1] S. Kandrot, S. Hayes, and P. Holloway, "Applications of Uncrewed Aerial Vehicles (UAV) Technology to Support Integrated Coastal Zone Management and the UN Sustainable Development Goals at the Coast," Estuaries and Coasts. 2022. doi: 10.1007/s12237-021-01001-5.

[2] B. P. Mohanty, S. Ganguly, A. Mahanty, T. Mitra, and S. Mohanty, "Nutrigenomics and fish," CAB Rev. Perspect. Agric. Vet. Sci. Nutr. Nat. Resour., 2020, doi: 10.1079/PAVSNNR202015048.

[3] K. K. Krishnani, G. Gopikrishna, S. M. Pillai, and B. P. Gupta, "Abundance of sulphur-oxidizing bacteria in coastal aquaculture using soxB gene analyses," Aquac. Res., 2010, doi: 10.1111/j.1365-2109.2009.02415.x.

[4] D. L. Pelic et al., "Slaughter yield and chemical composition of Siberian sturgeon reared in a recirculating aquaculture system (RAS)," 2021. doi: 10.1088/1755-1315/854/1/012055.

[5] FAO, "FAO Aquaculture Newsletter 52," FAO Aquaculture Newsletter, 2016.

[6] B. U. Foesel, H. L. Drake, and A. Schramm, "Defluviimonas denitrificans gen. nov., sp. nov., and Pararhodobacter aggregans gen. nov., sp. nov., non-phototrophic Rhodobacteraceae from the biofilter of a marine aquaculture," Syst. Appl. Microbiol., 2011, doi: 10.1016/j.syapm.2011.08.006.

[7] X. X. Zou, S. S. Xing, X. Su, J. Zhu, H. Q. Huang, and S. X. Bao, "The effects of temperature, salinity and irradiance upon the growth of Sargassum polycystum C. Agardh (Phaeophyceae)," J. Appl. Phycol., 2018, doi: 10.1007/s10811-017-1282-4.

[8] P. Bronzi and H. Rosenthal, "Present and future sturgeon and caviar production and marketing: A global market overview," J. Appl. Ichthyol., 2014, doi: 10.1111/jai.12628.

[9] I. Mladineo and M. Tudor, "Digenea of Adriatic cage-reared northern bluefin tuna (Thunnus thynnus thynnus)," Bull. Eur. Assoc. Fish Pathol., 2004.

[10] T. Liu et al., "Genome sequence of the fish pathogen yersinia ruckeri SC09 provides insights into niche adaptation and pathogenic mechanism," Int. J. Mol. Sci., 2016, doi: 10.3390/ijms17040557.

[11] [J. Xiao et al., "Effect of temperature, salinity and irradiance on growth and photosynthesis of Ulva prolifera," Acta Oceanol. Sin., 2016, doi: 10.1007/s13131-016-0891-0.

[12] X. Liu, Y. Liu, J. R. Xu, K. J. Ren, and X. Z. Meng, "Tracking aquaculture-derived fluoroquinolones in a mangrove wetland, South China," Environ. Pollut., 2016, doi: 10.1016/j.envpol.2016.09.011.

[13] E. Pafnutova, I. Shirokorad, O. Fadeeva, O. Oleksenko, and E. Zhelonkina, "Training of Specialists for the Rational Use and Protection of Aquatic Biological Resources," BIO Web Conf., 2021, doi: 10.1051/bioconf/20213700142.

Classification of Aquaculture According to Species

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Abstract— For the cultivation and collection of several marine species, aquaculture has shown to be very beneficial. Popular species that have been included in aquaculture farming include seaweed, catfish, algae, giant kelp, sea cucumbers, and more. The concepts covered in this chapter are crucial for expanding our understanding of aquaculture.

Index Terms— Fish Farming, Fish Species, Sponge Culture, Seaweed Cultivation, Wild Salmon

I. INTRODUCTION

Algaculture is a kind of aquaculture that involves growing various types of algae. The vast majority of purposely grown algae belong to the class of microalgae. While macroalgae, often known as seaweed, have several industrial and commercial applications, cultivation of these organisms is more difficult due to their size and unique environmental requirements. The production of food ingredients like omega-3 fatty acids or natural food colourants and dyes, food, fertiliser, bioplastics, chemical feedstock , pharmaceuticals, and algal fuel are just a few of the many uses for commercial and industrial algae cultivation. It can also be used to reduce pollution.

Harvesting, Cultivating, and Processing Monoculture of algae

The majority of producers choose monocultural cultivation and take great pains to keep their cultures pure. If a non-dominant species is thought to have specific value, it is vital to get pure cultures in order to nurture this species. With mixed cultures, one species gradually becomes dominant. For study, individual species cultures are also required. Serial dilution is a typical technique for creating pure cultures. A natural sample or a lab sample containing the desired algae is diluted by cultivators with filtered water before being fed in small amounts to a large number of tiny growth containers. A microscopic analysis of the source culture indicates that a single cell of the target species would be present in a few of the developing containers, which leads to dilution. Cultivators once again utilise a microscope to choose containers to begin bigger cultures after a proper time on a light table.

Using a particular medium that prohibits other species, such as invading algae, is another strategy. For instance, the microalgae species Dunaliella, which is often cultivated, thrives in very saline water that is inhospitable to most other creatures. For larval mollusks, mixed algae cultures are a good alternative. The cultivator first filters the seawater to get rid of the huge algae that the larvae can't feed. The cultivator then adds fertilisers and may aerate the end product. The resultant thin soup of mixed algae is prepared for the larvae after one or two days in a greenhouse or outside. Less maintenance is a benefit of this approach.

Increasing Algae

Brine shrimp are cultured on microalgae to yield latent eggs. The developed eggs may then be fed to cultured fish larvae and crustaceans on demand. Algae have diverse needs, and different types of algae need varying amounts of water, carbon dioxide, minerals, and light during production. Carbon dioxide + light energy + water = glucose + oxygen + water is the primary chemical process for algae development in water. We refer to this as autotrophic growth. Certain forms of algae can also thrive in the absence of light; these algae eat carbohydrates. Heterotrophic growth is what is meant by this.

Temperature

The water has to be between 25 and 35 degrees C, which is the temperature range that will sustain the particular algae species being produced.

Mixing and Light

Light only reaches the top 3 to 4 inches of the water in a typical algal-cultivation system, such an open pond, however this varies depending on the density of the algae. The culture of algae grows and multiplies until it is so thick that it prevents light from penetrating farther into the water. However, exposing an algae culture to direct sunlight is frequently the best course for strong growth because the algae beneath the surface get lighter. Direct sunlight is too strong for most algae, which can use only about 1 the amount of light they receive from direct sunlight.

Growers stir the water in deeper ponds to circulate the algae and prevent it from sticking to the top. Water may be stirred by paddle wheels, and algae from the bottom is lifted by compressed air coming from the bottom. Moreover, agitation lessens the risk of excessive solar exposure. Placing the light within the system is another way to provide illumination. The light intensity may be precisely controlled and distributed more uniformly with the use of glow plates, which are formed from sheets of plastic or glass and put

within the tank. Yet, owing to their exorbitant price, they are seldom utilised.

Oxygen and smell

The smell associated with bogs, swamps, and indeed anybody of still water may be brought on by the depletion of oxygen brought on by the decomposition of dead algal blooms. The bacteria that live in algal cultures breakdown organic material in an anoxic environment to create hydrogen sulphide and ammonia, which are responsible for the stench. Animals living in water often perish as a consequence of this hypoxia. Eutrophication or hypoxia are unlikely to happen in a system where algae are produced, maintained, and harvested on purpose [1]–[3].

Certain live algae and bacteria, especially those like Anabaena, create pungent compounds as well. The most well-known of these odor-producing substances are geosmin and MIB. They may have a very powerful musty or earthy smell. More gas that was trapped in the cells is released when the cyanobacteria eventually die. These substances, which cause several "taste and odour" problems in the treatment and distribution of drinking water, are detectable at very low concentrations, in the parts per billion range. Chemical poisons that cyanobacteria can create have been a hazard in drinking water.

Nutrients

Algae need nutrients like nitrogen, phosphorus, and potassium as fertiliser, and these elements are often required for growth. Several trace elements, like silica, iron, and others, may also be regarded as significant marine nutrients since their absence might restrict development or production in a particular region. Moreover, carbon dioxide is crucial since algal development often requires a CO2 input. For algae to develop, these components must be dissolved in the water in forms that are bioavailable to them. Techniques for Pond and Bioreactor Cultivation. Algae may be grown in photobioreactors and open ponds. Ponds at racetracks could be less pricey.

Vacant Ponds

Lakes and ponds in the raceway style are exposed to the elements. Open ponds are quite susceptible to contamination from other microbes, such as bacteria or other algae species. As a result, closed systems are often chosen by farmers for monocultures. Moreover, open systems do not provide temperature and lighting management. With the exception of tropical regions, the growth season is mainly confined to the warmer months. Raceway pond for growing microalgae. A motorised paddle wheel maintains steady motion in the water. Open pond systems are easier to build since they simply need a trench or pond as a foundation. Comparatively speaking to other systems of equivalent cost, big ponds have the highest output capacity. Moreover, open pond farming might take advantage of peculiar circumstances that are exclusively favourable to a certain kind of algae. For

instance, Dunaliella salina may flourish in excessively saline water. Since these peculiar growth conditions are inhospitable to other kinds of organisms, pure cultures can develop in open ponds. Open culture may also be successful if there is a method for just collecting the appropriate algae or if the ponds are regularly reinoculated before invasive species can considerably increase their population. Chlorella growers usually use the latter strategy since rival algae may thrive in the same circumstances as chlorella.

Certain chain diatoms may be filtered from a stream of water passing via an outflow pipe, therefore the first method can be used in this situation. Some algae may escape by being tied over the outflow pipe with a "pillow cover" made of tiny mesh fabric. At Eastern hatcheries, the chain diatoms are kept in the bag and used to aerate fresh ponds or tanks as well as feed shrimp larvae. A pond may be efficiently transformed into a greenhouse by enclosing it with a transparent or translucent barrier. This eliminates a lot of the issues with an open system. It extends the growth season, enables the species that are being produced to remain dominant, and, if heated, provides for year-round production in the pond. Live Spirulina sp. was employed to remove lead from open raceway ponds.

Photobioreactors

Furthermore, algae may be cultivated in a photobioreactor. A PBR is a kind of bioreactor that includes light. A PBR might be almost any transparent container, however the phrase is more often used to refer to a closed system than an open tank or pond. Because of the closed nature of PBR systems, all nutrients, including CO2, must be supplied by the farmer. Although a PBR may run in "batch mode," replenishing the reactor after each harvest, it can also continually grow and harvest. For continuous functioning to continue without an imminent collapse, all components must be precisely controlled. At the proper rates, the grower supplies nutrients, oxygen, carbon dioxide, and sterilised water. As a result, the reactor may run continuously. A benefit of "log phase" algae is that it often contains more nutrients than older "senescent" algae. The cultivation of algae in ponds or other resources is known as algal culture. When the "exchange rate" and the "doubling time" of the algae are equal, the productivity is at its highest level. PBRs come in a variety of forms, such as: tanks, polyethylene sleeves, or bags.

Harvesting

On Nusa Lembongan, a seaweed farmer collects edible seaweed that has grown on a rope. Microscreens, centrifugation, flocculation, and froth flotation may all be used to collect algae. Algae may flocculate on their own as a result of a disruption in the carbon dioxide supply, a process known as "autoflocculation". Commercial flocculants like "Chitosan," which are more often employed to purify water, are much more expensive. Crustacean powdered shells are processed to get chitin, a carbohydrate present in the shells,

which is then used to create chitosan via the deacetylation process. More levels of flocculant are needed for water that is more brackish or salty. Large enterprises often cannot afford flocculation. Among the other chemical flocculants are alum and ferric chloride. In froth flotation, the cultivator creates a froth in the water before skimming the algae off the surface. Other harvesting techniques, including ultrasound, are now being developed.

Extraction of oil

Algae oils are extracted using a number of techniques and have several industrial and commercial applications. Microalgae oil extraction is thought to cost around three times as much as palm oil extraction, according to various estimates.

Exercise Extraction

The oil has to be distinguished from the remaining algae as the first stage in the extraction process. Mechanical crushing is the most straightforward technique. Algae that has been dried keeps its oil, which may be "pressed" out using an oil press. Various strains of algae call for various oil pressing techniques, such as the use of a screw, expeller, and piston. In order to extract oil, many commercial vegetable oil producers use mechanical pressing and chemical solvents. This method is often used to extract algae-based oils as well. A fast drop in osmotic pressure may result in osmotic shock, which can rupture cells in a solution. Osmotic shock is sometimes utilised to liberate cellular materials like oil.

Processes for extracting materials may be considerably accelerated by ultrasonic extraction, a subfield of sonochemistry. Ultrasonic waves are employed in an ultrasonic reactor to induce cavitation bubbles in a solvent substance. These cells' walls shatter when these bubbles burst close to them, releasing their contents into a solvent as a consequence of the shock waves and liquid jets that occur. Basic enzymatic extraction may be improved by ultrasonication. The "sonoenzymatic treatment" boosts yields and speeds up extraction [4]–[6].

Compound Extraction

The extraction of the oils often involves the use of chemical solvents. The risks associated with handling the chemicals make utilising solvents for oil extraction undesirable. Both physical contact and exposure to fumes must be avoided since they both pose a substantial risk to one's health. Explosion risks are also inherent with chemical solvents.

Hexane, which is frequently used in the food business and is reasonably priced, is a popular option of chemical solvent. Oil may also be divided using benzoene and ether. Benzene is a substance that causes cancer.

Soxhlet extraction is an additional technique for chemical solvent extraction. This process involves repeatedly percolating an organic solvent, such as hexane or petroleum ether, under reflux in specialised glassware to extract the oils

from the algae. This method's benefit is that the solvent is utilised again after each cycle. Enzymes are used in enzymatic extraction to break down the cell walls while water serves as the solvent. As a result, fractionating the oil is simpler. This extraction procedure is expected to be substantially more expensive than the extraction of hexane. Ultrasonication may assist in the enzymatic extraction. The "sonoenzymatic treatment" accelerates oil extraction and increases oil yields.

Another use for supercritical CO_2 is as a solvent. In this process, CO_2 is heated until it becomes supercritical and then liquefies under pressure, acting as a solvent.There are still more techniques being developed, such as those for extracting certain kinds of oils, such those with a high concentration of long-chain, highly unsaturated fatty acids.

II. DISCUSSION

Algal culture collections, of which there are more than 500 recognised with the Global Federation for Culture Collections, may be used to get certain algal strains. Purple laver is perhaps the most common marine algae that has been domesticated. It is used in nori and gim in Asia. It is gathered and turned into a jelly by stewing or boiling in Ireland and used in Wales to make laverbread, a traditional dish. A pinkish jelly may also be created by frying or boiling the fronds with a little water during the preparation process. Moreover, harvesting takes place in Hawaii, New Zealand, and throughout the west coast of North America. A red species known as dulse is marketed in Ireland and Atlantic Canada. It may be consumed fresh, dried, cooked, or uncooked, much like spinach.

The blue-green microalgae spirulina has a long history of use as a food source in East Africa and pre-colonial Mexico. Spirulina is used as a dietary supplement and for malnutrition since it is rich in protein and other nutrients. Open systems are ideal for spirulina's growth, and commercial farmers have discovered that they can successfully cultivate it. Lake Texcoco in central Mexico is one of the biggest producing locations. Many nutrients, including large quantities of protein, are produced by the plants. Spirulina is often utilised in food supplements on the market. Spirulina and chlorella, two popular microalgae, are nutritionally comparable. In Japan, chlorella is particularly well-liked. It is furthermore utilised as a dietary supplement with potential benefits on metabolic rate. Others claim that chlorella may lower human mercury levels.

Irish moss, which is sometimes mistaken with Mastocarpus stellatus, is the source of carrageenan, a substance used to add stiffness to dairy goods including ice cream, sauces, and quick puddings. Brewers of beer also employ Irish moss as a fining agent. In Scotland, sea lettuce is used as a garnish for salads and soups. Alaria esculenta, often known as dab-berlocks or badderlocks, is consumed in Greenland, Iceland, Scotland, and Ireland both raw and cooked.

Aphanizomenon flos-aquae is a cyanobacteria that resembles spirulina, a dietary supplement. Other food items also employ algae extracts and oils as additives. Omega-3 and Omega-6 fatty acids, which are often found in fish oils and have been proved to have beneficial effects on health, are also produced by the plants. The species of sargassum constitute a significant class of seaweeds. These algae contain a lot of phytotanins. In Chile and Peru, cochayuyo is used in salads and ceviche.

Plant Food and Agar

Seaweed has been used as fertiliser for ages. For the production of potash and potassium nitrate, it is also a great source of potassium. Agar is produced using both microalgae and macroalgae.

Controlling pollution

New techniques for the complete and effective collection of CO2 are being sought after due to concerns about global warming. An open or closed algae system may use the carbon dioxide that a carbon-fuel burning plant generates to fix the CO2 and speed up algae growth. Untreated sewage may contribute more nutrients, converting two contaminants into priceless resources. The growth of algae is being investigated for its potential to cleanse fertiliser runoff and sequester uranium/plutonium.

Energy Generation

The use of algae to produce gasoline, diesel, and other fuels is being investigated by industry, academia, and governments. Algae itself has the potential to be utilised as a biofuel and to produce hydrogen.

Uses Besides

Because of its capacity to convert Hg2+ into elemental mercury, which is less harmful, chlorella, especially a transgenic strain that includes an additional mercury reductase gene, has been investigated as a tool for environmental cleanup. Other uses for grown algae include the creation of cosmetics, animal feed, bioplastics, dyes and colourants, chemical feedstock, and medicinal components.

On Nusa Lembongan, a seaweed farmer collects edible seaweed that has grown on a rope. The activity of growing and collecting seaweed is known as seaweed farming. It comprises, in its most basic form, of the management of naturally occurring batches. In its most sophisticated version, it entails total control over the algae's life cycle. Gelidium, Pterocladia, Porphyra, and Laminaria are the principal food species farmed by aquaculture in Japan, China, and Korea. Several times, seaweed farming has been established as an option to better the economy, lessen fishing pressure, and protect overfished fisheries. Seaweeds are collected all over the globe for use as a food source and as an exportable commodity for the manufacture of agar and carrageen-based goods.

History

At Tokyo Bay, seaweed cultivation started in Japan as early as 1670. Farmers would drop bamboo branches into muddy, shallow water in the fall each year, where the seaweed spores would gather. These branches would be relocated to a river estuary a few weeks later. The seaweed would benefit from the river's nutrients as it grew. The Japanese enhanced this technique in the 1940s by affixing synthetic material nets to bamboo poles. The output was essentially doubled as a result. The hibi technique, which uses simple ropes strung between bamboo poles, is a less expensive variation of this procedure.

Early in the 1970s, there was a demand for seaweed and seaweed products that was greater than the supply, and farming was seen as the most effective way to boost output.

Cultural Techniques

Laminaria seaweed and reef flats at around 1 m depth at low tide were encouraged for growing in the early seaweed farming manuals in the Philippines. Prior to the development of the farm, they also advised chopping off sea grasses and eliminating sea urchins. The seedlings are then strung between mangrove pegs driven into the substrate and attached to monofilament lines. One of the most popular techniques still in use today is the off-bottom approach. There are new long line cultivation techniques that can be used in water that is 7 metres deep or deeper. These are the main techniques utilised in the Indonesian communities of North Sulawesi, where they employ floating cultivation lines that are anchored to the ground. In Asia, seaweed cultivation is a low-tech industry with a significant labour need. Several efforts to use advanced technology to cultivate unattached plants growing in tanks on land in order to minimise labour have been made in different nations, but they have not yet achieved commercial viability.

Effects on the Environment and Ecosystems

Seaweed cultivation has the potential to cause a variety of environmental issues. Mangroves are sometimes felled by seaweed growers so they may utilise the wood as pegs for their ropes. Yet, this has a detrimental impact on farming since it depletes the mangroves' biodiversity and lowers the water quality. Eelgrass may sometimes need to be removed from agricultural areas. Yet, this is also discouraged since it adversely affects the quality of the water.

By boosting variety where algae and seaweed have been introduced and by giving native fish and invertebrate species a new niche, seaweed farming aids in the preservation of coral reefs. By expanding the population of shellfish and fish that eat plants, farming may be advantageous. With the beginning of significant eucheuma seaweed cultivation in communities in North Sulawesi, Indonesia, Pollnac & et al. Documented an increase in Siginid population. Moreover, extra nutrients may be captured, absorbed, and finally incorporated into live tissue via seaweed cultivation. The recommended phrase for bioremediation with cultivated plants and animals is "nutrient bioextraction". Seaweed

farming may play a role in biological carbon sequestration. Nutrient bioextraction, also known as bioharvesting, is the technique of cultivating and harvesting shellfish and seaweed with the goal of extracting nitrogen and other nutrients from natural water bodies.

Social Effects

North Cape seaweed harvesting

Seaweed cultivation is now widely practised outside of Japan. In the Philippines, seaweed farming was thought to provide a livelihood for 40,000 people in 1997. All of Southeast Asia, Canada, Great Britain, Spain, and the United States all use cultivation.

Social and economic factors

Nori is one of the most lucrative aquaculture crops in the world, with a US$2 billion yearly output value in Japan alone. The great demand for seaweed means that the local population has plenty of employment options. According to a research from the Philippines, pieces of land of around one hectare may provide net revenue from eucheuma cultivation that is 5 to 6 times more than the national minimum wage for agricultural workers. Seaweed exports increased from 675 metric tonnes in 1967 to 13,191 MT in 1980, and then more than quadrupled to 28,000 MT by 1988, according to the same research. Raising fish for a living in tanks or cages is called fish farming or pisciculture. Although other practises may be classified as mariculture, it is the primary kind of aquaculture. A fish hatchery is often referred to as a location that releases young fish into the wild for recreational fishing or to increase the population of a species. Carp, tilapia, salmon, and catfish are the most significant fish species raised for food around the world.

Indoor koi aquaculture in Israel

Fish and fish protein are in higher demand, which has led to widespread overfishing in wild fisheries. Sixty-two percent of the world's farmed fish is supplied by China. As of 2016, aquaculture generated more than 50% of all seafood. Although carnivorous farmed fish are often fed fishmeal and fish oil taken from wild forage fish, farming carnivorous species, such as salmon, does not necessarily relieve strain on wild fisheries. The FAO estimated that fish farming generated worldwide profits in 2008 of 33.8 million tonnes, or almost US$60 billion.

Growth is limited by the amount of food that is readily accessible; typically, zooplankton graze on pelagic algae or benthic creatures like crabs and mollusks. The direct feeding of tilapia on phytoplankton enables increased productivity. Pond water that has been fertilised with artificial fertiliser combinations including potash, phosphate, nitrogen, and microelements will produce more photosynthetic material. The possibility of algal blooms is another problem. Algae grow exponentially when conditions such as temperature, availability of nutrients, and sunlight are favourable for their development. When nutrients are exhausted, alga dies off.

Since it screens out the sun and pollutes the water with organic and inorganic solutes, the decaying algal biomass will reduce the amount of oxygen in the pond. This may result in a significant loss of fish.

Using a wetland system, like the one at Veta La Palma, is an alternative choice. The aquaculturist will select fish species that occupy different places in the pond ecosystem, such as a filter algae feeder like tilapia, a benthic feeder like carp or catfish, and a zooplankton feeder or submerged weeds feeder like grass carp, in order to take advantage of all the food sources in the pond. Notwithstanding these restrictions, these techniques are widely used in the fish farming industry. Trout and carp are taken out of thousands of natural and semi-natural ponds every year in the Czech Republic. The sizable ponds in the Trebon area date back to around 1650 and are still in use today. As long as enough oxygen, clean water, and food are available, these systems allow for flexible adjustments in fish output per unit of surface. A substantial water purification system must be implemented into the fish farm due to the need for enough fresh water. Combining water treatment with hydroponic agriculture is one approach to do this. The only exception to this rule are cages submerged in a river or ocean, which provide enough oxygenated water to augment the fish harvest. Several environmentalists are against this method.

Female rainbow trout expressing eggs

Because to the high cost of fish feed, which must have a substantially greater amount of protein than cattle feeding and a balanced amino acid composition as well, the cost of inputs per unit of fish weight is higher than in extensive farming. However these increased protein needs are a result of aquatic species' better food conversion efficiency. In contrast to chickens, who have an FCR of 2.5 kg of feed per kilogramme of chicken, fish like salmon have an FCR of roughly 1.1 kg of feed per kg of salmon? As fish don't need to consume energy to stay warm, their diets don't need to include as much carbs and lipids. The cheaper land prices and greater yields that may be attained because of the high degree of input control, however, could balance this out.

The water must be aerated since fish require a sufficient amount of oxygen to flourish. Aqueous oxygen, cascade flow, or bubbling are used to accomplish this. Clarias species are particularly well adapted for intensive fish production since they can breathe atmospheric air and can withstand far greater amounts of pollution than trout or salmon. This makes aeration and water purification less essential. Around 10% of the water volume in certain Clarias farms may be made up of fish biomass.

Similar to animal husbandry, particularly at high population densities, the danger of infections by parasites such fish lice, fungus, intestinal worms, bacteria, and protozoa is comparable. Yet, animal husbandry is a more substantial and developed technical aspect of human agriculture, and better pathogen problems have answers. In order to reduce stress, intensive aquaculture must supply

acceptable water quality, which complicates the pathogen issue. This indicates that strict oversight and a high degree of fish farmer skill are required for intensive aquaculture.

High value species are being raised in very high intensity recycle aquaculture systems, where all production parameters are under control. Very little water is utilised per unit of production because to water recycling. The procedure does have substantial startup and ongoing expenses, however. RAS is only financially viable for high value items like broodstock for egg production, fingerlings for net pen aquaculture operations, sturgeon production, research animals, and other unique niche markets like live fish because to the higher cost structures.

Although being potentially far more lucrative because to the increased revenue per weight of fish produced, raising ornamental cold water fish has never been done effectively until very recently. Many nations have started projects for closed system koi breeding and growth due to the rising prevalence of harmful viral infections in koi carp and the high value of the fish. Nowadays, the UK, Germany, and Israel all have a few economically viable intensive koi rearing operations. In an attempt to supply customers with fish that don't harbour latent viruses and infections, several companies have modified their intensive systems. In lieu of fish oil, young Nile tilapia were fed a diet in 2016 that included dried Schizochytrium. They gained more weight and had greater food-to-growth conversion than a control group reared on normal diet, and their meat contained more omega-3 fatty acids.

Farmed fish

There are various distinct kinds of fish farms that use intense and extensive aquaculture techniques; each offers advantages and uses particular to its design.

System Cage

To keep fish contained and protected until they can be caught, fish cages are positioned in lakes, bayous, ponds, rivers, and seas. The approach is sometimes dubbed "off-shore agriculture" when the cages are put in the water. They may be built from a broad range of materials. Fish are artificially fed, kept in cages until they reach market size, and then harvested. Several different kinds of waterways may be utilised for fish farming using cages, many different fish can be bred, and fish farming can coexist with recreational fishing and other water usage. Fish farming in open waters in cages is likewise becoming more and more common. Some people think that pond systems are often easier to maintain and simpler to start due to worries about illness, poaching, poor water quality, etc. Concerns about the cultivation of non-native fish species in dam or open-water cages have also been raised in the past as a result of cage failures that resulted in escapes. Storms will always make the risk about escapes legitimate, despite the cage industry's many technical advancements in recent years.

Thailand's central region is known for raising giant gourami in cages. Copper alloys have recently emerged as crucial netting components in aquaculture. As antimicrobials, copper alloys eliminate bacteria, viruses, fungus, algae, and other organisms. Copper alloys' antibacterial and algaecidal characteristics protect maritime structures against biofouling, which is the unwelcome buildup, adhesion, and development of microorganisms, plants, algae, tube worms, barnacles, mollusks, and other species. For farmed fish to develop and flourish, a cleaner and healthier environment is also provided by the resistance of organism growth on copper alloy nets. Regular and labor-intensive cleaning is required for conventional netting. Copper netting offers high structural and corrosion-resistant qualities in maritime conditions in addition to its antifouling advantages.

Now, commercial-scale aquaculture operations are using copper-zinc brass alloys throughout Asia, South America, and the USA. Two further copper alloys, copper-nickel and copper-silicon, are now the subject of extensive study, including experiments and demonstrations. Each of these alloy types has the innate capacity to minimise biofouling, illness, cage waste, and the demand for antibiotics, all the while maintaining water circulation and oxygen requirements. For research and development in aquaculture operations, other varieties of copper alloys are also being taken into consideration.

Pond or Irrigation Ditch Systems

They rear fish in agricultural ponds or irrigation ditches. The primary prerequisite is having a water-retentive ditch or pond, potentially with an above-ground watering system. Using this technique, one may store their allotted water in ponds or ditches that are often coated with bentonite clay. Small systems often use commercial fish food to feed the fish, and the waste they produce may help fertilise the land. In bigger ponds, the pond produces algae and water plants for fish food. Introduced plant and fish strains are both grown in some of the most productive ponds.

These fish farming ponds were built as a group effort in a small town. Water quality must be managed. As long as eutrophication is avoided and oxygen levels are maintained at a high level, fertilising, clarifying, and controlling the pH of the water may significantly enhance yields. If the fish get sick from electrolyte stress, yields may be minimal.

Multi-Fish Culture

The Indian Council of Agricultural Research created the Composite fish culture technique there in the 1970s. With this technique, a combination of five or six different fish species are employed in a single fish pond, including both native and imported fish species. These species were chosen in order to prevent food competition amongst them due to their diversity of food environments. As a consequence, all of the pond's food sources are used. Catla and silver carp, which are surface feeders, rohu, a column feeder, and mrigal and common carp, which are bottom feeders, are among the fish utilised in this system. The common carp's excrement will be

consumed by other fish, which increases the system's effectiveness and, under ideal circumstances, allows it to generate 300–600 kg of fish per acre each year.

The fact that many of these fish only reproduce during the month of May is a drawback to such composite fish cultivation. Fish seed may be combined with seed from other species even if it is taken from the wild. Thus, a significant issue in fish growing is the scarcity of high-quality seed. The solution to this issue is that these fish may now be bred in ponds utilising hormonal stimulation. This has made sure that there is an adequate supply of pure fish seed.

Systems for Integrated Recycling

Freshwater pisciculture may take up to a million gallons of water per acre annually, which is one of the biggest issues. Extended water filtration systems enable the recycling of nearby water. The biggest pure fish farms employ a technology that was developed by the New Alchemy Institute in the 1970s. Fundamentally, a greenhouse is furnished with large plastic fish tanks. They are surrounded by, above, or in between a hydroponic bed. When tilapia are reared in tanks, they may consume the algae that grows there naturally when the tanks are fertilised appropriately.

The tilapia faeces nourishes commercial plant crops in hydroponic beds where tank water is gently cycled. Ammonia is converted to nitrates and phosphates by carefully grown microbes in the hydroponic bed, which fertilises the plants. The hydroponic medium, which also functions as an aerated pebble-bed filter, filters out other wastes. This technology generates more edible protein per unit area than any other when it is calibrated appropriately. The hydroponic beds can support the growth of a broad range of plants. The majority of producers focus on herbs, such parsley and basil, which are in high demand year-round and fetch premium prices in tiny amounts. Wholesalers to restaurants are the most frequent clients.

As the system is greenhouse-based, it can adapt to practically any temperate environment and maybe tropical climes as well. The biggest environmental consequence is the outflow of salty water needed to maintain the electrolyte balance of the fishes. Growers now employ a number of secret techniques to maintain fish health while saving money on salt and waste water discharge licences. In order to maintain the Tilapia healthy with recirculated water, some veterinary experts believe that UV ozone disinfection systems may play a significant role. Several sizable, well-funded endeavours in this field have failed. Balancing biology and markets at the same time is challenging. The integration of integrated recycling systems with urban farming, as done in Sweden by the Greenfish programme, is one potential development.

Traditional Fry Farming

Another name for this is "Flow through system." Sometimes, trout and other sport fish are trucked to streams as fry or fingerlings and then released. Often, fresh stream water is used to feed the fry in long, shallow concrete tanks. Commercial fish food is fed to the fry in pellets. It is also far more straightforward and has been used for many years to spawn streams with sport fish, although not being as effective as the New Alchemists' technique. Glass eels, the juvenile stages of the European eel, travel north from the Sargasso Sea breeding grounds for the European eel aquaculture industry. The European eel is in danger of becoming extinct because Spanish fisherman capture too many glass eels, and adult eels are overfished in places like the Dutch IJsselmeer in the Netherlands. No one has been able to successfully breed the European eel in captivity as of 2005.

Issues

Fish farming feeds have long been a contentious topic. Many farmed fish, including tilapia, carp, and catfish, do not need to consume meat or fish products. The majority of salmon species, which are top-level carnivores, rely on fish feed, a part of which is often made from wild fish. Fish meal has been effectively substituted by vegetable-derived proteins in carnivorous fish feed, however carnivore diets have not yet been satisfactorily supplemented with vegetable-derived oils.

Second, fish raised for human consumption are housed at densities not seen in nature, such as 50,000 fish in a 2-acre space. Fish, on the other hand, often form vast, dense schools of creatures. Schooling animals, which do not have social issues at large densities, are the most productive aquaculture species. Aquaculturists typically believe that operating a rearing system above its design capacity or above the social density limit of the fish will result in a decreased growth rate and increased FCR, which will increase costs and increase the risk of health issues as well as reduce profits. While it is undesirable to stress animals, the notion and measurement of stress must be assessed from the animal's point of view utilising the scientific method.

Both farm-grown and wild salmon may become fatally infested by sea lice, notably Lepeophtheirus salmonis and several Caligus species, such as Caligus clemensi and Caligus rogercresseyi. Ectoparasites known as sea lice migrate and latch onto the skin of wild salmon when in the free-swimming, planktonic nauplii and copepodid larval stages, which may last for many days. Sea lice feed on mucous, blood, and skin. Many immature wild salmon are affected by sea live and die as a consequence when exposed in river estuaries with huge numbers of open-net salmon farms, which may produce extraordinarily high concentrations of sea lice. Little, thin-skinned young salmon travelling to sea are very susceptible, while adult salmon may withstand otherwise dangerous levels of sea lice. On Canada's Pacific coast, certain places often have pink salmon death rates of over 80% due to louse infestations. Salmon farming decreases the survival of associated wild salmon populations, according to a 2008 meta-analysis of the data. It has been established that the Atlantic, steelhead, pink, chum, and coho salmon all exhibit this association. Often, the

decline in abundance or survival is more than 50%.

The most typical explanations for these declines are illnesses and parasites. Coho and Atlantic salmon raised in farms have been known to be targets of certain sea lice species. It has been shown that these parasites have an impact on neighbouring wild fish. The Broughton Archipelago in British Columbia is one location that has received media coverage on a global scale. Before reaching the ocean, there, young wild salmon must "ran a gauntlet" of enormous fish farms situated offshore close to river mouths. According to allegations, the farms result in such severe sea lice infestations that a 2007 research estimated that by 2011, the wild salmon population will have fallen by 99%. Nevertheless, a number of experts have disputed this assertion, questioning the link between greater fish farming and increases in sea lice infestations in wild salmon. Some aquaculture operators routinely utilise potent antibiotic medications to keep the fish alive due to parasite issues. Some medications have occasionally gotten into the environment. Moreover, it is debatable if these medications still remain in human food items. Antibiotic resistance in human illnesses is considered to rise as a result of the use of antibiotics in food production. Due to vaccines and other techniques, the usage of antimicrobial medications in aquaculture has significantly reduced at several facilities. Yet, the majority of fish farming enterprises continue to utilise antibiotics, many of which leak into the environment. The 1990s' pathogen and lice outbreaks aided in the creation of the present sea lice and pathogen treatments. These advancements lessened the stress caused by parasite/pathogen issues. Yet, due to the oceanic environment, there is always a possibility that disease organisms from wild fish may spread to fish used for aquaculture.

The long-term housing of a particularly high number of fish in one place results in habitat destruction in the surrounding regions. High fish populations result in enormous amounts of faeces that are densely packed and often tainted with medications, which again have an impact on nearby waters. But, if the farm is strategically positioned near a strong river, the "pollutants" are swiftly swept away. Stronger currents in the water not only assist with the pollution issue, but they also promote fish development in general. There is still concern that the resulting bacterial development would deplete the water's oxygen supply and reduce or eliminate the local marine life. Fish farms are relocated to other, uncontaminated places once an area becomes so contaminated. The local fisherman are upset about this activity.

Obtaining different licences and water-use rights, profitability, worries about invasive species and genetic engineering depending on what species are involved, and contact with the United Nations Convention on the Law of the Sea are further possible issues that aquaculturists may run into. Concern has been expressed about the demonstrated re-productive advantage of genetically modified farmed salmon and how, if released into the wild, it would possibly wipe out local fish populations. In a carefully monitored laboratory experiment, GMO fish and wild fish were permitted to breed. In spawning grounds, the GMO fish pushed out the wild fish, but the progeny had a lower chance of surviving. Human retinal issues have been related to the colouring agent used to make salmon grown in pens seem pink like their wild counterparts.

Labeling

A law mandating the labelling of all genetically modified fish marketed in Alaska was approved in 2005. A study by Consumer Reports in 2006 found that farm-raised salmon is routinely marketed as wild. With the condition that fewer than 25% of their feed comes from wild fish, the US National Organic Standards Board permitted farmed fish to be certified as organic in 2008. The advocacy organization Food & Water Watch questioned this choice for "breaking the boundaries" of organic labelling. Since 2002, the European Union has mandated that fish be labelled with the species, production technique, and country of origin. Questions concerning the handling of farmed fish as well as the labelling of salmon as either wild-caught or farmed remain. Although the RSPCA created the Freedom Food mark to denote humane treatment of farmed salmon as well as other food items, the Marine Stewardship Council produced an Eco label to differentiate between farmed and wild caught salmon.

Fish farming indoors

Using a recirculating aquaculture system is a substitute for outdoor open ocean cage aquaculture. Water is continuously recycled and monitored in a RAS, which consists of a number of culture tanks and filters, to maintain ideal conditions all year long. The water is treated mechanically by removing particle matter and biologically by converting dangerous accumulating compounds into non-toxic ones in order to stop the degradation of water quality.

To maintain ideal water quality, other processes including UV sterilisation, ozonation, and oxygen injection are also utilised. Several of aquaculture's negative environmental effects, such as runaway fish, excessive water use, and pollutant introduction, are reduced by this approach. Due to the practises' provision of optimal water quality, feed-use efficiency growth was also boosted.

Water exchange is one of the problems with recirculation aquaculture systems. Nevertheless, aquaponics may slow the rate of water exchange by including hydroponically produced plants and denitrification. . Both methods decrease the nitrate content of the water and may make water exchanges unnecessary, isolating the aquaculture system from its surroundings. The cumulative feed burden, a measure of the quantity of feed that enters the RAS in relation to the amount of water and trash released, may be used to determine how much interaction there is between the aquaculture system and

the environment.

III. DISCUSSION

Beginning in 2011, a group from the University of Waterloo under the direction of Tahbit Chowdhury and Gordon Graff investigated vertical RAS aquaculture systems intended to produce fish species high in protein. RAS has, however, often been limited to activities like broodstock maturation, larval rearing, fingerling production, research animal production, SPF animal production, and caviar and ornamental fish production because to its high capital and operational expenses. As a result, it is still challenging to put Chowdhury and Graff's research and design ideas into practise. While many aquaculturalists believe it is currently impractical to use RAS for other species, there have been some limited instances of this being done successfully with high-value products like barramundi, sturgeon, and live tilapia in the US; eels and catfish in the Netherlands; trout in Den- mark; and salmon is planned in Scotland and Canada [7]–[10].

Slaughter Procedures

Fish have been rendered comatose in tanks that have been inundated with carbon dioxide. The fish are then further processed after having their gills sliced with a knife to allow the fish to bleed out. This is no longer seen as a compassionate way to kill animals. Electrical or percussive stunning techniques cause less physiological stress, and as a result, the carbon dioxide slaughter technique has been phased out in Europe. Spat was raised to juvenile status in pearl nets.

Coral Nets

The most popular method for developing scallop spat after they have been gathered is in pearl nets. They often reach a height of 15 mm at high stocking densities here. The benefit of being light and foldable for simple handling, pearl nets are normally strung 10 to a line. Because to the fragile nature of the apparatus, scallops in pearl nets often do not reach bigger sizes. Juveniles may be moved to another sort of culture once they reach the required size.

Candle nets

When young scallops are removed from pearl nets, the most popular technique for growing out scallops is the lantern net, which was initially invented in Japan. Because of their bigger size and stronger structure, they let the scallops to mature until they are ready to be harvested. In the mid-water column, lantern nets may be used in a similar way and at rather high densities. Scallops will often gather at the borders of the circular net to maximise their food intake since the flow velocity of the water and algae is suitable.

Hanging Ear

To compete with lantern nets on price, ear hanging techniques were created. Research has now shown that ear-hung scallop development may sometimes exceed that of scallops caught with lantern nets. In order to hang an ear, a hole must be drilled in the scallop's ear, which is the projecting shell edge located close to the point where two shells converge. Because to the need to handle and drill each scallop separately, this procedure may be labor-intensive. Additionally, if scallops are too tiny, drilled improperly, or spend too long time out of the water and become physiologically stressed, substantial death rates may ensue from drilling. As a consequence, research has been done to determine the ideal drilling size. Small species have been demonstrated to have poor survival rates, suggesting that this size is species-specific. As a result, growing out bigger species of scallops by ear hanging is successful. Scallops may be heavily packed in pairs on lines with as low as 100 mm between pairs if ear hanging is the best way. This kind of scallop care is continued till harvest. A number of attachment items are continuously being explored, but a fastener known as a securatie has so far shown the greatest development.

Culture of Rope

The only difference between ear hanging and rope culture is the way the connection is made. In rope culture, scallops are fastened to a hanging rope by their flat valve rather than an ear dangling. Similar growth and death rates are obtained using this approach as ear hanging, but it has the benefit of allowing the setting of scallops of any size. Aiming to reduce the amount of time scallops spend out of the water and so reducing stress, new cementing methods are continuously being developed.

Portable nets

Scallops are hung in separate net pockets during the pocket netting process. Most often, pockets are placed in clusters that are connected. Due of their expense, pocket nets are not frequently employed on bigger farms. Nonetheless, since handling time is short, it may be taken into account in smaller procedures. Hog Rigging Netting pockets of three or four scallops and tying them together around a main line is hog rigging. The European Queen Scallop business has extensively used this rapid and economical method. It has had very little success with bigger species of scallops.

Metal Trays

As an alternative to tools like lantern nets, scallops may be grown in hanging plastic trays like oyster cages. These systems may be pricey, have a hard frame that prevents folding, and are difficult to store when not in use. Plastic trays are often used for the transportation and temporary storage of scallops.

Lower Culture

Bottom culture techniques may be employed in addition to or instead of hanging culture. The major benefit of employing bottom culture techniques is the cheaper cost and less demand for buoyancy as equipment is supported by the

seafloor. Nevertheless, since mid-water plankton is no longer used, growth periods have sometimes been seen to be longer.

Plastic Lower trays

Again, bottom culture methods may make use of plastic trays like oyster cages. They provide a user-friendly, straightforward method. The size of plastic trays is restricted by the development rates of scallops at the centre of cages because of slower water and food flow rates. Plastic trays are useful in big quantities.

Ranching the Wild

When significant swaths of seafloor can be used, wild ranching, by far the least expensive method of scallop farming, may be quite productive. Areas must first be cleaned and then partially walled since predators like crabs and starfish might be an issue. Nevertheless, cleaning and fencing won't stop predator larvae from settling. Dredging is often used for harvesting, which further lowers expenses. Divers, though, may be used to harvest on smaller farms.

Feeding

As filter feeders, scallops may take in both live and inert particles that are suspended in the water column. In culture, phytoplankton that is either generated artificially in culture or naturally at a location makes up the majority of the food of scallops. Several studies have been done to determine which phytoplankton species are best at promoting growth. According to this study, the most productive species for bivalve aquaculture are Chaetoceros neogracile and Iso-chrysis aff. Galbanum. A significant amount of effort has recently been focused on developing an artificial microalgal alternative that is more cost-effective than conventional feeds due to the rise of enclosed farming practises. A lot of research is being done in this field on how to alter microalgae cultures to create algae with a more desired protein, lipid, and carbohydrate composition. Moreover, the microalgal species employed in the growth of scallops often include high quantities of vitamins including vitamin C. Depending on the species and stage of life, scallops have different nutritional needs. For instance, it has been shown that a higher protein content in the microalgal diet of broodstock may speed up spawning and enhance fertility. In larvae given high protein diets, similar favourable outcomes for growth and survival have been shown. It is still possible that lipids are crucial to scallop larvae, however.

Phycotoxins, parasites, and diseases Diseases

The incidence of illness, like with any animal raised for aquaculture, might be increased by the near proximity of people. The prevalence of illnesses in scallop cultivation has been pre- sented as repressed and not well known; nonetheless, the Chinese production of Farrer's scallop was decimated by malacoherpesviridae in the 1990s. For a better defence against future epidemics, databases are being compiled and business and academic institutions are working

together.

Parasites

In terms of parasites, the situation is similar to that of diseases: few scallop parasites have been detected as of yet, and nothing is known about them. As of 2006, no reports of widespread parasitic demise exist. Just 17 parasites and commensals have been identified as having a relationship with scallops.

Phycotoxins

The presence of phycotoxins is often linked to certain bodies of water, and it is important to take this into account when setting up farms since many of the phycotoxins produced by toxic algae may be harmful to people who eat contaminated meat. Two types of toxins have been associated with scallop culture: paralytic shellfish poisoning and amnesic shellfish poisoning. PSP must be taken into consideration in culture operations since it has been linked to Placopecten magellanicus for a lot of years and has been known to be a sluggish toxin detoxifier. A neurotoxic known as ASP is produced by certain marine diatoms, and scallops from the Northwest Atlantic have also been shown to contain it. While they have not yet been observed in scallop cultivation, diarrheatic shellfish poisons have also been noted as a possible issue. Dinoflagellates, which scallops may consume, create DSPs that upset human gastrointestinal tracts.

Final Product the flesh from the adductor muscles of the giant scallop, Pecten maximus, is the completed product. After scallops have been produced, collected, and processed, the flesh, which typically only includes the adductor muscle, is the main byproduct. Yet, selling complete animals as well as the muscle with the roe still attached is becoming in popularity. As a result, the sector now creates three clearly distinct goods. Live scallops have a short shelf life, but by marketing this product, scallop producers may sell smaller animals and boost their income flow. High demand for premium scallop muscle may result in a high market price, which varies depending on production, the performance of wild scallop fisheries, and many other international variables.

Effects on the environment

Contrary to popular belief, scallop aquaculture is considered to be a sustainable practise that can have positive ecosys- tem effects. This is in contrast to the common perception regarding the negative impacts of many aquaculture practices. This is a consequence of filter-feeding bivalves clearing the water column of suspended particles, undesirable nutrients, sediment, bacteria, and viruses. This enhances benthic and pelagic habitats, especially by encouraging the development of vegetation like seagrass.

The eutrophication of waterways is one of the primary negative environmental effects scallop cultivation may have in certain other locations. Taking this into account, such

beneficial consequences are quite region-specific. This has been clearly shown in Russia, where the cultivation of scallops in bays that are only partly closed has led to eutrophication and changes in the species composition, structural features, and functional characteristics of benthic and pelagic ecosystems. Ecosystems were regenerated once farms were shut down, according to monitoring, in only 5 to 10 years. This is consistent with a large body of evidence that bivalve aquaculture activities alter a variety of environmental factors, such as the hydrological regime, ecological communities, and the biochemical composition of waters, biodeposits, and the success of invertebrate settlement. Moreover, aquaculture farms in densely populated coastal regions often face public criticism since they are a source of visual pollution. As their waste and illnesses should be controlled and prevented from spreading to the wild, catfish maintained in inland tanks or channels are thought to be environmentally safe.

Asia

Several catfish species are significant food sources in Asia. In Africa and Asia, there is extensive cultivation of a number of walking catfish and shark catfish species. The U.S. catfish business has put pressure on exports of one specific shark catfish species from Vietnam, Pangasius bocourti. In 2003, a bill was approved by the US Congress that forbade the import fish from carrying the "catfish" label. As a consequence, the Vietnamese companies who export this fish now refer to it as "basa fish" when selling it in the United States. North America is where ictalurids are raised. Ictalurus punctatus, the channel catfish, is the main crop in the $450 million aquaculture sector. In Kansas, Oklahoma, and Arkansas, the farm-raised catfish business in the US had its start in the early 1960s. Due to its hardiness and ease of spawning in clay ponds, the channel catfish swiftly surpassed all other catfish species cultivated. When farmers suffered with declining revenues in cotton, rice, and soybeans, particularly in those agricultural regions whose soils had a relatively high clay content, the industry shifted into the Mississippi Delta by the late 1960s. The current bird-foot delta, also known as the Mississippi Delta, and the Atchafalya delta are two active pro-grading deltas that are part of the Mississippi Deltaic Plain. There are other deltaic systems that are deteriorating, such as the Lafourche and the St. Bernard [source: Hart and Coleman's Global Delta Data Base]. These deltas developed became the catfish industry's base of operations because they provided the soils, climate, and shallow aquifers needed to supply water for the earthen ponds that yearly produce 360–380 million pounds of catfish. Soybean meal is a component of the grain-based diet provided to catfish. Over the summer, fish are fed daily with pelleted floating feed at rates ranging from 1 to 6 percent of body weight. To create one pound of live weight in catfish, around two pounds of feed are required. Mississippi is the state with the most catfish ponds, at 100,000 acres. Alabama, Arkansas, and Louisiana are more states that are significant for catfish farming.

Aquarium

Many aquaria often include hundreds of species of catfish, including Corydoras and armoured suckermouth catfish, which are part of a significant and expanding ornamental fish trade. Banjo catfish, talking catfish, and long-whiskered catfish are additional catfish that are often seen in the aquarium trade. After carp and salmon, tilapia has risen to become the third-most significant fish in aquaculture; in 2002, global output of tilapia topped 1,500,000 metric tonnes, and it continues to rise. Many tilapiine cichlids, notably different species of Oreochromis, Sarotherodon, and Tilapia, are the subject of significant aquaculture efforts because of their high protein content, huge size, quick development, and palatability. Africa is where tilapia fisheries first emerged. Outdoor aquaculture operations have been inspired by the unintentional and intentional introduction of tilapia into freshwater Asian lakes in several tropical nations, most notably Honduras, Papua New Guinea, the Philippines, and Indonesia. Projects for tilapia farms in these nations have the best chance of being "green" or ecologically friendly. Farmers of tilapia in temperate zones sometimes need an expensive energy source to keep their tanks at a tropical temperature range. Using waste heat from enterprises and power plants to reheat the tank water is one somewhat sustainable method.

Because to their omnivorous food, style of reproduction , tolerance of high stocking density, and quick development, tilapias are among the simplest and most lucrative fish to farm. When the rice is ready for harvest, the fish may be reared in select areas on the rice fields throughout the planting season and grown to edible size. Commercially significant tilapiine species consume diets heavy in vegetables or grain, as opposed to salmon, which need on high-protein feeds based on fish or meat. As their waste and illnesses are controlled and do not spread to the wild, tilapia kept in inland tanks or channels are regarded as being environmentally safe. Nonetheless, tilapiines have developed a reputation as being among the world's most dangerous invasive species in many tropical and subtropical regions. In the southern United States, notably in Florida and Texas, Oreochromis aureus, O. mossambicus, Sarotherodon melanotheron melanotheron, Tilapia mariae, and T. zilli have all developed populations.

The majority of tilapia raised for commercial purposes are male. Female tilapia in ponds or tanks will produce a lot of little fish since they are prolific breeders. The yield of skinless, boneless fillets made from whole tilapia ranges from 30% to 37%, depending on the size of the fillets and the level of final trimming.

All around the World

There are no tilapiine cichlids native to Asia save the very few species found in the Levant, including the Middle Eastern mango tilapia. African species, however, have been extensively imported and are now commercially significant

as food fish in many nations. The top suppliers are China, the Philippines, Taiwan, Indonesia, and Thailand, who together produced nearly 1.1 million metric tonnes of fish in 2001, or almost 76% of the entire aquaculture output of tilapia globally. With their arrival, tilapiine cichlids, also known as "South Pacific crucian carp" in Taiwan, have colonised aquatic habitats all around the island. Tilapiine cichlids, which were first introduced in 1946, had a significant economic impact by feeding the Taiwanese population as well as opening up new markets for the island's fish farmers, including Japan and the US. Tilapiine cichlids have grown to be a significant farmed fish in Taiwan, both for export and home consumption. Tilapia is the only name for it in Spanish. While commercial tilapia farming is still relatively young in Honduras, the export industry is growing quickly. In 2010, a tilapia fishery in Honduras had its first assessment, and it was found to be up to par with international standards.

As a result of Honduras aquafarmers shipping roughly 20 million pounds of the fish annually, tilapia is now seen to be a viable export for the underdeveloped country. Community farm training centres, the non-profit Honduras microfinance organisation FEHMISSE, and international investors are working together to support local business owners as they create and operate ecologically friendly tilapia farms. The sensitivity of tilapia to temperature places a restriction on their range of cultivation. The optimal water temperature for growth is between 82 and 86 °F, while growth is significantly inhibited below 68 °F. Lower than 50 °F, death occurs. Thus, tilapia farming is only feasible in the southernmost states. Depending on location, tilapia may be kept in cages in the southern area for five to twelve months a year. In the US, tilapia consumption was estimated to reach 1.5 million tonnes in 2005 and 2.5 million tonnes by 2010.

Other nations India

India has not reported any tilapia farm output to the FAO. The R&D division of the Marine Products Export Development Authority, the Rajiv Gandhi Centre for Aquaculture, has constructed a facility in Vijayawada to breed mono-sex tilapia in two strains. In this project, a satellite nucleus for the GIFT strain of tilapia will be established in India. Additionally, a genetic improvement programme will be designed and carried out for this strain, dissemination strategies will be developed, and local capacity in the fields of selective breeding and genetics will be strengthened. The creation and spread of a high-yielding tilapia strain with favourable production traits is anticipated to have a significant positive impact on the nation's economy. Tilapia farming is not legal on a commercial scale in the nation. For the growth of aquaculture in the nation, the Rajiv Gandhi Center for Aquaculture has indicated interest in acquiring the Genetically Improved Farmed Tilapia. The GIFT tilapia strain was developed by selective breeding in Malaysia and the Philippines. It has improved its growth rate by more than 10% every generation and has been extensively distributed across Asia and South America. Nevertheless, the

Center is interested in operating a formal breeding programme, similar to the one that has been carried out for the GIFT strain in Malaysia, rather than passively importing the enhanced genetic stock.

The goal is to create tilapia strains that develop quickly, yield a lot, and can be raised for the least amount of money feasible in a variety of local agricultural settings. There are numerous phases in the project. The first involves creating a new GIFT strain nucleus at the RGCA and developing a systematic breeding plan to enhance the strain's genetic performance in the neighbourhood. With specialised training programmes, local staff members' abilities in selective breeding, genetic improvement, statistical analysis, and hatchery administration will be increased.

After a high-performing tilapia strain have been created, satellite hatcheries will make seed stock more readily available and less expensive. These public and private hatcheries will serve as distributors of high-quality broodstock for fish producers as well as multipliers for the superior genetics created at RGCA. While small households and fish farmers are the project's primary target audiences, a broader variety of stakeholders, such as commercial producers, researchers, and consumers, are anticipated as benefactors. The RGCA will obtain expertise and knowledge in various areas of contemporary quantitative genetics, including the creation of genetic improvement programmes for characteristics that are economically significant. Other aquaculture species that are often cultivated in India may benefit from genetic improvement initiatives made possible by this expertise and the creation of a standardised selective breeding technique. Farmers, producers, and hatchery managers will all be better able to carry out on-farm selective breeding operations.

The initiative is also anticipated to aid in the establishment of a whole manufacturing chain over the long run. This would need providing farmers with initial finance assistance, finding affordable alternatives to animal feed, diagnosing illnesses in hatcheries, and developing early growth control measures. As a result of this initiative, harvest technologies—including product storage and transportation infrastructure—are projected to advance.

Malawi

Malawi produced 2,997 tonnes of tilapia for farming in 2010. Oreochromis lidole, a species of tilapia, is one of the most consumed fish in Malawi. In Malawi, it is referred to as "chambo" locally. Lake Malawi, Lake Malombe, and the Shire River in Malawi are among the aquatic bodies where it is endemic. The fish, however, is currently listed as an endangered species as a result of overfishing. This fish is raised in Malawi's specialised fish farms. NTRDP of the Philippines Tilapia Red Nile Fish farming with tilapia Tilapia nile the nilotic Oreochromis since natural sea cucumber populations have been overfished, there is now a push to cultivate sea cucumbers in aquaculture. Aquaculture refers to the farming of sea cucumbers in enclosed spaces where they

can be grown under controlled conditions. Sea cucumbers are raised in integrated multi-trophic systems in China, along with prawns and some fish species. The waste and faeces of the other species are consumed by the sea cucumbers in these systems. By doing this, what would otherwise be wasteful byproducts of the culture of the other species are converted into a useful resource and a salable good.

Typically, scavengers like sea cucumbers eat the debris on the ocean floor. Apostichopus japonicus, prized for its high meat content and success in commercial hatcheries, was first successfully hatched by the Chinese and the Japanese. In 1988, these methods were used for the first time in India to cultivate a second species, Holothuria scabra. The same technique, which has since been applied to other species, has recently been used to successfully culture H. scabra in Australia, Indonesia, New Caledonia, Maldives, Solomon Islands, and Vietnam.

Broodstock

Sea cucumbers to be used as broodstock are either collected from the wild or are taken from com- mercial harvests. Only the largest and healthiest individuals are used for broodstock, as the suc- cess of a hatchery relies on the healthy condition of brood individuals. These individuals are kept in tanks with at least 6 inches of sand to allow burrowing behaviour. Water is changed every day and sand is changed every fortnight. Sea cucumbers are fed with a paste made from freshly collect- ed algae added to the tanks once a week to settle on sand where they feed. If water conditions are not right and if proper food is not provided sea cucumbers will eviscerate or re-absorb their gonads rendering them unfit for spawning. The Philippine "Balatan" or Sea cucumber breeding/harvesting.

Spawning

Temperature shock involves cooling and heating of seawater by 3–5°C until spawning is induced. This is achieved by first reducing the temperature of the water by 3–5°C. The sea cucumbers are left for five minutes before they are exposed to 'normal' tem- perature seawater, where the small rise in water temperature is sufficient to induce spawning. Males tend to spawn first which then induces females to release their eggs. Spawning stimulation can also be achieved through lightly drying the broodstock followed by ex- posure to a powerful jet of seawater. Sea cucumbers are dried for 30 minutes in the shade and then are exposed to a powerful jet of seawater for 30 minutes. Usually 60–90 minutes later males will release their sperm, and 30 minutes after that females will swell and release eggs in rapid inter- mittent jets. Though many species of sea cucumbers can be induced to spawn using both of these methods, temperature shock is usually considered to be the preferred method. Often spawn obtained from drying and wetting with a jet of water does not produce viable gametes. Spawning induction and successful fertilisation has only been achieved in some species of sea cucumbers and the likelihood that a method

will work or not is highly dependent on the species.

Larvae

The first month after hatching is particularly crucial and mortality during the larval phases is par- ticularly high. Larval survival drops to 30 – 34% after the first 20 days of hatching and larval de- velopment. Larvae usually hatch 48 hours after fertilisation and spend their first 17 days as feeding larvae or auricularia. During this phase they are fed on a mix of planktonic microalgae. The proportions and overall quantity of microalgal feed species varies with larval stage, and the quantity is gradually increased as larvae grow until they metamorphose into th doliolaria or non-feeding phase Individuals in this phase of their development are put into a tank with settlement cues. These may include food items such as seagrass extract, seaweed extract, Algamac2000, Algamac Protein Plus, dead algae, benthic diatoms and spirulina. Around day 19 of development the larvae transform into their pentacula phase and settle. Plates or polythene sheets are provided as substrate for larvae to settle on and to feed off. Benthic diatoms Nitzchia sp. and Navicula sp. are most effective as settlement cues.

Nursery

Juveniles are sometimes transferred to a sand-based feeding substrate in nursery tanks when they reach 10 mm; however, survival of juveniles is better if they are allowed to grow to 20 mm before transferral to sand. Juveniles are grown for a few months until they reach 5–7 cm when they are moved out to sea ranches or into ponds.

Grow Out

Sea ranching is carried out in sheltered bays with seagrass in areas with few predators. The sea cucumbers can be kept in pens in shallow water made of fine wire mesh or bamboo, and in deeper water they are raised in cages made from fine woven mesh or in tub enclosures on the seafloor. They can also be kept and grown in ponds with appropriate water exchange and movement. In- dividual growth is density-dependent and is stunted at high densities. Monitoring water quality and growth characteristics are essential to survival during this phase. Sea cucumbers are ready to harvest after 12 months of grow out.

Asexual Methods

Two sea cucumber species Thelenota ananas and Stichopus chloronotus have been found capable of asexual propagation through transverse fission, the process whereby an organism is cut in half and completely regenerates the missing half. Rubber bands areplaced around the middle of the sea cucumbers which induces them to undergo fission within 1–2 weeks. After separating, the posterior half regrows a complete anterior half, and vice versa. This happens within 3–7 months, producing two new fully-grown individuals from one. Survival from this process by these species was found to be 80% or greater. Though this

technique is not suitable for all sea cucumber species, it may provide a cheaper and faster alternative method of obtaining prickly redfish and greenfish for aquaculture. The prickly redfish and greenfish can be asexually propagated

Polyculture

Sea cucumbers are currently cultured in polyculture with prawns and some fish species. Their presence in the bottoms of the pens or nets, where they feed on debris composed of faeces, excess food, algae, and other particulate organic matter, significantly reduces fouling of water and equipment. China currently produces around 90,000 tonnes of sea cucumbers using these practises and enhanced growth of sea cucumber juveniles has been reported when they are grown at the bot- tom of prawn farms. Farming sea cucumbers with the fouling debris of other aquaculture species helps to mitigate the impacts of marine farms' effluents and turns these wastes into a marketable product [11]–[13].

IV. CONCLUSION

Sea sponge aquaculture is the process of farming sea sponges under controlled conditions. It has been conducted in the world's oceans for centuries using a number of aquaculture techniques. There are many factors such as light, salinity, pH, dissolved oxygen and the accumulation of waste products that influence the growth rate of sponges. The benefits of sea sponge aquaculture are realised as a result of its ease of establishment, minimum infrastructure requirements and the po- tential to be used as a source of income for populations living in developing countries. Sea sponges are produced on a commercial scale to be used as bath sponges or to extract biologically active compounds which are found in certain sponge species. Techniques such as the rope and mesh bag method are used to culture sponges independently or within an integrated multi-trophic aquacul-ture system setting. One of the only true sustainable sea sponges cultivated in the world occur in the region of Micronesia, with a number of growing and production methods used to ensure and maintain the continued sustainability of these farmed species.

REFERENCES

[1]   E. Villar-Navarro, C. Garrido-Pérez, and J. A. Perales, "The potential of different marine microalgae species to recycle nutrients from recirculating aquaculture systems (RAS) fish farms and produce feed additives," Algal Res., 2021, doi: 10.1016/j.algal.2021.102389.

[2]   H. Wang et al., "Mangrove Loss and Gain in a Densely Populated Urban Estuary: Lessons From the Guangdong-Hong Kong-Macao Greater Bay Area," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2021.693450.

[3]   I. Belghit et al., "Species-specific discrimination of insect meals for aquafeeds by direct comparison of tandem mass spectra," Animals, 2019, doi: 10.3390/ani9050222.

[4]   N. R. Le François, H. Lemieux, and P. U. Blier, "Biological and technical evaluation of the potential of marine and anadromous fish species for cold-water mariculture," Aquac. Res., 2002, doi: 10.1046/j.1365-2109.2002.00652.x.

[5]   F. A. C. Santos et al., "Growth performance and physiological parameters of Colossoma macropomum in a recirculating aquaculture system (RAS): Importance of stocking density and classification," Aquaculture, 2021, doi: 10.1016/j.aquaculture.2020.736274.

[6]   A. Dubois, C. Barras, J. C. Pavard, A. Donnay, M. Béatrix, and V. M. P. Bouchet, "Distribution patterns of benthic foraminifera in fish farming areas (Corsica, france): Implications for the implementation of biotic indices in biomonitoring studies," Water (Switzerland), 2021, doi: 10.3390/w13202821.

[7]   K. Dochin, "Functional and morphological groups in the phytoplankton of large reservoirs used for aquaculture in bulgaria," Bulg. J. Agric. Sci., 2019.

[8]   D. Wang et al., "Deciphering dissolved organic matter from freshwater aquaculture ponds in Eastern China based on optical and molecular signatures," Process Saf. Environ. Prot., 2021, doi: 10.1016/j.psep.2021.09.025.

[9]   J. Liu and Y. Zhao, "Morphological and functional characterization of clam Ruditapes philippinarum haemocytes," Fish Shellfish Immunol., 2018, doi: 10.1016/j.fsi.2018.08.019.

[10] V. Orobets, E. Lisovets, S. Zabashta, and A. Ermakov, "Control of fish parasites in aquaculture," 2019. doi: 10.1088/1755-1315/403/1/012065.

[11] J. Tagliavini, F. Conterio, G. Gandolfi, and F. Fontana, "Mitochondrial DNA sequences of six sturgeon species and phylogenetic relationships within Acipenseridae," J. Appl. Ichthyol., 1999, doi: 10.1111/j.1439-0426.1999.tb00198.x.

[12] [D. Zarski et al., "A new classification of pre-ovulatory oocyte maturation stages in pikeperch, Sander lucioperca (L.), and its application during artificial reproduction," Aquac. Res., 2012, doi: 10.1111/j.1365-2109.2011.02879.x.

[13] et al., "Transcriptome analyses of female black tiger shrimps (Penaeus monodon) for reproductive trait using RNA-sequencing approach," Minist. Sci. Technol. Vietnam, 2021, doi: 10.31276/vjst.63(12).47-51

Evolution of Sea Sponges

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Abstract— Oceanic and freshwater habitats are home to more than 8000 different species of sea sponges. Historically, sponge fishing has been a significant and profitable industry, with yearly catches from 1913 to 1938 routinely exceeding 181 tonnes and bringing in more than 1 million dollars. However, because of this demand, catch rates have peaked. In 2003, there was a 2,127-tonne demand for bath sponges, but only a quarter of that was met by global harvesting.

Index Terms— Bath Sponge, Commercial Sponge, Sea Sponge, Sponge Developments, Water Flow

I. INTRODUCTION

A variety of farming techniques were used in early aquaculture research to improve sea sponge aquaculture techniques. Commercial sponge farming, however, encountered fierce opposition and interference from sponge fishermen who thought their source of income was in jeopardy. Aquacultured sponge products had a low market penetration and poor consumer adoption as a result of the commercial sponge farmers' opposition [1]–[4].

Those who live in developing nations can clearly benefit from commercial sponge aquaculture. Sponge aquaculture is a simple and lucrative industry in these nations that benefits the local population and environment by reducing pressure on wild stock harvests and environmental harm. The process of growing sponges is fairly easy and doesn't require much specialised knowledge. Additionally, because sponge aquaculture is so simple, the entire family can participate in the production process. This leads to a successful family business that adheres to conventional discourses of "family farms," which raises the possibility that sea sponge aquaculture will catch on. Additionally, it is typical for sea sponge farms to be situated close to residential areas so that ongoing maintenance, monitoring, and work can be done on the farm. Sea sponge aquaculture may be pursued as a full-time career or as a part-time profession to augment an existing income, giving families a year-round source of income.

Uses

Bath towels

In the last two decades, there has been a resurgence of interest in the possibility of sponge aquaculture to help meet the rising demand for bath sponges on a worldwide scale. The most popular usage for modern aquacultured sea sponges is as bath sponges. Any kind of sponge that exclusively has spongin fibers—springy fibres formed of collagen protein—is considered a bath sponge.

Bath sponges are sold commercially for a variety of functions, including cosmetic, bathroom, and industrial ones.

The quality of the sponge is determined by examining the sponge skeleton, with sponges with soft, long-lasting, and elastic fibres commanding the highest prices.

Bioactive Applications

The sponge's growth and survival are enhanced by the secondary metabolites generated by symbiotic bacteria. Several of the thousands of secondary metabolites formed from sponges that have been successfully extracted from them have potential therapeutic qualities, including cytotoxicity, anti-inflammatory, and antiviral activity. As a result, they offer enormous potential for developing new medications in the pharmaceutical sector. The only ways to utilise these secondary metabolites as medicines, however, rely on the scaling up of the substances via chemical synthesis or aquaculture. They are often only present in tiny levels.

Period Sponges

A few businesses have started to manufacture and sell little sponges as reusable feminine hygiene items; however, it is still something of a niche industry. In the US and the UK, they are sold under the brand names Sea Pearls and Jam Sponge, respectively. Similar to tampons, the sponges are placed into the vagina and withdrawn after they are full so they may be cleaned and reused. A reusable tampon substitute has the benefits of being economical and reducing waste. Some women believe that using a natural material is better due to their concerns about the health dangers linked with conventional tampons. While there are no documented occurrences of toxic shock syndrome linked to the usage of menstruation sponges, it is important to keep this potential in mind since sponges are known to contain sand, grit, and germs. While most tampons can't absorb as much menstrual flow as sponges can, they still need to be replaced at least every eight hours.

Sponges' Growth is Affected by a Number of Factors pH, temperature, light, and salinity. A salinity of 35 ppt should be used while cultivating sea sponges. Sponge cells will get dehydrated in an environment that is hypersaline, while an environment that is hyposaline will make the sponge's

internal environment more diluted. The pH of the water must be 7.8 to 8.4, the same as seawater, in order to enhance the growth of sponges. As sponges are temperature-sensitive, drastic changes in the surrounding temperature might be harmful to their wellbeing. Sponge culture collapses are caused by high temperatures. As the water's ambient temperature rises a few degrees, the symbiotic bacteria that typically live within sea sponges begin to reproduce at an unsustainable pace. The sponge tissue and cells are subsequently attacked by these bacteria and destroyed. According to some research, sponges should be cultivated in water that is only a little bit warmer than the region from where they were initially separated. Many tropical sponges are home to photosynthetic endosymbionts, which depend on light to thrive [5]–[7].

II. DISCUSSION

As a consequence, certain sponges rely on the availability and intensity of light to meet their nutritional demands. Yet, certain species that are sensitive to ultraviolet radiation may experience growth suppression as a result of exposure to light. The best growing circumstances for sea sponges are gloomy environments, with the exception of when they are coupled with photosynthetic bacteria [8]–[11].

Oxygen in solution

The aquiferous system is used to absorb oxygen that has been dissolved. Consumption rates of oxygen in marine sponges vary from 0.2-0.25 mol O h/cm3 of sponge volume. Demosponges kept in a lab can endure hypoxic circumstances for a short time, which may indicate that they are able to adapt to dissolved oxygen.

Waste Disposal

Certain species of sponge may create bioactive and cytotoxic compounds in confined culture conditions, which may accumulate quickly and impede future sponge development. Biofilters, however, are probably unsuccessful at eliminating secondary compounds that the sponge ejected. The removal of these substances is anticipated to be accomplished by adsorption techniques in which biomolecules bind to an adsorbate.

Diseases

A significant epidemic of the bath sponge disease might wipe out both populations of wild and aquacultured sponges. Disease outbreaks may be caused by underlying causes brought on by causal organisms such viruses, fungus, cyanobacteria, and bacterial strains.

Site choice

The variables that support the development and survival of the cultivated sponge species must be taken into account while selecting an aquaculture site for sea sponges. As bacteria and microalgae, which are the sponges' primary sources of nutrition, depend heavily on passive water flow,

excellent water flow promotes sponge development and quality. Sponge farms may suffer if water flows at higher than usual rates. A protected region with sufficient water flow and food availability for optimal sponge development would provide the best site for a sea sponge farm [12], [13].

III. CONCLUSION

Explants are used as a method of cultivating sponges in sponge aquaculture, which takes advantage of the totipotent sponge cells' great capacity for regeneration. Sponges develop indefinitely, with their maximum size being governed by environmental factors rather than genetics. Sponge explants will be selected for a farm's initial setup based on their phenotypic traits of rapid development and high-quality spongin or metabolites.

REFERENCES

[1] M. C. Bart, M. Hudspith, H. T. Rapp, P. F. M. Verdonschot, and J. M. de Goeij, "A Deep-Sea Sponge Loop? Sponges Transfer Dissolved and Particulate Organic Carbon and Nitrogen to Associated Fauna," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2021.604879.

[2] C. R. Back et al., "A New Micromonospora Strain with Antibiotic Activity Isolated from the Microbiome of a Mid-Atlantic Deep-Sea Sponge," Mar. Drugs, 2021, doi: 10.3390/MD19020105.

[3] E. Martins, H. T. Rapp, J. R. Xavier, G. S. Diogo, R. L. Reis, and T. H. Silva, "Macro and Microstructural Characteristics of North Atlantic Deep-Sea Sponges as Bioinspired Models for Tissue Engineering Scaffolding," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2020.613647.

[4] R. Afifi and O. F. Khabour, "Antibacterial activity of the Saudi Red Sea sponges against Gram-positive pathogens," J. King Saud Univ. - Sci., 2019, doi: 10.1016/j.jksus.2017.08.009.

[5] G. Gonzalez-Mirelis, R. E. Ross, J. Albretsen, and P. Buhl-Mortensen, "Modeling the Distribution of Habitat-Forming, Deep-Sea Sponges in the Barents Sea: The Value of Data," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2020.496688.

[6] O. Dudik et al., "Bioactivity of Biosilica Obtained From North Atlantic Deep-Sea Sponges," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2021.637810.

[7] E. Borchert, S. A. Jackson, F. O'Gara, and A. D. W. Dobson, "Diversity of natural product biosynthetic genes in the microbiome of the deep sea sponges Inflatella pellicula, Poecillastra compressa, and Stelletta normani," Front. Microbiol., 2016, doi: 10.3389/fmicb.2016.01027.

[8] A. Rusanova, V. Fedorchuk, S. Toshchakov, S. Dubiley, and D. Sutormin, "An interplay between viruses and bacteria associated with the white sea sponges revealed by metagenomics," Life, 2022, doi: 10.3390/life12010025.

[9] G. Steinert et al., "Compositional and Quantitative Insights Into Bacterial and Archaeal Communities of South Pacific Deep-Sea Sponges (Demospongiae and Hexactinellida)," Front. Microbiol., 2020, doi: 10.3389/fmicb.2020.00716.

[10] F. Li, C. Peifer, D. Janussen, and D. Tasdemir, "New discorhabdin alkaloids from the antarctic deep-sea sponge latrunculia biformis," Mar. Drugs, 2019, doi: 10.3390/md17080439.

[11] E. Borchert, J. Selvin, S. G. Kiran, S. A. Jackson, F. O'Gara, and A. D. W. Dobson, "A novel cold active esterase from a

deep sea sponge stelletta normani metagenomic library," Front. Mar. Sci., 2017, doi: 10.3389/fmars.2017.00287.

[12] M. C. Bart et al., "Differential processing of dissolved and particulate organic matter by deep-sea sponges and their microbial symbionts," Sci. Rep., 2020, doi: 10.1038/s41598-020-74670-0.

[13] S. Afoullouss, A. R. Sanchez, L. K. Jennings, Y. Kee, A. L. Allcock, and O. P. Thomas, "Unveiling the Chemical Diversity of the Deep-Sea Sponge Characella pachastrelloides," Mar. Drugs, 2022, doi: 10.3390/md20010052.

Integrated Multi-Trophic Aquaculture

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Abstract— In the last 10 years, there has been a significant expansion in intensive marine aquaculture, which has had significant negative effects on the ecosystem. High concentrations of nutrients have been found in coastal waterways as a consequence of large amounts of organic matter being discharged from uneaten feed and excretory waste from aquacultured animals. Massive amounts of nitrogen are expelled by bivalves, salmon, and shrimp and reach the coastal environment where they have the potential to cause algal blooms and lower water oxygen levels.

Index Terms— Aquatic Plants, Bath Sponge, Mesh Bag, Metabolites Production, Water Column, Water Flow.

I. INTRODUCTION

Many species at various trophic levels of the food chain make up an integrated aquaculture system. In order to remove surplus nutritional stuff from the water column, waste-producing animals like fish and shrimp are combined with extractive creatures like abalone, sponges, or sea urchins. Since they have the capacity to function as a bioremediator to remove both harmful bacteria and organic debris, sea sponges have a special benefit as an extractive organism in an integrated multi-trophic aquaculture system. In integrated aquaculture circumstances, the sponge Hymeniacidon perlevis has shown an exceptional capacity to extract total organic carbon from saltwater and may be a viable bioremediation tool for aquaculture systems in areas with high levels of water pollution. Moreover, the organic enrichment from nearby fish farms may promote sponge development, leading to more effective sea sponge farming [1]–[3].

Aquaculture using bath sponges

To maximise the amount of sponge explants that may be cultivated and boost output, many commercial sea sponge farms locate their aquaculture locations in deeper waters. Bath sponge aquaculture has been tested using two basic techniques, with sponges either being cultivated on a rope or within a mesh bag.

Rope Approach

The survival rate of sponges grown on ropes is often lower because "threading" onto the rope causes irreparable harm to the explant. Also, since water flow rises dramatically during storms, sponges cultured on ropes run the risk of being pulled off the rope or growing away from the rope and developing into an unmarketable, low-value, distinctive doughnut-shaped sponge. Among species, there are variations in regeneration capacity, sensitivity to infection after cutting, hardiness, and growth potential that contribute to differences in sponge development and health.

Mesh Bag Technique

With certain species of sponges cultivated in mesh bags, lower degrees of damage may result in greater levels of survival. Since the mesh threads on the bags may reduce water flow, restricting the availability of food, growth rates may be slowed. Water movement may be further impeded by the buildup of biofouling substances such bryozoans, ascidians, and algae on the mesh. A well-positioned location and thin mesh strands with wide gaps may be used as a defence against biofouling and decreased flow rates.

A fusion of techniques

The quality and output of bath sponge aquaculture may improve by combining the rope and mesh bag methods in a "nursery period". In order to effectively filter water, sponges are first grown in mesh bags until the explants have recovered and rejuvenated. The regenerated explants are strung on rope to encourage the best development till harvest. Growth rates and survival have been proven to be no higher when farming is done only using the mesh bag technique, making this approach labor-intensive and expensive. Transferring sponges to bigger mesh bags as they develop would be a more economically feasible way to cultivate bath sponges since it would allow for appropriate water flow and nutrient sequestration.

Manufacture of Bath Sponge in Micronesia

The sponge Coscinoderma matthewsi is now being used to make bath sponges, with over 12,000 sponges being made and marketed locally to residents and visitors in Pohnpei, Federated States of Micronesia. One of the few really sustainably farmed sea sponges in existence are these sponges. The rope technique of farming produces 100% natural sponges without the use of harsh chemicals during processing, and it only requires a little investment of a few thousand dollars for farming and maintenance equipment. The Marine and Environmental Research Institute of Pohnpei began growing C. matthewsi sponges in aquaculture in an effort to provide locals with limited opportunities for employment with a steady source of income. The sponges grow to harvestable size over the course of about two years,

and free divers frequently remove seaweed and other biofouling substances by hand. These sponges are treated naturally; after being air dried, they are put in baskets and sent back to the lagoon where they were first produced. The sponge's whole organic content is eliminated throughout this procedure, leaving just the finished bath sponge remaining. The sponge is further processed by being made softer, but no bleaches, acids, or colourants are used [4]–[6].

Aquaculture with Bioactive Sponge

In the Mediterranean, Indo-Pacific, and South Pacific areas, research is being done on the cultivation of sea sponges for bioactive compounds. The major objectives are to maximise the production of bioactive substances by optimising environmental factors, aquaculture practises, and production methods.

Novel Techniques

The ultimate explant form is unimportant in aquaculture for bioactives, allowing for the use of other production techniques. The "mesh array technique," a brand-new approach to bioactive culture, hangs a mesh tube vertically from the water column while holding individual explants in alternating compartments.

The ability to repeatedly collect sponge secondary metabolites over a long period of time reduces the number of sponges needed for aquaculture bioactives, as well as the associated costs and infrastructure requirements. To maximise production and revenues, the few sponges chosen for metabolite synthesis would have high production rates for the desired metabolite.

Factors Influencing the Formation of Secondary Metabolites

Production of sponge metabolites is influenced by a variety of variables, and the concentration of these metabolites varies significantly across adjacent explants. Physical and biological elements that have been shown to substantially alter the metabolite production in sponges include localised changes in light intensity and biofouling. Environmental changes may influence microbial populations, which will therefore have an impact on metabolite production. Knowing the ecological functions of metabolites or the environmental conditions that influence their biosynthesis may be leveraged as a competitive advantage to increase metabolite production and overall output. For instance, imitating predation by injuring the sponge before harvesting may be an effective technique to maximise metabolite synthesis if the secondary target molecule's ecological function was to discourage predators [7]–[10].

Certain sponges that produce metabolites grow quite fast, indicating that farming sponges would be a good option for creating bioactives that are now impossible to make chemically. The increased value-adding features of sponge farming make it more profitable, but there are other difficulties that do not arise when bath sponges are

aquacultured, such as the high costs of metabolite extraction and purification.

Massive kelp

Big kelp, or Macrocystis pyrifera, has been used as a food source for a long time. It also has been used as a nutritional supplement since it includes a variety of substances, including iodine, potassium, other minerals, vitamins, and carbohydrates. Californian kelp beds were collected in the early 20th century as a supply of potash. Commercial interest dramatically increased in the 1970s and 1980s, especially as a result of the manufacture of alginates and biomass for animal feed owing to the energy crisis at the time. Commercial production of M. pyrifera, however, never materialised. The study of growing Macrocystis decreased together with the conclusion of the energy crisis and the drop in alginates' costs [11]–[13].

II. DISCUSSION

Due to the newly discovered applications for these plants, including fertilisers, bioremediation culture, abalone and sea urchin feed, the demand for M. pyrifera is rising. Using M. pyrifera as feed for other aquaculture species like shrimp is also being researched. In the early 1990s, restoration and management of natural beds were crucial to maintaining a sufficient supply of M. pyrifera for alginate synthesis. In an effort to restore the natural environment after extensive harvesting, adult plants between 3 and 6 metres in length were transplanted to increase the stability of the harbour and promote diversity. Other functions, such as this species' capacity to stabilise substrate, were also recognised in California.

The technology and techniques for growing aquatic plants have advanced significantly in response to the rising worldwide demand for them. The main producers of aquatic plants now are China and Chile, which each produced over 300,000 tonnes in 2007. These two nations have expanded it. As aquatic plants are often grouped into one category rather than being recorded separately like animal species, it is difficult to determine how much of this total may be linked to genuine M. pyrifera harvesting. Both of these nations cultivate a wide range of species; in Chile, numerous species of phaeophytes account for 50% of output, while rhodophytes produce the remaining 50%. Chlorophytes are among the greater diversity of seaweeds that are produced in China. In an attempt to create a super cultivar, trials are also being conducted in Chile to create hybrids between this species and M. integrifolia.

Growing Techniques

The long line cultivation system, which is now the most widely used technique for growing M. pyrifera, was created in China in the 1950s. where the sporelings are created in a water-cooled greenhouse and afterwards planted along long lines in the ocean. They are grown to varying depths in various nations. As this species' life cycle alternates between

huge sporophytes and tiny gametophytes, it has an alternation of generations. It is the sporophyte that is used to make seaweed.

On the underside of the leaves, the adult sporophyte forms sori, which are reproductive structures that create the motile zoospores that develop into the ga- metophyte. The chosen plants are dried for a few to up to twelve hours before being put in a seeding container with cold saltwater that is between nine and ten degrees Celsius, has a salinity of thirty percent, and has a pH of 7.8 to 7.9. Throughout the sporulation and growth stages, photoperiod is also regulated. During sporalation, a synthetic yarn with a diameter of between 2 and 6 mm is put on the bottom of the same container. The released zoospores cling to the twine and start to geminate into male and female gametophytes. As these gametophytes reach maturity, sperm and egg cells are released. These cells fuse in the water column and adhere to the same substrate as the gametophytes. These plants are subsequently raised for up to 60 days into immature sporophyte plants.

These strings are fastened to a bigger diameter cultivation rope by wrapping them around it or by cutting them into little pieces. The cultivation ropes vary but are typically 60 metres long with connected floating buoys. For some of the nations, they are cultivated at different depths in the water column. In China, M. pyrifera is grown on the surface using ropes tied to floating buoys spaced every 2-3 metres and wooden pegs fixed to the substrate. Individual ropes are typically suspended at a distance of 50 cm from one another. Nonetheless, M. pyrifera is cultivated in Chile at a depth of 2 m, with buoys used to maintain a consistent depth for the plants. They are then permitted to grow naturally until they are ready for harvest. The management of the transition in the juvenile phases, from spore to gametophyte and embryonic sporophyte, which are all done on a land-based facility with careful control of water flow, temperature, nutrients, and light, presents a number of challenges with this kind of production. Using a force culture technique, the Japanese are able to push plants to grow at a pace equivalent to two years in only one growing season.

A project for offshore or deep-sea culture in China was also investigated. Several farm structures were created to promote the development of M. pyrifera, and nutrients from the deep waters were pumped up into the kelps as they grew. The algae were freed from size restrictions that are common in shallow waters, which was this method's biggest advantage. The project for deep water culture was beset by operational and farm design problems, which hindered future cultivation in this way. This species is typically harvested after two growing seasons, while the length of the cultivation depends on the area and level of farming.

III. CONCLUSION

A pulley system linked to boats harvests M. pyrifera that is artificially grown on ropes by pulling the various lines on the vessels for cleaning. The surface canopy is harvested many times annually by boats in other nations, such the United States of America, which relies mostly on naturally produced M. pyrifera. This is made feasible by the species' rapid growth, which leaves the vegetative and reproductive portions intact.

REFERENCES

[1] N. Ridler et al., "Integrated multi-trophic aquaculture (IMTA): A potential strategic choice for farmers," Aquaculture Economics and Management. 2007. doi: 10.1080/13657300701202767.

[2] J. Fang, J. Zhang, T. Xiao, D. Huang, and S. Liu, "Integrated Multi-Trophic Aquaculture (IMTA) in Sanggou Bay, China," Aquac. Environ. Interact., 2016, doi: 10.3354/aei00179.

[3] M. Troell, A. Joyce, T. Chopin, A. Neori, A. H. Buschmann, and J. G. Fang, "Ecological engineering in aquaculture - Potential for integrated multi-trophic aquaculture (IMTA) in marine offshore systems," Aquaculture. 2009. doi: 10.1016/j.aquaculture.2009.09.010.

[4] K. Barrington, N. Ridler, T. Chopin, S. Robinson, and B. Robinson, "Social aspects of the sustainability of integrated multi-trophic aquaculture," Aquac. Int., 2010, doi: 10.1007/s10499-008-9236-0.

[5] D. Y. Ashkenazi, A. Israel, and A. Abelson, "A novel two-stage seaweed integrated multi-trophic aquaculture," Reviews in Aquaculture. 2019. doi: 10.1111/raq.12238.

[6] K. A. Alexander et al., "Improving sustainability of aquaculture in Europe: Stakeholder dialogues on Integrated Multi-trophic Aquaculture (IMTA)," Environ. Sci. Policy, 2016, doi: 10.1016/j.envsci.2015.09.006.

[7] L. qi Sun et al., "Food web structure and ecosystem attributes of integrated multi-trophic aquaculture waters in Sanggou Bay," Aquac. Reports, 2020, doi: 10.1016/j.aqrep.2020.100279.

[8] K. A. Alexander and A. D. Hughes, "A problem shared: Technology transfer and development in European integrated multi-trophic aquaculture (IMTA)," Aquaculture, 2017, doi: 10.1016/j.aquaculture.2017.01.029.

[9] R. Wartenberg et al., "The impacts of suspended mariculture on coastal zones in China and the scope for Integrated Multi-Trophic Aquaculture," Ecosystem Health and Sustainability. 2017. doi: 10.1080/20964129.2017.1340268.

[10] J. Zhang et al., "Bio-mitigation based on integrated multi-trophic aquaculture in temperate coastal waters: Practice, assessment, and challenges," Latin American Journal of Aquatic Research. 2019. doi: 10.3856/vol47-issue2-fulltext-1.

[11] X. Wang, L. M. Olsen, K. I. Reitan, and Y. Olsen, "Discharge of nutrient wastes from salmon farms: Environmental effects, and potential for integrated multi-trophic aquaculture," Aquaculture Environment Interactions. 2012. doi: 10.3354/aei00044.

[12] A. R. J. Cabrita, M. R. G. Maia, I. Sousa-Pinto, and A. J. M. Fonseca, "Ensilage of seaweeds from an integrated multi-trophic aquaculture system," Algal Res., 2017, doi: 10.1016/j.algal.2017.04.024.

[13] M. S. Park, J. K. Kim, S. Shin, B. H. Min, and P. Samanta, "Trophic fractionation in an integrated multi-trophic aquaculture off Tongyoung Coast: A stable isotope approach," Aquaculture, 2021, doi: 10.1016/j.aquaculture.2021.736454.

An Overview Aquatic Ecosystem

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Abstract— Understanding a species' natural environment, its prey, and its predators is important since no species can survive on its own. Natural interactions between aquatic components and the species being farmed are necessary for aquaculture. The study of aquatic ecosystems yields information that is crucial for the development and survival of the farmed species..

Index Terms— Atlantic Salmon, Aquatic Ecosystem, Fish Meal, Littoral Zone, Marine Ecosystem, Salmon Aquaculture

I. INTRODUCTION

Coastal waters and an estuary mouth are components of an aquatic environment. An aquatic ecosystem is one that exists in or around water. Aquatic ecosystems are home to groups of creatures that are dependent on one another and on their surroundings. Freshwater ecosystems and marine ecosystems are the two primary categories of aquatic ecosystems.

Types Marine

Around 71% of the Earth's surface is made up of marine habitats, which also hold 97% of the water on the planet. 32% of the world's net primary output is produced by them. They differ from freshwater environments because the water contains dissolved chemicals, particularly salts. Sodium and chlorine make up around 85% of the dissolved substances in saltwater. The salinity of seawater is 35 parts per thousand on average. Several marine environments have varying actual salinities [1]–[3]. Depending on the water depth and coastline characteristics, marine ecosystems may be separated into a variety of zones. The huge, open area of the ocean known as the oceanic zone is home to creatures like whales, sharks, and tuna. Several invertebrates dwell on substrates in the benthic zone, which lies below the water. The region between high and low tides is known as the intertidal zone; in this diagram, it is referred to as the littoral zone. Salt marshes, coral reefs, lagoons, and mangrove swamps may also be considered near-shore zones. Hydrothermal vents may be found in the deep ocean, where chemosynthetic sulphur bacteria serve as the foundation of the food chain.

Brown algae, dinoflagellates, corals, cephalopods, echinoderms, and sharks are among the several classes of species that may be found in marine habitats. The majority of commercial meals sourced from wild populations come from fish collected in maritime habitats. Unsustainable resource extraction, marine pollution, climate change, and coastal development are all environmental issues that affect marine ecosystems.

Freshwater

Freshwater habitats occupy 0.009% of the planet's total water and make up 0.80% of its surface. Almost 3% of its net primary output is produced by them. 41% of all fish species known to exist worldwide are found in freshwater habitats.

Zones exist throughout lake habitats. Lakes are divided into three zones using a similar approach. The first is the littoral zone, which is a shallow area close to the coast. Here are found rooted wetland plants. An open water zone and a deep water zone are the other two zones that make up the offshore. Sunlight nourishes animals that consume photosynthetic algae in the open water zone. As there is no sunshine in the deep sea zone, the food chain in this area depends on debris coming from the photic and littoral zones. The names of several systems vary. The pelagic zone, limnetic zone, and profundal zone are terms that may be used to describe the offshore regions, photic zone, and aphotic zone, respectively. A riparian zone that contains plants that are nevertheless impacted by the lake's presence is commonly found inland from the coastal zone; these impacts may include those of windfalls, spring floods, and winter ice damage. A combination of output from plankton growing in open water and production from plants growing in the littoral zone results in the lake's overall production [4]–[6].

Wetlands may be a component of the lentic system since they naturally grow along the shores of most lakes. The breadth of the wetland and the littoral zone depends on the slope of the coastline and how much the water level naturally fluctuates within and between years. In this area, dead trees often gather, either from windfalls on the coast or logs carried there by floods. This woody debris protects shorelines from erosion while also providing crucial habitat for fish and breeding birds. Ponds, which are often tiny lakes that intergrade with wetlands, and water reservoirs are two significant subclasses of lakes. Lakes or the bays within them may over a long period of time become progressively enriched by nutrients and slowly fill up with organic sediments, a process known as succession. The amount of silt entering the lake may speed up this process when people utilise the watershed. Eutrophication is the process of adding sediments and nutrients to a lake.

Ponds

Ponds are little freshwater bodies with marsh, aquatic vegetation, and shallow, calm water. The vegetative zone, open water, bottom mud, and surface film are the four zones into which they may be further subdivided. Ponds may vary

widely in size and depth depending on the season; many ponds are created when rivers flood in the spring. Aquatic plants and free-floating algae serve as the foundation of food webs. Algae, snails, fish, beetles, water bugs, frogs, turtles, otters, and muskrats are a few examples of the rich diversity of aquatic life that is often present. Large fish, herons, or alligators are a few examples of top predators. Ponds that dry up every year, killing the native fish, serve as crucial refuges for amphibian reproduction since fish are a significant predator of amphibian larvae. Vernal pools are ponds that fully evaporate every year. Alligator holes and beaver ponds are two examples of ponds that are created by animal activity, and they significantly increase the variety of landscapes.

Lotic

The gradient of the river bed or the current's speed determines the key zones in river ecosystems. In contrast to the slow flowing water of pools, turbulent water moves more quickly and generally has higher concentrations of dissolved oxygen. The disparities between highland and lowland rivers are based on these differences. While broader streams and those without a canopy mostly get their food from algae, streams in riparian forests get most of their food from the trees. Furthermore a significant supplier of nutrients are anadromous fish. Rivers are under risk from environmental factors such as water loss, dams, chemical pollution, and imported species. A dam has negative repercussions that spread farther into the watershed. The loss of deltaic wetlands is one of the most significant adverse consequences, as is the decline in spring floods, which affects wetlands.

Wetlands

Vascular plants that have adapted to soggy soil predominate in wetlands. Wetlands come in four basic varieties: swamp, marsh, fen, and bog. Due to the close closeness of water and soil, wetlands are among the most productive natural habitats on earth. As a result, they are home to many plant and animal species. Wetlands are often turned into dry ground via dykes and drains and utilised for agricultural reasons because to their productivity. Dykes and dams have detrimental effects on both isolated wetlands and whole watersheds. They are often constructed for human habitation because of their proximity to lakes and rivers. Settlements are prone to ground subsidence and an ever-increasing danger of flooding after they are built and protected by dykes. One well-known example is the coast of Louisiana near New Orleans, while another is the Danube Delta in Europe.

Functions

Aquatic ecosystems carry out a variety of crucial environmental tasks. For instance, they recycle nutrients, clean water, reduce flood damage, refuel groundwater, and provide habitat for animals. Also utilised for human pleasure, aquatic environments are crucial to the tourist sector,

particularly in coastal areas. When an aquatic ecosystem's capacity to withstand a stress is surpassed, its health deteriorates. Environmental changes that are physical, chemical, or biological may put stress on an aquatic ecosystem. Changes in water temperature, water velocity, and light availability are examples of physical modifications. Chemical modifications include adjustments to the loading rates of oxygen-consuming substances, biostimulatory nutrients, and toxins. Overharvesting of commercial species and the introduction of foreign species are examples of biological changes. Aquatic environments may experience too many stressors from human populations. There are several instances of extreme stress having detrimental effects. Think about three. This issue is shown by the environmental history of North America's Great Lakes, notably how various pressures, such as water pollution, overfishing, and invasive species, may coexist. The English Norfolk Broadlands provide an example of a comparable deterioration brought on by pollution and invading species. The detrimental consequences of many pressures, including as levee building, swamp logging, invasive species, and salt water intrusion, are shown by Lake Pontchartrain bordering the Gulf of Mexico.

Biological Features

The creatures that exist mostly control the biotic traits. For instance, wetland plants may grow into thick canopies that cover vast expanses of sediment; alternatively, snails or geese may graze the vegetation, leaving behind sizable mud flats. Because of the comparatively low oxygen levels in aquatic habitats, the species that live there are forced to adapt. To transport oxygen to their roots, many wetland plants, for instance, must develop aerenchyma. Some biotic traits, including the relative significance of competition, mutualism, or predation, are more nuanced and difficult to quantify. Predation by coastal herbivores, such as snails, geese, and animals, seems to be a major biotic element in an increasing number of instances [7]–[10].

Animals that are Autotrophic

Producers that convert inorganic material into organic molecules are known as autotrophic organisms. Algae are among the most important autotrophic organisms in aquatic settings, using sun energy to produce biomass from carbon dioxide. Of course, the biomass contribution from rooted and floating vascular plants increases with the depth of the water. The amazing productivity of estuaries and wetlands is a result of the interaction of these two sources, as this autotrophic biomass is transformed into fish, birds, amphibians, and other aquatic animals. Benthic marine environments include chemosynthetic microorganisms. These organisms may consume the hydrogen sulphide present in volcanic vent water. At volcanic vents, large populations of animals that consume these microorganisms may be discovered. For instance, there are 30 cm long Calyptogena magnifica clams and 1.5 m long enormous tube worms.

Animals that are Heterotrophic

In addition to consuming autotrophic organisms, heterotrophic organisms employ the organic molecules found inside of them as fuel and as a source of raw materials for biomass production. Whereas stenohaline or salt-intolerant animals can only exist un freshwater habitats, euryhaline creatures are salt tolerant and can thrive in marine ecosystems. The growing and harvesting of salmonids under controlled conditions for both commercial and recreational reasons is known as salmonid aquaculture. Carp and salmonids, in especially salmon and steelhead, are the two most significant fish species in aquaculture. The Atlantic salmon is the salmonid that is commercially farmed most often. The National Fish Hatchery System in the United States produces the majority of the salmonids raised for pleasure and subsistence fishing: Chinook salmon and rainbow trout. The most frequently raised fish for recreational restocking in Europe is brown trout. Tilapia, catfish, sea bass, and bream are among the non-salmonid fish species that are often farmed.

Globally, salmonid aquaculture generated US$10.7 billion in 2007. In the 25 years from 1982 to 2007, salmonid aquaculture productivity increased more than ten-fold. With 33%, Chile, and other European producers with 19% each, Norway and Chile are the top producers of farmed salmonids. Salmonid aquaculture output, in tonnes, 1950–2010, according to the FAO The effects of extensive sal-monids aquaculture on the environment and human health are now a hotly debated topic. The effects on wild salmon and other marine species are of special concern. A portion of this debate is related to a significant commercial competition between Alaska's commercial salmonid fishermen and the quickly developing salmonid aquaculture sector for market share and pricing.

Methods

The capture of wild salmonids via commercial fishing methods may be compared with the aquaculture or rearing of salmonids. Nevertheless, the Alaska Seafood Marketing Institute defines "wild" salmon as stock augmentation fish produced in hatcheries that were formerly regarded as ocean ranching. Nonetheless, all of it is sold as "wild Alaska salmon," regardless of the kind of salmon or the place where it was raised. The proportion of Alaska's salmon catch that comes from ocean ranching varies depending on those factors.

In Europe in the late 18th century, fertilisation experiments gave rise to the first salmonid aquaculture techniques. Europe and North America both employed salmon hatcheries in the late 19th century. In the US, Canada, Japan, and the USSR, improvement programmes based on hatcheries were launched beginning in the late 1950s. Norway is where the modern method of employing floating sea cages was developed in the late 1960s.

Salmonids are typically raised in two phases, however this number may vary locally. The salmon is first reared on land in freshwater tanks after hatching from eggs. The amount of water that has accumulated thermally during incubation might be increased to speed up hatching. The smolt are moved to floating sea cages or net pens when they are 12 to 18 months old and are moored in protected bays or fjords along a coast. Mariculture is the term used to describe this farming in a maritime setting. For another 12 to 24 months, they are given pelleted feed there before being harvested. Chile and Norway together produce 31% and 33% of the world's farmed salmonids, respectively. These nations' beaches have adequate water temperatures and several spots that are well shielded from storms. Large fodder fisheries that provide fish meal for salmon farming are nearby in Chile. Canada and Scotland each have sizable production capacities. Systems for raising salmonids nowadays are quite intensive. Large agricultural firms that run industrial-sized automated manufacturing lines often have influence over who owns them. These five businesses generated over half of the world's farmed salmon in 2003.

Hatcheries

Recirculating Aquaculture Systems are being used in modern commercial hatcheries to provide salmon smolts to aquaculture net pens. With these systems, the water is recycled inside the hatchery. This enables the hatchery's placement to be independent of a large fresh water source and permits reasonably priced temperature control to both accelerate and retard development in order to accommodate the requirements of the net pens. Traditional hatchery systems use flow throughs to let spring water or water from another source into the facility. The salmon smolts are then generated in raceways once the eggs have hatched in trays. Typically, the feed and waste products from the maturing salmon fry are dumped into the nearby river. A kilogramme of smolts produced in a conventional flow-through hatchery, like the majority of Alaska's enhanced hatcheries, requires more than 100 tonnes of water.

Using spawning canals is an alternative to hatching in freshwater tanks. These are man-made streams with gravel bottoms and concrete or rip-rap banks that are often parallel to an existing stream. In order to remove silt, water from the nearby stream is sometimes pumped into the channel's top. Since floods may often wipe away the natural reds, spawning success is frequently considerably greater in channels than in nearby streams. Lack of floods necessitates periodic cleaning of spawning canals to eliminate accumulated debris. Natural redds are cleaned away by the same floods that destroy them. As there is no incentive to employ prophylactic chemicals to prevent infections, as there is in hatcheries, spawning channels retain the natural selection of natural streams. Nevertheless, the expensive expense of spawning canals coupled with the risk of exposing fish to wild parasites and viruses renders this technique unsuitable for salmon aquaculture operations. Only stock improvement programmes might benefit from this kind of technology.

Sea pens

The typical material for sea cages, also known as sea pens or net pens, is mesh that is framed in steel or plastic. These may be round or square, 10 to 32 metres wide, 10 metres deep, and have contents ranging from 1,000 to 10,000 cubic meters. Up to 90,000 fish may be housed in a large marine cage. In order to create a system known as a seafarm or seasite, they are often arranged side by side. This system includes a floating dock and walkways along the net limits. The seafarm may additionally be surrounded by additional nets to keep away predatory marine animals. For Atlantic salmon, stocking densities vary from 8 to 18 kilogrammes per cubic metre, while for Chinook salmon, they range from 5 to 10 kilos per cubic metre.

Salmonids are carnivorous animals that are now given complex fish feeds that comprise fish meal as well as other feed materials such soybean meal, feather meal, and remnants of the wheat industry. Salmonids need fat as their main source of energy since they are aquatic predators and cannot tolerate or effectively digest many plant-based carbohydrates. With the quantity of global fish meal output being practically a constant level for the past 30+ years and at maximum sustainable yield, most of the fish meal market has migrated from chicken and pig feed to fish and shrimp feeds as aquaculture has increased in this time period.

Harvesting

Wet well ships are increasingly being used in modern harvesting practises to deliver live salmon to the processing facility. This makes it possible to kill, bleed, and fillet the fish before rigidity sets in. Due to more humane handling, the client receives products of higher quality. Prior to being electrically and percussionally murdered and having their gills sliced for bleeding, live salmon must experience the least amount of stress possible in order to produce the highest quality product. Commercially significant improvements in processing times and freshness for the consumer are compelling commercial wild fisheries to modernise their processing for the benefit of all seafood consumers. Using a sweep net, which functions somewhat similarly to a purse seine net, is an earlier technique for harvesting. A large net with weights along the bottom edge serves as the sweep net. It is extended over the pen, and the bottom border touches the ground. Fish are herded into the purse by lines lifted from the bottom corners, where they are then netted. The fish are often put comatose in carbon dioxide-rich water before being killed, however several nations are phasing out this technique owing to concerns about the method's morality and the quality of the resulting product. With a hit to the head from a pneumatic piston, more sophisticated systems use a percussive-stun harvest technique that swiftly and mercifully kills the fish. Next the gill arches are cut, and they are immediately submerged in icy water to be bled. Fish are killed using techniques that minimise scale loss and prevent the release of stress hormones that compromise the quality of the meat.

Affliction and parasites

Gyrodactylus, a monogenean parasite, was introduced to Norway's state-run hatcheries in 1972 together with live Swedish trout and salmon. Infected eggs, smolts, and fry were released into several rivers from hatcheries with the intention of bolstering the wild salmon supplies, but some of the impacted wild salmon populations were wiped out instead. At an Atlantic salmon hatchery in Norway in 1984, infectious salmon anaemia was shown to exist. Fish in the epidemic perished to the tune of 80%. The profitability of Atlantic salmon aquaculture is being seriously threatened by the viral illness known as ISAv. It is now the first illness listed on List One of the fish health regime of the European Commission. This mandates, among other actions, the complete destruction of the fish stock in the event that a disease outbreak is detected on any farm. Salmon farms in Chile, Norway, Scotland, and Canada are negatively impacted by ISAv, which results in significant economic losses for such farms. As the name suggests, it makes infected fish very anaemic. Fish carry DNA in their red blood cells, unlike mammals, and they may get viruses. The fish may swim near the water's surface while gasping for breath, developing pale gills. Yet, the sickness may also develop without any outward symptoms being present, the fish continue to eat normally, and then they pass away unexpectedly. A farm with the illness may only gradually experience its effects.

Also, it poses a danger to the declining wild salmon supplies. Making a vaccine and enhancing the disease's genetic resistance are examples of management techniques. In the wild, parasites and illnesses are typically at low levels and are controlled by natural predation on vulnerable people. They may spread like wildfire in overcrowded net enclosures. Moreover, parasites and diseases spread from populations of farmed to wild salmon. A new research in British Columbia establishes a relationship between salmon farms and wild pink salmon in the same river in terms of the transmission of parasitic sea lice. The European Commission came to the following conclusion: "The reduction of wild salmonid abundance is also linked to other factors, but there is more and more scientific evidence establishing a direct link between the number of cages present in the same estuary and the presence of lice-infested wild fish." According to reports, sea lice from adjacent salmon farms are threatening to exterminate wild salmon on Canada's west coast. Some scientists have challenged these projections, and subsequent harvests have shown that they were incorrect. In order to rid farmed salmon of ectoparasites, Scotttish salmon farming began the use of farmed wrasse in 2011.

Contaminants and Pollution

Salmonid farms are typically located in marine ecosystems with favourable water quality, high water exchange rates, current speeds that are fast enough to prevent bottom

pollution but slow enough to prevent damage to pens, protection from major storms, a reasonable water depth, and a reasonable distance from major infrastructure like ports, processing plants, and logistical facilities like airports. There are important logistical challenges, including the need to get feed and maintenance workers to the plant and the product back. Complex political-driven permission issues in many nations make it difficult to locate farms in the best areas, complicating siting considerations. The benthos around salmon farms may accumulate with heavy metals, especially copper and zinc, in locations with insufficient currents.

While contaminants are often identified in the flesh of both farmed and wild salmon, the tolera- ance standards established by health authorities are seldom exceeded. Science published a 2004 research that examined both farmed and wild salmon for organochlorine contamination. They discovered that farm-raised salmon had greater contamination levels. Chilean salmon had the lowest amounts while European fish had the greatest levels of farmed salmon. PCBs in commercial fish have a tolerance/limit of 2000 ppb, set by the FDA and Health Canada. This was corroborated by a subsequent research, which found that farmed salmon had levels of dioxins, chlorinated insecticides, PCBs, and other toxins up to 10 times higher than those in wild Pacific salmon. Using the same fish samples as the prior study, further research revealed that farmed salmon had levels of beneficial fatty acids that were two to three times greater than those of wild salmon. A subsequent benefit-risk study on salmon eating matched its benefits for fatty acids with its cancer concerns. Because PCBs specifically are lipophyllic and are therefore found in higher concentrations in fattier fish in general, current methods for this type of analysis take into account the lipid content of the sample in question. Therefore, the higher level of PCB in the farmed fish is in relation to the higher content of beneficial n-3 and n-6 lipids they contain. They discovered that although eating farmed salmon may provide necessary levels of fatty acids with acceptable carcinogenic risks, recommended levels of EPA+DHA intake cannot be entirely obtained from farmed salmon without unacceptable carcinogenic hazards. Consumers should not consume farmed fish from Scotland, Norway, or eastern Canada more than three times per year; from Maine, western Canada, and Washington state, no more than three to six times per year; and from Chile, no more than about six times per year. These were the findings of this 2005 study. Pink salmon, Sockeye and Coho may be eaten around twice a month, Chinook just under once a month, and wild chum salmon up to once a week.

In light of the fact that the levels of all contaminants in that study were, on average, 100 times lower than those set as the maximum by the FDA, CIA, and EFSA, and any risk posed by these contaminants is far outweighed by the proven benefits of consuming farmed or wild salmon, a research paper from 2008 titled "Balancing the risks and benefits of

fish for sensitive populations" contradicts the aforementioned recommendation. Because of this, according to Health Canada, no particular recommendations addressing fish eating in relation to PCB exposure are now necessary. The latest Canadian dietary recommendations say Consume fish per week in at least two Food Guide servings. Choose fish like trout, char, herring, mackerel, salmon, and sardines.

According to the US's 2010 Dietary Guidelines, you should consume 12 ounces of fish for breastfeeding women and 8 ounces of seafood for everyone else per week. There are no fixed upper limits or prohibitions on consuming wild or farm-raised salmon. The European Food Safety Authority reported in July 2012 that "Farmed salmon and trout had on average fewer dioxins and PCBs than wild-caught salmon and trout," in an "Update of the monitoring of levels of dioxins and PCBs in food and feed." This statement was made in response to the 2004 article "Global Evaluation of Organic Contaminants in Farmed Salmon" by the European Food Information Council.

After the release of a study by US researchers that revealed that the levels of organic contaminants, such as dioxins and PCBs, in farmed salmon might represent a health risk, public concerns were raised earlier this year. In stark contrast to the recommendation from food authorities to eat one portion of oily fish per week, they advised consuming less than one half part of farmed salmon every month. Nevertheless, as the amounts of pollutants were similar with those previously reported in smaller investigations and stayed within generally recognised safety standards, this research did not reveal any novel evidence. The authors' advice was inconsistent because it was based on a risk analysis technique that toxicologists and other specialists in food safety do not consider to be universally recognised. European and American food safety agencies concurred that the research did not raise any fresh health issues and that consuming one dish of farmed salmon per week was still regarded as safe. and these guidelines came after that. "Consumers should base their decisions on which foods to include or eliminate from their diets on sound evidence rather than media headlines," the statement reads.

Influence on wild salmonids

Salmonids raised in captivity are capable of escaping from saltwater cages and often do so. If the farmed salmonid is not native, it could fight for food and habitat with the wild species. If the farmed salmonid is natural, it may breed with salmonids that are native to the wild. Such hybridization may lower disease resistance, genetic diversity, and adaptation. Over 500,000 salmon and trout escaped from ocean net enclosures off the coast of Norway in 2004. 600,000 salmon were released during storms in Scotland. Farm salmon that escape often be caught by commercial fisherman who are fishing for wild salmon. 20 to 40 percent of the fish taken in the Faroe Islands at one time were fugitive farm salmon.

Both farm-raised and wild salmon may get infested with sea lice, notably Lepeophtheirus salmonis and several Caligus species, such as Caligus clemensi and Caligus

rogercresseyi, which can be fatal. While salmon are in the planktonic nauplii and copepodid larval phases, which may last for many days, sea lice migrate and latch onto the salmon's skin and feed on its mucous, blood, and skin. Many juvenile wild salmon get infected with sea live and die as a consequence when exposed in river estuaries with huge numbers of open-net salmon farms, which may produce extraordinarily high concentrations of sea lice. Little, thin-skinned young salmon travelling to sea are very susceptible, while adult salmon may withstand otherwise dangerous levels of sea lice.

According to mathematical analyses of data from the Canadian Pacific coast, nearly 80% of pink salmon in certain locations were killed by lice in 2007. In that year, Canada federal fisheries experts Kenneth Brooks and Simon Jones issued a criticism titled "Perspectives on Pink Salmon and Sea Lice: Scientific Data Fails to Support the Extinction Theory" in response to the aforementioned 2007 mathematical analysis. Since these investigations, there has generally been a rise in pink salmon abundance in the Broughton Archipelago.

Researchers from the Canadian Government Fisheries, Brian Riddell and Richard Beamish et al., made a similar observation in the scientific literature and came to the conclusion that there is no connection between pink salmon returns to the Broughton Archipelago and the prevalence of farmed salmon louse. In addition, "the data was utilised selectively and results do not align with subsequent observations of returning salmon".

Salmonid aquaculture decreases the survival of associated wild salmonid populations, according to a meta-analysis of the available evidence published in 2008. It has been established that the Atlantic, steelhead, pink, chum, and coho salmon all exhibit this association. Often, the decline in abundance or survival is more than 50%. These analyses are entirely correlational, and correlation does not imply causation, particularly when the salmon losses in Oregon and California, which lack salmon farming and marine net cages, are comparable. The wild salmon run in 2010 produced a record harvest, despite the research' forecasts that salmon runs in Canada would fail.

A 2010 research that used data on fish output and sea lice counts from every salmon farm in the Broughton Archipelago for the first time showed no connection between farm lice numbers and wild salmon survival. The authors come to the conclusion that the proliferation of farm sea lice was not to blame for the 2001 stock decline. The research indicated that the farm sea lice population during the juvenile pink salmon migration was higher in 2000 than in 2001, yet owing to the record salmon escapement in 2001, sea lice are not held responsible for the 2002 collapse. The authors also point out that despite reports of bleeding at the base of the fins—a sign often linked to infections but not, under laboratory circumstances, with exposure to sea lice—early research had not looked into bacterial and viral reasons for the incident.

II. DISCUSSION

Salmon in the wild is anadromous. They give birth in freshwater inland and then travel to the ocean as juveniles, where they develop. While some salmon wander to other rivers, the majority of salmon return to the river where they were born. Concerns exist about the function of genetic variation in salmon streams. Certain fish must be able to withstand environmental shocks, such as exceptional temperature extremes, for the population to be resilient. It is also unknown how salmon genetic diversity has been affected by hatchery output.

Genetic Engineering

For rapid growth, salmon have been genetically altered in labs. Commercial usage of these fish is opposed, and no clearance has been provided so far. A modified Atlantic salmon has been created by a Canadian business, Aqua Bounty Farms, that develops almost twice as quickly—producing a fully-fledged fish in 16–18 months as opposed to 30—and is more tolerant of low temperatures. Moreover, it uses 10% less food. This was accomplished by combining a promoter sequence from the ocean pout that affects the generation of antifreeze with a gene sequence from the chinook salmon that affects growth hormones. Growth hormones are often only produced by salmon in the presence of light. The production of growth hormones is not turned off in the transgenic fish. In 1996, the business submitted the fish for FDA clearance for the first time. What may happen if transgenic salmon escapes into the wild is a worry. In a laboratory experiment, it was discovered that transgenic salmon mixed with their wild counterparts competed aggressively but eventually failed.

effect on predatory wild species

Diverse natural predators may be drawn to sea cages, and these predators may sometimes get entangled in related nets, suffering harm or even dying. White-bellied sea eagles get entangled in salmon farming sea cages in Tasmania, Australia. One firm, Huon Aquaculture, has been moved by this to support a centre for bird rehabilitation and test more durable nets.

III. CONCLUSION

Although the market for fish meal has changed from chicken, pig, and pet food to aquaculture diets, the consumption of forage fish has been practically stable over the previous thirty years and at the maximum sustainable output. It is implied that the expansion of salmon aquaculture has no effect on forage fish harvest rates given that this market shift at constant output is an economic choice with no impact on forage fish harvest rates for fish meal. Fish do not naturally produce omega-3 fatty acids; instead, they accumulate them by either consuming microalgae that produce these fatty acids, as is the case with forage fish like

herring and sardines, or by consuming prey fish that have accumulated omega-3 fatty acids from microalgae, as is the case with fatty predatory fish like salmon. To meet this need, farmed salmon are fed more than 50% of the world's fish oil output [11]–[13].

REFERENCES

[1] D. P. Häder, H. D. Kumar, R. C. Smith, and R. C. Worrest, "Effects on aquatic ecosystems," J. Photochem. Photobiol. B Biol., 1998, doi: 10.1016/S1011-1344(98)00185-7.

[2] F. Borgwardt et al., "Exploring variability in environmental impact risk from human activities across aquatic ecosystems," Sci. Total Environ., 2019, doi: 10.1016/j.scitotenv.2018.10.339.

[3] Y. Chae and Y. J. An, "Effects of micro- and nanoplastics on aquatic ecosystems: Current research trends and perspectives," Mar. Pollut. Bull., 2017, doi: 10.1016/j.marpolbul.2017.01.070.

[4] R. Fernandez, N. R. Colás-Ruiz, H. J. Bolívar-Anillo, G. Anfuso, and M. Hampel, "Occurrence and effects of antimicrobials drugs in aquatic ecosystems," Sustainability (Switzerland). 2021. doi: 10.3390/su132313428.

[5] A. Pariatamby, F. S. Hamid, M. S. Bhatti, N. Anuar, and N. Anuar, "Status of microplastic pollution in aquatic ecosystem with a case study on cherating river, Malaysia," J. Eng. Technol. Sci., 2020, doi: 10.5614/j.eng.technol.sci.2020.52.2.7.

[6] M. Arias-Andres, U. Klümper, K. Rojas-Jimenez, and H. P. Grossart, "Microplastic pollution increases gene exchange in aquatic ecosystems," Environ. Pollut., 2018, doi: 10.1016/j.envpol.2018.02.058.

[7] Q. Zhou, J. Zhang, J. Fu, J. Shi, and G. Jiang, "Biomonitoring: An appealing tool for assessment of metal pollution in the aquatic ecosystem," Analytica Chimica Acta. 2008. doi: 10.1016/j.aca.2007.11.018.

[8] N. D. Baloyi, M. Tekere, K. W. Maphangwa, and V. Masindi, "Insights Into the Prevalence and Impacts of Phthalate Esters in Aquatic Ecosystems," Frontiers in Environmental Science. 2021. doi: 10.3389/fenvs.2021.684190.

[9] E. Tzafesta, F. Zangaro, V. Specchia, and M. Pinna, "An overview of dna-based applications for the assessment of benthic macroinvertebrates biodiversity in mediterranean aquatic ecosystems," Diversity. 2021. doi: 10.3390/d13030112.

[10] C. Çevik, A. E. Kıdeyş, Ü. N. Tavşanoğlu, G. B. Kankılıç, and S. Gündoğdu, "A review of plastic pollution in aquatic ecosystems of Turkey," Environmental Science and Pollution Research. 2022. doi: 10.1007/s11356-021-17648-3.

[11] L. N. Nash, P. A. P. Antiqueira, G. Q. Romero, P. M. de Omena, and P. Kratina, "Warming of aquatic ecosystems disrupts aquatic–terrestrial linkages in the tropics," J. Anim. Ecol., 2021, doi: 10.1111/1365-2656.13505.

[12] [P. A. Staehr, J. M. Testa, W. M. Kemp, J. J. Cole, K. Sand-Jensen, and S. V. Smith, "The metabolism of aquatic ecosystems: History, applications, and future challenges," Aquatic Sciences. 2012. doi: 10.1007/s00027-011-0199-2.

[13] J. Flotemersch and K. Aho, "Factors influencing perceptions of aquatic ecosystems," Ambio. 2021. doi: 10.1007/s13280-020-01358-0..

An Overview on Construction of Fish Pond

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Abstract— Every natural body of water, such as rivers, streams, and lakes, contains fish. Such natural water bodies are either cold, where less natural fish food is generated, or warm, where more is produced since the climate is better suited to an aquatic environment. Consequently, a stagnant water body is created on a suitable piece of land by digging earth or building an earthen dike or dikes around it, where water is held to stock the fish, in order to boost fish output. The fish that are supplied are raised in controlled environments. This body of water is known as a fish pond.

Index Terms— Earthen Ponds, Fish Pond, Fish Cultivation, Fish Farming, Water Supply

I. INTRODUCTION

Such a fish pond is built on either flat, plain terrain or muddy ground. The easiest method of building a fish pond in flat locations is to dig the ground to create a depression, then pile the earth/soil in a systematic pattern around the hole to create a form of dike. Excavated ponds are this kind of pond. Once again on a muddy site, a pond is created by constructing sturdy dikes on 1, 2, or 3 sides to keep water. Dam ponds are the name for this kind of pond. The amount of land that may be used for a fish pond determines its size and design [1]–[3].

Choice of location:

A fish pond is never built carelessly since a well-built fish pond is simple to run and maintain. Thus, careful thought must be paid to the following factors in order to build the optimal fish pond:

a) Appropriate Site:

Any flat, muddy area may be used to build a fish pond as long as the soil can hold the water; soil that is made of gravel, stone, or sand cannot. Since such terrain is believed to be most suitable for a fish pond,

Due to its topography, land is not necessary to erect all four dikes, and their construction proves to be cost-effective.

b) Sufficient Water:

Fish need water to survive, thus a fish pond requires a large amount of water to develop as well as maintain the fish. Consequently, it is crucial to construct a fish pond around a dependable perennial water supply.

d) Nearer Home:

The fish pond has to be designed closer to the home in order to complete daily tasks on time, to have close monitoring, to prevent poaching, and to prevent anything from happening to the water or the live fish.

e) Avoiding any Shade:

The fish pond's generation of natural food depends greatly on sunlight. To ensure that a fish pond receives enough sunlight, it must be constructed away from large trees or other sources of shadow. Moreover, the large trees shed their leaves into the pond, reducing sunlight penetration and causing the water quality to be bad or worse [4]–[7].

f) Location that is Simple to Reach:

Since a fish pond requires frequent inputs such as fish seeds, lime, manure, and fish meal, the location must be chosen in an area that is readily accessible. They must be transferred as necessary. All the inputs must be brought to the farm again in the event of a difficult approach, which raises the operating costs. Similar to this, there will be additional challenges when the agricultural produce is harvested. A location that is simple to get to reduces labour and transportation costs while also making it easier to carry agricultural goods and live fish seeds.

Soil Analysis

The prospective farmer who wants to construct a more conventional semi-intensive fish or shrimp farm using clay ponds considers soil quality to be significant. The right local soil composition is necessary for this sort of operation to provide stable. Waterproof ponds made of dirt. Earthen ponds are said to be the most economical method to store water for fish and shrimp growing operations in land-based aquaculture.

Our overall aquaculture feasibility evaluations include comprehensive soil horizon investigations at several sample points within each candidate site whenever soils may be appropriate for building earthen ponds. All boreholes and several soil sample strata have their soil pH tested on-site. Also made on the spot are broad observations on the soil type. For many samples collected from the most appropriate locations, a well-equipped soil lab may carry out an extensive soil texture analysis as well as a soil chemical analysis of all main and minor soil nutrients. The findings of the soil quality test will next be compared to ideal aquaculture parameters.

Sand, silt, and clay content in a sample are used to categorise the texture of the soil. The soil triangle is then used to classify soils by type based on these percentages. Construction-ready soils for earthen ponds must have a minimum of 20 to 30% clay and, ideally, no more than 30% sand. Clay, silty clay, silty clay loam, and clay loam are the finest soil types for aquaculture.

Water supply

Fish cannot survive without water; thus, a fish pond need a substantial amount of water to keep the fish alive as well as to help them thrive. Hence, before deciding to build a fish pond, it is virtually essential to check the water supply both statistically and qualitatively. In the dry season, a 2" to 4" pipe filled with water is thought to be sufficient to run one or more sizable ponds. The size of the fish culture operation affects the water's volume. In addition to quantity, water quality must also be assessed.

Water Temperature

The ecology of the pond, which includes the generation of fish, depends critically on the water temperature. Due of its low temperature, cold water is less effective. Due to the need of extra feed in cold water fish farming, production costs skyrocket, making it unaffordable for the vast majority of people. Yet in warm water, various forms of naturally occurring fish food from plant and animal sources are created with less effort, and the water is rendered productive. The cost of the commodity has decreased due to increasing fish output, and the majority of people now have access to fish. Hence, people prefer water that is warmer in temperature. In Warm water fish cultivation, between 20 and 30 degrees Celsius, is thought to be the most advantageous.

Water Alkalinity

In fish culture, alkaline water with a pH range of 7 to 10 is best recommended. Water that is acidic and has a pH value below 6 is not at all recommended since it is still ineffective. By adding lime, slightly acidic water with a pH of 6 or below may be made alkaline. Nevertheless, this process raises production costs and increases the risk of disease outbreaks in the water. Acidic water with a pH value below 7 is thus not thought to be ideal for fish cultivation [8]–[10].

Dissolved oxygen

The amount of dissolved oxygen in the water is used in fish culture to determine the quality of the water. The greater dissolved oxygen content defines the quality of the water. The water in rivers and streams is naturally aerated, and as a result, it naturally contains more oxygen. The amount of dissolved oxygen is lower in dirty water, and fish farming is never done there. For fish cultivation, water with dissolved oxygen levels below 4 mg/l is not recommended. Hence, a perpetual water supply with a higher water temperature, an alkaline nature, and a larger proportion of dissolved oxygen is thought to be preferable for the cultivation of warm-water fish.

Suitably situated land for fish farming

It is important to check the suitability of the suggested land location. The terrain should generally have slopes that are no steeper than 2%. The cost of the land will be minimal if wasteland that cannot be used for agriculture or other direct uses is chosen for a fish pond. When deciding whether a location is suitable for the development of a fish farm or hatchery, the land elevation and flood level are crucial considerations. Deep flooding shouldn't occur on the land, and the highest flood level during the last ten years shouldn't have risen higher than the dikes. The projected heights of floods may be determined by looking at the marks that flood waters have left on nearby bridges or other buildings, or by asking locals. Consideration should be given to the size and form of the available land. Land with a regular shape and adequate space for future growth is good for a fish farm. Knowing the area's growth plans is crucial since it would be foolish to choose a project location in an area where potential industrial activity may lead to air and water pollution in the future. Similar to this, the danger of pollution should be considered if a location is close to a densely inhabited region. Yet, fish aquaculture may be able to use certain industrial and agricultural wastes. Special investigations on their use or necessary care should be made in such situations.

The kind and density of plants are somewhat influenced by the elevation of the ground. Indicators of soil types and water table elevation may also be found in vegetation. The manner of clearing the site and, therefore, the amount of time and money required for building are heavily influenced by the kind and density of vegetation, its size, and the root systems of trees.

As opposed to property with extremely dense jungle or marshy regions with towering trees, grassland, abandoned paddy fields, open forest, or land covered with low shrubs and bushes offer for less expensive development. The kind of aquaculture pond utilised, as well as the dike, inlet, and outlet structure. Whatever time is needed for water in a fish pond. In order to prevent constant maintenance, a permanent water canal must be built from the water source to the pond. When building a permanent canal, it is preferable to have two parallel grooves at regular intervals on both sides of the canal wall so that a screen made of wood may be erected to screen the water and prevent undesired fish or other animals from accessing the pond water.

II. DISCUSSION

Advantages:

1. It is simple to build and requires just a modest level of engineering.

2. The provision of plentiful natural food produced with little labour.

3. More potential for weed fish and undesired aquatic weeds to enter.

A fish pond with cement:

Cemented ponds are ponds that are built using cement concrete. It is often built at a research station. Farmers cannot afford this pond since it demands a higher installation fee.

Advantages:

1. While the cost to create a concrete pond is more initially, overall upkeep costs are less than those of an earthen pond.

2. It is possible to control the turbidity of water.

Disadvantages: Increased initial installation costs, plus the issue of summertime water temperatures.

The racing cultures:

Raceways are pond structures where producers regularly feed fresh water to cultivate cold water fish, such as trout. In Nepal, raceways that resemble ladders are common.

Pond for young fish:

They are a little and shallow pond. This pond serves as a holding area for spawn and hatchlings until they develop into fry or fingerlings. In comparison to nursery ponds, they are deeper and rather big. It is sometimes utilised as a production pond and is typically used to grow fingerlings until they are advanced fingerlings. In comparison to other ponds, this one is enormous and deep, and it is used to raise fish seeds until they are ready for sale or for use as food.

Male and female fish are stockpiled and raised in it. This kind of pond is often utilised for breeding purposes. In order to create flat terrain during dam preparation, dirt is removed from steeper slopes and filled with lower muddy land. Lastly, a pond is built on the level terrain. Different locations may have different land slopes [11]–[13].

III. CONCLUSION

With this kind of pond, earth is removed from the ground and utilised to create a dike. It was built on relatively level terrain with increased elevation. The absence of floods should be the primary priority. Wall building over a gentle or flat valley creates barrage ponds. Usually, river water or rainfall fills these ponds. It should not be built in an area with a significant water flow or current

REFERENCES

[1] Audu V. E. Michael, "Design and Constructional Estimate of a 1000-Capacity Fish Pond Towards Diversification of the Nigerian Economy," Int. J. Eng. Res., 2018, doi: 10.17577/ijertv7is040338.

[2] J. Shafi, K. N. Waheed, Z. S. Mirza, and M. Zafarullah, "Assessment of soil quality for aquaculture activities from four divisions of Punjab, Pakistan," J. Anim. Plant Sci., 2021, doi: 10.36899/JAPS.2021.2.0244.

[3] I. C. Dos Reis et al., "Epidemic and endemic malaria transmission related to fish farming ponds in the Amazon Frontier," PLoS One, 2015, doi: 10.1371/journal.pone.0137521.

[4] E. Koten, L. L. J. . Mondoringin, and I. R. . Salindeho, "Evaluasi Usaha Pembudidayaan Ikan di Desa Matungkas Kabupaten Minahasa Utara," e-Journal Budid. Perair., 2019, doi: 10.35800/bdp.3.1.2015.6971.

[5] M. Kobiyama, R. D. L. Michel, M. A. Paixão, and G. P. Michel, "Small Fish-pond Design for Debris Flow Disaster Measure with Kanako-2D," Tokyo Int. Sabo Assoc., 2018.

[6] A. El-Adawy, A. M. Negm, O. C. Saavedra, K. Nadaoka, and I. A. El-Shinnawy, "Coupled hydrodynamic-water quality model for pollution control scenarios in El-Burullus Lake (Nile delta, Egypt)," Am. J. Environ. Sci., 2014, doi: 10.3844/ajessp.2014.546.565.

[7] A. A. Rosalia, A. B. Pane, I. Solihin, R. Y. F. Hutapea, A. S. Putri, and D. Tirtana, "Strategi Pengembangan Pangkalan Pendaratan Ikan Cisolok, Kabupaten Sukabumi: Pendekatan Analisis SWOT," J. Teknol. Perikan. dan Kelaut., 2020, doi: 10.24319/jtpk.10.191-204.

[8] J. Li, X. Lai, H. Liu, D. Yang, and G. Zhang, "Emergy Evaluation of three Rice Wetland Farming Systems in the Taihu Lake Catchment of China," Wetlands, 2018, doi: 10.1007/s13157-017-0880-x.

[9] H. Mendelssohn and Y. Yom-Tov, "A report of birds and mammals which have increased their distribution and abundance in Israel due to human activity," Isr. J. Zool., 1999.

[10] R. Bordoloi and A. U. Muzaddadi, "Indigenous technical knowledge associated with disaster management and fisheries related activities in the highest flood affected district (Dhemaji) of Assam, India," Indian J. Tradit. Knowl., 2015.

[11] [V. Stabnikov, V. Ivanov, and J. Chu, "Sealing of sand using spraying and percolating biogrouts for the construction of model aquaculture pond in arid desert," Int. Aquat. Res., 2016, doi: 10.1007/s40071-016-0136-z.

[12] "Resource Schedule of Concrete Fish Pond Construction Using Network Analysis," J. Mark. Consum. Res., 2019, doi: 10.7176/jmcr/57-04.

[13] A. Darmansah, . Sulistiono, T. Nugroho, and E. Supriyono, "Pemberdayaan Masyarakat melalui Pengembangan Budi Daya Ikan Lele di Desa Balongan, Indramayu, Jawa Barat," Agrokreatif J. Ilm. Pengabdi. Kpd. Masy., 2016, doi: 10.29244/agrokreatif.2.1.8-16.

An Overview on the Different Pond Structures

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Abstract— Ponds are man-made or natural bodies of water that serve a variety of purposes, including water storage, irrigation, recreation, and wildlife habitat. There are different types of pond structures that vary in size, shape, and purpose. One common type of pond structure is the earthen pond, which is constructed by excavating a depression in the ground and lining it with clay or plastic to prevent water leakage. These ponds are typically used for irrigation, livestock watering, or aquaculture. Another type of pond structure is the concrete pond, which is constructed using concrete walls and a floor. These ponds are often used for recreational purposes such as swimming, as well as for aquaculture or water storage.

Index Terms— Dam Crown, Fish Pond, Pond Structure, Pond Dikes, Pond Type

I. INTRODUCTION

Natural ponds are also a type of pond structure that are formed by natural processes such as erosion, and are typically used for wildlife habitat or recreational activities like fishing.

1. Inlet: An inlet is a structure designed to provide water to the pond. At the top of the pond, a little box-like structure is built, and the fine wire screen is attached there to filter the water. In the event that more water is not required, it is redirected to the main canal by placing a simple wooden board in the groove created on the wall of the intake box.

2. Outlet an outlet is a building designed to drain an overflowing pond. For pond water to be controlled and drained, an outflow is just as crucial as an intake. The outflow structure is permanently built into the fish pond at its lowest position. This structure has a permanent outlet and is known as Monk. While clearing pond detritus and collecting fish, the exit is crucial.

3. A pit for harvest

To make the process of collecting fish simpler, a shallow pit is often built in the middle of the fish pond. It is around 0.5 m deep and 0.5–1 m broad.

4. Pond dikes

Dike is the term for the earthen construction that encloses the whole water surface area of the pond.

To determine the earth volume for a purposed pond dike, the dike's cross section area is first computed, then its whole length is multiplied by that number to get the earthen volume needed. A pond or set of ponds is created with the site selection based on the scenery. The dike is created using the least amount of dirt possible to be removed, which lowers the cost of construction. Depending on what is available at a location, the fish pond is built either by machine or by human labour [1]–[3].

The site is initially marked off before building work can begin by placing tiny and large pegs in accordance with the plan. At a distance of 3' from the centre of each dike, two bamboo pegs that are eight feet high are attached. To represent the Dam Crown, or top of the dike, both peg points

are linked at 7' in height with a rope. The inner rope of the future pond is stretched out with a slope of 1:2, and little pegs are used to secure it at the place where it reaches the ground. The outer rope is similarly fastened to the ground and stretched in the same manner, but towards the outside edge of the dike at a slope ratio of 1:1.5.

It is advised to keep the water level at five feet, necessitating the construction of pond dikes that are six feet high, in order to prevent fish deaths caused by extreme heat in the summer and extreme cold in the winter. As a result, the dike has to be elevated to seven feet during pond building so that it will be six feet high after the earth has been compacted. For fish culture activities including liming, feeding, manuring, and netting, the outside slope of the dike is typically maintained at the ratio of 1:1.5 while the inner slope of the dike is maintained at the ratio of 1:2. Both slopes are maintained at a 1:2 ratio in the event of a shared dike between two ponds. If the dam height is maintained at 6' using the aforementioned slopes, the inner side slope terminates 12' away from the inner bamboo of the dam crown. The outside slope of the dike also finishes at 9' from the outer pole of the dam crown, leaving a total base width of 24' for a well-constructed fish pond dike with a 3' dam crown [4]–[7].

Make Site Clear

The pond's layout provides a good notion of the area that the four pond dikes will cover as well as the location of the region from which dirt will be extracted and where it will be filled. The top dirt from the excavation and dike sites has to be scraped off first, and it should be dumped outside the building zone. In order for the filled-up soil to settle down fast for the dike to be stronger, clear the building site of any rocks, trees, or tree's roots, and plants. Under no circumstances can the dikes' grass, shrubs, or other vegetation be left. If these materials are left beneath the dike, they begin to decompose over time, weakening the dike. The risk of the dike leaking water increases in such circumstances.

Create a core and a trench if required

If there are any areas of poor soil found on the building site, it is advised to dig a trench approximately 3' broad and 3' deep between the two long bamboo poles along the pond's dikes,. The name of this trench is Core-Trench. The dike's core trench is also thought of as its base. Once again, quality dirt is used to fill the core-trench, and the earth is thoroughly rammed. In this manner, the seepage is prevented and the dike is strengthened and sturdy. If there is a question about the soil's quality, the core-trench is suitable; otherwise, it is not often used in practise.

Digging the Ground to Construct a Dike

The excavation sites of the soil are selected and brought to the required level throughout the pond design process. Systematically piling and ramming the excavated earth into the designated frame layer. If excavation is done using a large machine, the dirt is regularly compressed by the machine. A sturdy and stable dike is made from compacted good soil. The Fisheries and Extension Staff must be familiar with the calculation procedure to determine the precise amount of dirt needed to create the four dikes of a certain sized pond in order to be of assistance to the farmer. Take into account a pond that is 75' long, 75' broad, and 6' high. You now need to determine how much dirt is needed for the pond of the aforementioned dimensions. The pond mentioned above has a total size of 5625 square feet and a height of 6'. The dike's inner slope has a slope-to-area ratio of 1: 2, while the outer slope has a slope-to-area ratio of 1:1.5. Use the calculation below to determine how much dirt is needed to meet the aforementioned requirements.

II. DISCUSSION

It is important to focus on getting the earth properly compacted when building the dike. When the dikes are finished, it is important to grow a decent variety of grass on both the inner and outer slopes of each dike to prevent erosion. Also, when the turfed grass matures, it is given to the grass carp. As a result, it is important to choose a grass type with characteristics that retain the soil as well as having a high nutritional value [8]–[10].

Water system construction

Water is always needed for a fish pond. So that it doesn't need to be repaired constantly, a permanent water canal has to be built from the water supply to the pond. It is preferable to have two parallel grooves at regular intervals on both sides of the permanent canal wall when building it so that a screen may be placed in them. The wooden frame is put in place to screen the water and prevent undesired fish or other creatures from getting into the pond water.

Calculating the cost to build a pond

These costs include the cost of the property, the feasibility study, the fencing, the building of the pond or ponds, the water system, the approach road, and other infrastructures related to the development of the pond. Typically, the cost

incurred just once during the first stages of the activity is only reported under this section, as seen below;

Costs of Operations

The costs incurred for running the fish farm are included under this area, including costs associated with labour, preparing a pond, buying fish seed and transporting it, buying manure, feed, and medications and transporting them. These costs are incurred annually to keep the events running. As a result, these costs are known as operation expenditures. During one production cycle alone, the operating costs are limited to several manufacturing operations. The activity constantly compares the effectiveness of these costs to yearly revenue. Thus, it is necessary to focus operating costs on increasing output. Also, needless operating costs expose poor management. The operating records must thus be kept as thoroughly as feasible [11]–[13].

III. CONCLUSION

Equally significant to capital and operational expenses is the revenue record from sales of agricultural products. As a result, it is necessary to keep track of all revenue information. Analysis of agricultural production and the cost-benefits of the activity is made easier with the use of detailed harvest and revenue data. The profitability of a fish farm relies on the strategy used to put it into operation. For instance, if a fish pond has only been used to raise fish for table use, the farm only generates cash from the sale of the produced fish. Nevertheless, if a farm has been developed to produce fish for fish seed, it earns money from a variety of sources, such as the sale of spawn, fry, fingerlings, and yearlings in addition to the table-sized fish. Similar to this, the integrated fish farm makes money not just from the fish but also from different integration-related things.

REFERENCES

[1] Z. Liu et al., "Comparative analysis of microbial community structure in the ponds with different aquaculture model and fish by high-throughput sequencing," Microb. Pathog., 2020, doi: 10.1016/j.micpath.2020.104101.

[2] M. Reyne et al., "Artificial agri-environment scheme ponds do not replicate natural environments despite higher aquatic and terrestrial invertebrate richness and abundance," J. Appl. Ecol., 2021, doi: 10.1111/1365-2664.13738.

[3] A. C. Ávila, C. Stenert, E. N. L. Rodrigues, and L. Maltchik, "Habitat structure determines spider diversity in highland ponds," Ecol. Res., 2017, doi: 10.1007/s11284-017-1442-7.

[4] M. S. Nardelli, A. A. Padial, D. C. Bicudo, C. M. D. S. Cordovil, and S. C. Sampaio, "Variation of diatoms at different scales in the Brazilian pantanal basin," Water (Switzerland), 2021, doi: 10.3390/w13060823.

[5] Z. Wu, C. Lin, H. Shao, X. Feng, X. Chen, and S. Wang, "Ecological risk assessment and difference analysis of pit ponds under different ecological service functions-A case study of Jianghuai ecological Economic Zone," Ecol. Indic., 2021, doi: 10.1016/j.ecolind.2021.107860.

[6] J. W. Arntzen, C. Abrahams, W. R. M. Meilink, R. Iosif, and A. Zuiderwijk, "Amphibian decline, pond loss and reduced

population connectivity under agricultural intensification over a 38 year period," Biodivers. Conserv., 2017, doi: 10.1007/s10531-017-1307-y.

[7] L. Ancillotto, L. Bosso, V. B. Salinas-Ramos, and D. Russo, "The importance of ponds for the conservation of bats in urban landscapes," Landsc. Urban Plan., 2019, doi: 10.1016/j.landurbplan.2019.103607.

[8] B. L. Preto, J. M. Kimpara, P. Moraes-Valenti, and W. C. Valenti, "Population structure of pond-raised Macrobrachium amazonicum with different stocking and harvesting strategies," Aquaculture, 2010, doi: 10.1016/j.aquaculture.2010.07.023.

[9] J. S. Sinclair, L. S. Reisinger, C. R. Adams, E. Bean, A. J. Reisinger, and B. V. Iannone, "Vegetation management and benthic macroinvertebrate communities in urban stormwater ponds: implications for regional biodiversity," Urban Ecosyst., 2021, doi: 10.1007/s11252-020-01072-5.

[10] Y. Eissler, M. J. Gálvez, C. Dorador, M. Hengst, and V. Molina, "Active microbiome structure and its association with environmental factors and viruses at different aquatic sites of a high-altitude wetland," Microbiologyopen, 2019, doi: 10.1002/mbo3.667.

[11] A. Bloechl, S. Koenemann, B. Philippi, and A. Melber, "Abundance, diversity and succession of aquatic Coleoptera and Heteroptera in a cluster of artificial ponds in the North German Lowlands," Limnologica, 2010, doi: 10.1016/j.limno.2009.08.001.

[12] M. Rodríguez-Rodríguez, A. Fernández-Ayuso, M. Hayashi, and F. Moral-Martos, "Using water temperature, electrical conductivity, and pH to characterize surface-groundwater relations in a shallow Ponds System (Doñana National Park, SW Spain)," Water (Switzerland), 2018, doi: 10.3390/w10101406.

[13] A. Bacolla, J. A. Tainer, K. M. Vasquez, and D. N. Cooper, "Translocation and deletion breakpoints in cancer genomes are associated with potential non-B DNA-forming sequences," Nucleic Acids Res., 2016, doi: 10.1093/nar/gkw261
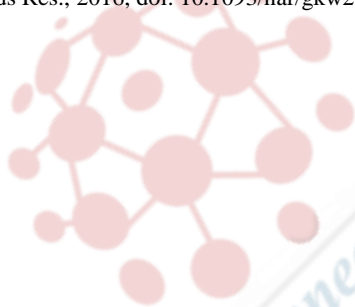
Management of Fish Pond

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Abstract— To increase fish productivity, fish pond management is essential. After completing this course, the student will be able to: - Clean and maintain pond cleanliness - Assess the water quality in the pond and take the necessary corrective action - Use organic and inorganic fertiliser in the fish pond - Effectively manage the feeding system.

Index Terms— Animal Feed, Brood Fish, Fish Ponds, Natural Feed, Terrestrial Plant

I. INTRODUCTION

Liming is a component of pond management that has various positive effects on the health of the fish and pond. It is often utilised in ponds for a variety of functions, including reducing soil acidity. It increases pond production, improves pond cleanliness, and acts as a preventative and therapeutic measure to eliminate pond bacteria, parasites, and other pests. Liming a pond is not always essential, but it may be done when the pH is too low or acidic, the organic matter content is too high, the amount of muck that has accumulated at the bottom of the pond is too high, or there is a danger that the oxygen will be depleted. It depends on the pH of the soil. A large quantity of lime is needed if the soil pH is low, and vice versa. A table with liming doses for various pH values is provided.

Setting up and running the fish ponds

1. Site choice

On the basis of the topography, soil type, water type, and drainage, a suitable site and location should be chosen.

2. Land depth

The expense of construction, sunlight penetration, and the need for a minimum water depth of 1.25 metres are all factors.

3. Pond dimensions

Ponds in Nepal range in size from 0.5 to 5 hectors economically.

The pond should be constructed such that the amount of earth accessible for pond excavation will match the amount of earth needed to raise the necessary embankment.

4. Pond dike construction

Dike is the name for the earthen wall that surrounds the whole pond's water surface area.

Calculating the cross section area of the dike and multiplying it by the dike's overall length is the first step in determining the earth volume needed for the dike's intended function.

Management of fish ponds, pond liming, natural food or fish pond manuring or fertilisation methods, organic and inorganic manuring, pre- and post-stocking management, regular fertilisation, pond environment monitoring, fish health monitoring, and management of natural resources are all covered.

The use and significance of feed and fertiliser in fish ponds the vital element for the fish's healthy growth and development is feed. There are two types: natural and artificial.

Natural:

1) Plankton: Throughout the early phases of their life histories, all fish and crustaceans depend on plankton as a primary source of nutrition. There are two kinds of phytoplankton: phytoplankton, which includes chlorophyta and cynophyta, and zooplankton, which includes crustaceans, insect larvae, and protozoa.

2) Aquatic creatures: Snail's clams, insects, aquatic worms, and tiny crustaceans are among the aquatic creatures often utilised as fish food. Aquatic animal feed is rich and full in nutrients. They are high in protein and regarded as the greatest natural meal for fish that are both omnivore and carnivorous.

3) Detritus: Pond aquatic plants and living algae.

If no animal consumes it, it will eventually die and sink to the bottom of the pond.

Detritus, often known as non-living organic particle matter coated by bacteria, is typically a rich source of food for fish. Living bacteria, fungus, connected algae, and microinvertebrates that colonise dead algae and detritus aggregates improve the nutritional value of the detritus.

4) Aquatic and terrestrial plants: Herbivorous fishes consume aquatic and terrestrial plants directly in addition to using them as green manure and compost. Many aquatic plants, such as Wolffia, spirodela, lemna, hydrilla, Eichhornia, and pistia, are used directly as fish food. The primary terrestrial plants utilised include pea and bean leaves, napier, mulbary, banana, ipil-ipil, and others.

Formulated food:

This term refers to food that is derived from plant and animal sources, such as plant feed like oil cakes and grains, and animal feed that contains bone meal, fish meal, or other ingredients.

1) Oil cakes are the main source of lipids and protein in

fish diets. Nowadays, mustard oil cakes, soybean cakes, cotton seed cakes, peanut cakes, sesame cakes, and sunflower seed cakes are the most popular variants utilised in aquaculture.

2) Grains: The main source of carbohydrates in fish feed is grains.

They are distinguished by having low protein contents, high nitrogen-free extract contents, mostly made of starch, and low fat contents.

Rice, wheat, maize, barley, oats, sorghum, wheat bran, and wheat flour sweeping are examples of grain feeds.

Animal feeds: The main source of protein for fish feeds is animal feed.

Animal feeds with high nutritional content are prepared from a range of ingredients, including fish meal, shrimp meal, bone powder, blood powder, and feather powder, as well as by-products from processing plants, slaughterhouses, and silk-weaving companies. High quantities of vitamins and well-balanced amino acids, notably lysine and methionine, as well as high protein levels are characteristics of animal feeds [1]–[3].

Formulation of Feeds:

It is usually essential to have a multi-ingredient feed formula in order to fulfil the pre-established nutritional needs of the species and age of fish since no single feed material is a complete meal on its own. Raw materials should be chosen based on how cheaply they can provide certain nutrients. Use of the square approach is required to balance the protein supplement and base feed. Nevertheless, the least-cost approach technique employing the linear programming method is also in use for balancing the nutrients in feed. Nowadays, the square approach is more accessible and practical for use by rural farmers. The following is the feed formulation process.

1. Determine the protein content of your local ingredients.
2. Choose protein and energy sources using the least expensive option.
3. Maintain a level of digestible energy.
4. Moderate the amount of crude protein.
5. Verify the amounts of essential amino acids and essential fatty acids in the final feed, and repeat steps 3 and 4 if necessary to ensure that the feed meets the needs of the fish.

II. DISCUSSION

The pace of feeding varies for tiny, growing, and brood fish. The fish's body weight is used to determine the rate of supplemental feed. The feed proportion is raised as the fish develops. Depending entirely on the fish culture approach used to run the farm, developing fish often get 2 percent to even 6 percent of their body weight. The brood before breeding season in a brood fish pond, fish are reared with particular care and fed at a rate of 2 to 4 percent of their body weight. While rearing brood fish, care should be taken not to overfeed them since they store extra energy as fat, and a high fat deposition severely reduces both the amount and quality of their eggs. Fish should not be fed an excessive amount of extra feed as a result [4]–[6].

Fish should always be fed in the morning, at around the same time, and in the same location. The fish get used to the system and go to the feeding area at around the same time. The feed is therefore used to its fullest extent. To ensure that the feed is utilised to its fullest potential and produces high food coefficient rates, it is advised to split the complete amount of food into two portions and serve them in the morning and evening.

The supplemental feed might come in the shape of pellets or chewed food. Pellet feed is produced with great care. The kind of pellet feed may either float or immerse. Such feed is well-bound with a suitable binder to prevent disintegration in the presence of significant lime in the water. This form of supplemental feed is not readily accessible everywhere, and generally, the binding capacity in the water determines the quality of the product.

In addition to commercial feed in pellet form, there are many forms of grinning commercial feed combined with certain binders. When feed and water are combined, the binder keeps the feed bound; a good binder reduces feed waste. The grinning feed is often formed into balls, soaked in water, and then put on a feeding platform constructed of a bamboo plank, a tin sheet, or a wooden plank that has been dipped in water. To determine the state and health of the fish that have been supplied, it is advised to watch the fish while they eat [7]–[9].

Fertilizer

In ponds, fertiliser is a natural or artificial material used to boost the growth of aquatic life that fish may consume. It involves adding fertiliser to a body of water in order to provide nutrients that will promote the fast development of phytoplankton and zooplankton. In order to increase production and carrying capacity, it is essential. There are two kinds of fertiliser used in fish ponds: one is organic and the other is inorganic. When the water in the fish pond is more translucent and the excellent bottom mud has not yet developed, one or two weeks after the pond was first constructed. fertiliser dose

A first dosage of manure is spread at the rate of 100–200 kg of bovine dung or 50 kg of chicken litters per ropani when the time to use or reuse the fish pond draws near. Only then is it advised to apply inorganic fertiliser at the rate of 8–12 kg of nitrogen and 8–12 kg of phosphorous per ropani if organic manure is not readily accessible. The pond is covered with the organic or inorganic fertiliser. After filtering with fine wire gauze, manure is distributed, and the pond is then filled with clean, fresh water.

After a few days, the freshly filled water is left. At that time, the water's colour has changed to a bright or dark green, clearly demonstrating the fertilizer's impact. The result of the manuring is that the water is somewhat green. The colour is a

sign of the proliferation of phytoplankton, which are tiny plant cells with one or more cells. Animal cells with one or more cells—zooplankton follow the phytoplankton. The fingerlings or yearlings of several cultivable fish species are placed in the pond as phytoplankton and zooplankton develop. The stocked fingerlings and yearlings continue to consume the prepared natural food and mature more quickly. The fingerlings and yearlings don't receive enough food when there isn't natural food in the pond, thus they get weaker and weaker. With starvation or cannibalism, relocated fingerlings and yearlings, in particular, suffer substantial mortality within two to three days. As a result, in fish culture, pond preparation is crucial. It is necessary to carry out the fish pond's preparation.

The stocking of fingerlings/yearlings is completed by the middle of April and by the end of February, respectively, in colder regions by the end of March and in warmer regions by the early part of February.

Fish are taken as a developed natural meal when fingerlings or yearlings are stocked. As a result, if further manure or fertiliser is not provided, the pond's water colour begins to change to that of regular water or muddy water. Hence, manure application is repeated in order to continually give nutrients in water. It is always best to watch the water's colour, and as soon as it begins to become light or lighter, a second, third, or fourth application of manure must be made at the same pace as the original dosage. As a result, there is no set amount of manure that must be applied since the impact of manure varies from one location to another based on numerous conditions, such as the quality of the soil, the quantity and quality of water, and the intensity of the sun light. In order to make an informed decision about when and how much manure should be utilised, the field worker must be a good observer to detect the influence of manure on pond water and changes in water.

Natural fertilisers

The natural elements included in organic fertiliser are composite in nature and essential to the metabolic cycle.

Chemical Fertilizer

Chemical fertiliser is an inorganic fertiliser that instantly supplies nutrients to pond plants by dissolving in the water. These fertilisers are produced industrially to be used in agriculture for enhancing crop output and may be purchased from specialist providers. They solely include mineral nutrients and no organic materials [10]–[13].

III. CONCLUSION

A field technique, however, has been devised to determine the hue of pond water. To use it, a worker must enter the pond, submerge their hand up to the elbow, and attempt to detect the water's colour using their horizontally placed hand and fingers. If the fingers and palm are clearly visible, the manure application is already past due; nevertheless, if they are not clearly visible owing to the pond's water's green or

brown colour, the timing is perfect for another application. Never be too lazy to check the colour of the pond water or to apply the manure at the appropriate time. The development of fish's natural diet is accelerated by the timely application of manure, and the fish develop more quickly.

REFERENCES

[1] M. B. New, "Water quality management for pond fish culture," Aquaculture, 1983, doi: 10.1016/0044-8486(83)90087-x.

[2] A. Bhatnagar and P. Devi, "Water quality guidelines for the management of pond fish culture," Int. J. Environ. Sci., 2013, doi: 10.6088/ijes.2013030600019.

[3] D. Drózdz et al., "Fish pond sediment from aquaculture production-current practices and the potential for nutrient recovery: A Review," International Agrophysics. 2020. doi: 10.31545/intagr/116394.

[4] A. Wezel, J. Robin, M. Guerin, F. Arthaud, and D. Vallod, "Management effects on water quality, sediments and fish production in extensive fish ponds in the Dombes region, France," Limnologica, 2013, doi: 10.1016/j.limno.2012.11.003.

[5] A. Mzula, P. N. Wambura, R. H. Mdegela, and G. M. Shirima, "Present status of aquaculture and the challenge of bacterial diseases in freshwater farmed fish in Tanzania; A call for sustainable strategies," Aquaculture and Fisheries. 2021. doi: 10.1016/j.aaf.2020.05.003.

[6] M. Sidoruk and I. Cymes, "Effect of water management technology used in trout culture on water quality in fish ponds," Water (Switzerland), 2018, doi: 10.3390/w10091264.

[7] I. M. Shaker, M. A. Elnady, R. K. Abdel-Wahed, and M. A. M. Soliman, "Assessment of heavy metals concentration in water, sediment and fish under different management systems in earthen ponds," Egypt. J. Aquat. Biol. Fish., 2018, doi: 10.21608/ejabf.2018.7704.

[8] C. Nash, "Freshwater fish pond culture and management," Aquaculture, 1977, doi: 10.1016/0044-8486(77)90219-8.

[9] A. E. A. Mahmoud, "Effect of Different Management of Fish Ponds on Fish Productivity and Water Quality," Benha University. 2015.

[10] C. Gabaldón, Z. Buseva, M. Illyová, and J. Seda, "Littoral vegetation improves the productivity of drainable fish ponds: Interactive effects of refuge for Daphnia individuals and resting eggs," Aquaculture, 2018, doi: 10.1016/j.aquaculture.2017.11.027.

[11] Y. Avnimelech and G. Ritvo, "Shrimp and fish pond soils: Processes and management," Aquaculture, 2003, doi: 10.1016/S0044-8486(02)00641-5.

[12] C. O. DUBLIN-GREEN, A. O. AYINLA, and T. K. OGORI, "Management of fish ponds built on acid sulfate soils in Buguma creek, Niger Delta, Nigeria," J. Appl. Sci. Environ. Manag., 2004, doi: 10.4314/jasem.v7i2.17209.

[13] D. Castro de Oliveira et al., "Management in Production of Fish Farming Using Arduino," Int. J. Innov. Educ. Res., 2019, doi: 10.31686/ijier.vol7.iss11.1871.

Water Quality in Fish Farming

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Abstract— The significance of water quality in fish farming Learning Objective: Water is crucial to fish farming. The success of fish production depends heavily on the maintenance of water quality. After finishing this session, the student should have a broad understanding of water quality and its significance in fish farming..

Index Terms— Cold Water, Oxygen Levels, Suspended Particles, Water Column, Water Fish

I. INTRODUCTION

Temperature, dissolved oxygen content, and turbidity are examples of physical water quality metrics.

1. Temperature:

Solar radiation, air temperature, and depth all have an impact on the water temperature in ponds. The water is heated by the solar energy that is absorbed when light passes through it; the uppermost layer of the water absorbs the majority of the heat. Water can store heat for a very long time. As water has a specific heat capacity of 1, it takes 1 cal to raise the temperature of 1 g of water by 1 c.

Stratification of temperatures:

Thermal stratification is the horizontal separation of the colder bottom of the water column from the somewhat warmer upper layer. Since water's density changes with temperature, there is a variation in temperature at various depths in lakes, a phenomenon known as thermal stratification. The epilimnion often contains water that is less dense than the water in the hypolimnion because cold water is denser than warm water. Freshwater's greatest density, however, occurs at 4 °C. When the cold, thick water at the lake's surface descends, a cyclical pattern of overturn develops in temperate locations where lake water heats up and cools over the seasons [1]–[3].

The division of lakes into three strata is known as lake stratification.

1. Epilimnion, the lake's summit.
2. The intermediate layer known as the metalimnion may vary in depth during the day.
3. The lowest layer, the hypolimnion.

The top layer of a thermally stratified lake, known as the epilimnion or surface lake, is found above the lower Hypolimnion. In comparison to the hypolimnion, it is warmer and generally has a higher pH and dissolve oxygen content. Since it is exposed at the surface, surface wind-mixing usually causes it to become turbulently mixed. Exchanges of dissolved gases like O_2 and CO_2 with the environment are also free. The most phytoplankton is found in this stratum because it gets the greatest sunlight. As they die, they descend into the hypolimnion, depleting the epilimnion of nutrients. As they develop and reproduce, they take nutrients from the water.

Metalimnion:

A thermocline is a thin but distinct layer in a large body of fluid, where temperature varies more quickly with depth than it does in the layers above or below. It is also known as a metalimnion in lakes. The thermocline in the ocean separates the turbulent top mixed layer from the tranquil deep water below. Thermo clines may be a semi-permanent characteristic of the body of water in which they occur, depending mostly on the season, latitude, and turbulent mixing by wind, or they may arise briefly in reaction to events like the radiative heating/cooling of surface water throughout the day/night. Seasonal weather fluctuations, latitude, and local environmental factors like tides and currents are among the variables that influence a thermocline's depth and thickness. The thick bottom layer of water in a thermally stratified lake is known as the hypolimnion or under lake. The layer below the thermocline is the one in question. The hypolimnion is typically a lake's coldest layer in the summer and its hottest layer in the winter. Being deep, it is shielded from summertime surface breeze mixing and often gets inadequate light for photosynthesis to take place. The deepest waters of the hypolimnion are often found in deep, temperate lakes.

Destratification:

Turbulence may disrupt stratification. Water layers are intermingled as a result. Some types of turbulence include upwelling and down welling, wind-sea surface friction, and turbulence. When water masses have varied qualities, such as salinity, oxygenation, density, and temperature, stratification develops. The less dense water masses lie above the more dense layers in this usual arrangement, which is based on density. Moreover, water stratification makes it more difficult for nutrients to mix between layers. By reducing photosynthetic processes, this may have an impact on a region's primary output. The availability of nutrients may restrict the growth of phytoplankton when nutrients from the benthos cannot reach the photic zone. Net productivity in waterways is also impacted by primary production levels.

Temperature of the water and fish growth:

Fish are animals with chilled blood. Around 0.5oC is what their body temperature is. The body temperature of fish fluctuates with changes in water temperature, but when this fluctuation is fast and exceeds 5 oC, the fish will perish. The pace of biochemical reactions in fish is temperature-dependent, and as temperature rose, so did oxygen consumption. Fish can tolerate temperatures between 5 and 42 degrees Celsius, although they may grow the most between 25 and 30 degrees Celsius. The ideal temperature range for cold-water fish is 10–20 oC and for warm-water fish is 20–32 oC.

1. Fishpond temperature control:
 Keep the pond's water depth constant
1. In the summer, give the ponds some temporary shade.
2. Avoid shading fish throughout the winter.
3. Refrain from handling fish when temperatures are very high or low.
4. Change the pond water as needed.
2. Oxygen in solution:

When oxygen gas is dissolved in water, the term "dissolved oxygen" is used. Much like creatures on land, fish also "breathe" oxygen. Yet, unlike terrestrial animals, which need their lungs to take in oxygen from the atmosphere, fish can take in oxygen straight from the water into their bloodstream via their gills.

In the aquatic environment, oxygen is primarily obtained from three sources:

1). Direct atmospheric diffusion
2) Wave and wind motion
3. Photosynthesis.

The most crucial of these is photosynthesis, which is carried out by aquatic plants and phytoplankton. As sunlight hits the aquatic plants throughout the day, photosynthesis, which produces oxygen, takes place. Because of the respiration of plants, animals, especially fish, oxygen levels decrease at night. The diurnal oxygen cycle is the name given to these consistent variations in DO that take place every 24 hours. Low DO levels are referred to as oxygen depletion, which may cause fish death. For the healthiest fish, water DO at a concentration of 5 mg/L is advised. While species-specific sensitivity to low dissolved oxygen levels vary, most fish species become agitated when DO falls below 2-4 mg/L. Less than 2 mg/L concentrations often cause mortality. How low the DO drops and how long it remains there affects how many fish perish during an oxygen depletion event. Low DO often affects bigger fish before smaller ones.

Oxygen depletion factors include:

When oxygen production is lower than oxygen consumption, oxygen depletion occurs. An excess of aquatic plants or algae in the ecosystem, increased organic waste entering a body of water, the death and decay of organic matter, or specific chemicals that remove oxygen directly from the water column can all lead to increases in oxygen consumption.

A warm water environment:

Compared to cold water, warm water is substantially less able to contain oxygen gas in solution. For instance, water at 90°F can only saturate with 7.4 mg/L DO, but water at 45°F can saturate with 11.9 mg/L DO. Because of this physical occurrence, fish are in double danger since hot water speeds up their metabolism, which raises their physiological need for oxygen. Summertime days that are humid and cloudy often lead to oxygen deficiency. The amount of light that reaches surface waters is significantly reduced when it is foggy outside, which significantly reduces the amount of oxygen produced by photosynthesis. Yet, the amount of oxygen used does not alter. As a consequence, each 24-hour period sees a net loss of oxygen. The lack of oxygen due to reduced production is worsened by the stagnant, muggy, and humid air that characterises summer days with clouds. There is very little oxygen transport.

Stratification and Pond Rotation

Surface waters warm up more quickly than deeper seas in hot weather. A thermocline forms when the temperature differential between warm surface water and chilly bottom water widens. Warm water at the top and cold water at the bottom are physically separated by a region of rapid temperature fluctuation known as a thermocline. There is no mixing of the deep and surface layers of water when a thermocline is present. As photosynthesis and oxygen synthesis only take place close to the surface, deep-layer water loses oxygen and begins to develop an oxygen demand. Heavy winds and chilly rain, which are frequent during summer thunderstorms, might break the thermocline. Surface waters that are oxygen-rich mix with bottom waters that are oxygen-deficient as the thermocline collapses. If the oxygen demand is high enough, all DO will quickly be taken from the water column, severely depleting the oxygen level and causing a fish death.

II. DISCUSSION

Keeping Oxygen Levels High

Monitoring the amount of dissolved oxygen in a pond allows for the prediction and eventual prevention of an oxygen depletion event. The most effective instrument forAn electronic oxygen metre measures DO. Most aquaculture supply firms sell these devices for a range of pricing. There are additional chemical test kits available. They need more work to operate but are more precise and don't cost pond owners as much money. Night oxygen workers are often employed by commercial catfish farms to check the DO content in each pond every two hours during the night. The best strategy to prevent a fish death brought on by low DO is to do this. Depending on the kind of fish, aeration devices may be activated if oxygen levels fall below a certain

threshold.

For recreational pond owners and part-time fish growers, it is impracticable to monitor oxygen levels throughout the night. For these individuals, monitoring DO levels in the late afternoon and late evening makes it simpler to "predict" oxygen depletion. By plotting DO concentration vs time on a piece of standard graph paper, it is possible to anticipate how DO will change during the night. Emergency aeration is advised if the anticipated DO concentration is below 4 mg/L before 7 a.m. Potential for dissolved oxygen depletion is estimated. If a metre or test kit to measure DO concentration is not available, the following circumstances and observations may be used to predict oxygen depletion:

1. Fish swim at or near the surface while taking breaths, fish quit eating all of a sudden.

2. The water quickly becomes dark, black, or grey, indicating the demise of an algal bloom.

3. The water has a foul smell.

4. The weather has been hot and overcast for a while.

5. There is a storm and a strong summer breeze.

6. When atmospheric pressure rises, so does the solubility of oxygen.

Salinity: - When salinity rises, oxygen solubility declines. Dissolved oxygen needs for warm water fish are 5 mg/lit and 8 mg/lit, respectively. 3. Turbidity: As we already discussed, pond water includes a variety of suspended particles. These suspended particles, which are present in variable concentrations, contribute to the turbidity of water. Turbidity is the term used to describe how poorly water transmits light due to suspended particles in the water. It could be brought on by phytoplankton, which is suspended in silt and clay particles with a high concentration of humus feed fertiliser, etc.

 A high concentration of silt and/or clay particles, which give the water a light brown, sometimes reddish colour, is the source of mineral turbidity. That could happen if the water source is murky or if a fish that feeds on the bottom, such the common carp, stirs up the muck at the bottom. A large concentration of tiny plants and animals that give the water different colours of brown, green, blue-green, or yellow-green depending on the dominant plankton species is what causes plankton turbidity. Humus, which gives the water a dark brownish hue, is what causes humic turbidity. While an overabundance of organic debris entering the pond might also be to blame, its source is often the water supply. Turbidity's effects Turbidity has minimal direct impact on fish, although high turbidity may interfere with gill function and create breathing problems. Less light penetration produced by siltation of the substrate's bottom affects fish eyesight.

Reduces pond depth and causes siltation of the bottom substrate while adsorbing and evaporating nutrients from the water. Turbidity hinders sunlight's ability to penetrate surfaces, which lowers photosynthetic activity, which in turn affects how productive a water mass is. Depending on the number of suspended particles, pond water might be quite clear or very murky. The technique used to measure it differs depending on the kind of turbidity that is present.

If the water is mineral turbid, a laboratory will be required to calculate the weight of the material suspended in a particular amount of water. The term "total suspended solids" refers to this quantity, which is often represented in milligrammes per litre. While collecting samples, take care not to agitate the water too much since this might quickly raise the TSS. Also, avoid simply using surface water since it is often considerably less turbid. Using the two simple techniques outlined below, you may determine the level yourself whether the turbidity is caused by plankton. They will also assess your pond's potential fertility for you [4]–[7].

Using your arm to gauge the turbidity of plankton

There is no additional equipment needed for this procedure since it is so straightforward. Extend one arm out and dip it into the water vertically until your hand is hidden from view. If the water level is considerably below your elbow, the plankton turbidity is extremely high; if it is at or just above your elbow, the plankton turbidity is high; and if it is much above your elbow, the plankton turbidity is low. A fairly simple instrument that may be used to get a more accurate assessment of turbidity is the Secchi disc. Estimating plankton turbidity is very helpful in ponds with a green tint. The Secchi disc transparency is the name given to this measurement. A Secchi disc is simple to create on your own. Go forward as directed. From a piece of wood or metal, such as a hammered tin can, cut a disc with a diameter of approximately 25 cm. Draw two lines on its surface to create four quarters. To avoid glare, paint this in matte black and white.Make a tiny hole in the disc's middle. A line or length of thread that is between one and two metros long passes through this hole. Attach a little weight to the line below the disc, such as a long bolt or a stone. By tying the line around a little piece of wood or metal over the top of the disc, you may secure the disc at the bottom of the line against the bottom weight. Label the remaining line at intervals of 10 cm with knots or firmly knotted coloured thread.

Acid toxicity

There are many ways to measure PH, including: PH indicator paper; colour comparator

pH monitors

A tiny strip of paper, such as chemically treated litmus paper, is dipped into the water to be tested to determine the pH. The paper's colour changes, and this new hue is compared to a colour chart, which provides the pH value based on the resultant hue. Several chemists sell litmus paper at a reasonable price. Colorimeter: Special chemical vendors provide inexpensive water-testing kits. They often include many liquid indicators. The new colour of the solution is compared with a set of standard colours provided with the testing kit when a few drops of one of these colour indicators

is introduced to a tiny sample of water.

pH metre: While somewhat costly, this equipment offers the simplest approach to determine the pH of water, even in the field. The glass electrodes are inserted into a water sample, and the pH value is then measured immediately from the metre. As these electrodes are so delicate, they should be carried with care. At regular intervals, they should be precisely calibrated in buffer solutions with known pH.

Phytoplankton

The Greek words for plants and community, respectively, are Phyto and plankton, from which the phrase "phytoplankton" is formed. These bacterial autotrophic algae appear close to the water's surface, where they get enough light to enable photosynthesis. Diatoms, cyanobacteria, dinoflagellates, and coccolithophores are the significant groupings. Nonetheless, when present in sufficient quantities, certain kinds may be recognisable as coloured patches on the sea surface owing to the presence of chlorophyll inside their cells and required pigment in some species. Most phytoplankton are too microscopic and even cannot be seen with the naked eye [8]–[10]. In order to stabilise the whole pond ecology and reduce water quality fluctuations, phytoplankton is crucial. The system is enriched with oxygen throughout the daytime thanks to a healthy phytoplankton population, which also reduces CO_2, NH_3, NO_2, and H_2S levels.

Phytoplankton's function is:

The following are the functions of phytoplankton in fish ponds:

1. The foundation of the food web in the fish pond
2. Primary food for phytoplankton feeder
3. Significant source of dissolved oxygen in water
4. Makes water murky
5. Prevents the development of unwanted aquatic weeds by shade
6. Density of phytoplankton, particularly in fish ponds, also affects the physical & chemical qualities of water.

Zooplankton:

The words zooplankton and plankton, which imply community and creatures respectively in Greek, are the origins of the phrase. They are tiny protozoa or metazoans whose presence in the water affects the biological quality of the water because they eat other plankton [11]–[13].

III. CONCLUSION

The most important aspect of water quality for aquaculture is dissolved oxygen. Aquatic animals need dissolved oxygen to breathe, and without it they will either get agitated and susceptible to illness, or they would perish. Temperature influences how much oxygen is soluble in water. Do drop off as the water temperature rises

REFERENCES

[1] A. F. Zambrano, L. F. Giraldo, J. Quimbayo, B. Medina, and E. Castillo, "Machine learning for manually-measured water quality prediction in fish farming," PLoS One, 2021, doi: 10.1371/journal.pone.0256380.

[2] H. Amiri, B. Hadizadeh, M. G. Mooselu, S. Azadi, and A. H. Sayyahzadeh, "Evaluating the water quality index in dam lake for cold water fish farming," Environ. Challenges, 2021, doi: 10.1016/j.envc.2021.100378.

[3] C. S. M. Figueiró, D. Bastos de Oliveira, M. R. Russo, A. R. L. Caires, and S. S. Rojas, "Fish farming water quality monitored by optical analysis: The potential application of UV–Vis absorption and fluorescence spectroscopy," Aquaculture, 2018, doi: 10.1016/j.aquaculture.2018.02.027.

[4] . N. C. E., "Standard Water Quality Requirements And Management Strategies For Fish Farming (A Case Study Of Otamiri River)," Int. J. Res. Eng. Technol., 2015, doi: 10.15623/ijret.2015.0403001.

[5] J. L. Portinho et al., "The pathways influence of agricultural expansion on water quality of fish farming in Ilha Solteira reservoir, São Paulo, Brazil," Aquaculture, 2021, doi: 10.1016/j.aquaculture.2021.736405.

[6] W. Khan, A. Vahab, and A. M. | N. Hasan, "Water Quality Requirements and Management Strategies for Fish Farming A Case Study of Ponds Around Gurgaon Canal NUH Palwal," Int. J. Trend Sci. Res. Dev., 2017, doi: 10.31142/ijtsrd5914.

[7] G. Valentino, A. A. Damai, and H. Yulianto, "Analisis Kesesuaian Perairan Untuk Budidaya Ikan Kerapu Macan (Epinephelus Fuscoguttatu) Di Perairan Pulau Tegal Kecamatan Teluk Pandan Kabupaten Pesawaran," e-Jurnal Rekayasa dan Teknol. Budid. Perair., 2018, doi: 10.23960/jrtbp.v6i2.p705-712.

[8] A. Shitu et al., "Recent advances in application of moving bed bioreactors for wastewater treatment from recirculating aquaculture systems: A review," Aquaculture and Fisheries. 2022. doi: 10.1016/j.aaf.2021.04.006.

[9] K. I. Amira et al., "Data on Growth, survivability, water quality and hemato-biochemical indices of Nile Tilapia (Oreochromis niloticus) fry fed with selected marine microalgae," Data Br., 2021, doi: 10.1016/j.dib.2021.107422.

[10] S. Mousavi and M. J. Zorreihzahra, "Proper management of fish farms for the most appropriate productivity," J. Surv. Fish. Sci., 2021, doi: 10.18331/sfs2021.8.1.10.

[11] A. Uwimana, A. A. van Dam, and K. Irvine, "Effects of conversion of wetlands to rice and fish farming on water quality in valley bottoms of the Migina catchment, southern Rwanda," Ecol. Eng., 2018, doi: 10.1016/j.ecoleng.2018.10.019.

[12] A. C. Godoy et al., "Water Quality in a Reservoir used for Fish Farming in Cages in Winter and Summer Periods," Water. Air. Soil Pollut., 2018, doi: 10.1007/s11270-017-3669-x.

[13] [R. K. Abdel-Wahed, I. M. Shaker, M. A. Elnady, and M. A. M. Soliman, "Impact of fish-farming management on water quality, plankton abundance and growth performance of fish in earthen ponds," Egypt. J. Aquat. Biol. Fish., 2018, doi: 10.21608/ejabf.2018.7705..

Common Fish Disease, Prevention & Treatment

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Abstract— An essential component of effective fish farming is having a working knowledge of common fish diseases and how to handle them. After you've finished this lesson, has the ability to distinguish between fish that are healthy and those that are sick, may take preventative action to manage certain fish diseases.

Index Terms— Fish Ice, Fungal Infections, Fish Lice, Red Pest, White Patches

I. INTRODUCTION

Illness is different from a fish's ordinary, healthy condition. Infectious and noninfectious illnesses may both be categorised as disease. Microorganisms like protozoa, bacteria, fungus, viruses, worms, or crustaceans are what cause infectious disorders. Comparable to infectious illness, non-infectious diseases include food toxicity, water quality issues, and nutritional inadequacies [1]–[3].

Bacterial infections, fungal infections, parasitic or protozoan infections, and viral infections are the four broad categories into which fish diseases may be divided. Bacterial Illnesses Swelling of the abdomen or the eye, together with red streaks or patches, are typical symptoms of bacterial illnesses. Antibiotics like penicillin, amoxicillin, or erythromycin work best for treating them. Typical fungal infections can appear as fluffy grey or white spots. Disorders Caused by Parasites: Copper or malachite green, when administered in the proper dose, are the best treatments for "Ich," the most prevalent parasite ailment. Copper is a common component in therapies. A lot of water purification products, like "Aquari- Sol," also use copper as a component. Remember to remove any carbon from the filtering system if your treatment involves antibiotics or copper.

Approximately 125 distinct viruses have been identified in fish, although the majority have been found in fish used as food in aquaculture, where the majority of resources are concentrated. Positive identification is challenging in aquarium fish since the symptoms of piscine viral infections coincide with those caused by several other illnesses. It is important to understand that no treatments are available to treat active viral illnesses in any fish, despite the fact that vaccinations are available to protect particular species of food fish against specific viruses.

Symptoms of sickness include: aberrant or restless behaviour in the fish; loss of balance and inability to maintain position in the water column; propensity to sleep on its side, either floating at the surface or resting at the bottom; and pale-colored gills.

1. A bloody, dilated eye.
2. Abdominal swelling. A lack of energy in the function of the tail and fins - Erosion of scales, fins, gill lamellae, or a portion of the skin.
3. A reduction in feeding or a stopping entirely.

Biological Agent: Argulus foliaceus

In the subphylum Crustacea, argulus are parasitic crustaceans. Argulus belongs to the Branchiura class of parasitic crustaceans. One of the biggest external parasites in ponds is the argulus. They are sometimes known as fish lice because of their size and naked-eye appearance. The length of the fish lice varies from 5mm to 10mm. Despite their size, they might be hard to see at times because they like to hide in more protected regions on the fish host. The fish lice are almost flat and have a round or oval form. resembles a flattened horseshoe crab, roughly. The fish lice may swim between hosts and migrate extremely swiftly [4]–[7].

Disease symptoms include inflamed skin patches, gills, and fins with tiny red holes. The argulus possesses sucking feeding apparatuses and hook-like arms, and they may produce open wounds that can result in secondary infection. Control measures - Organophosphates are the most popular and successful lice treatments.

Lice are nearly typically eliminated by applying three treatments during the parasite's anticipated life cycle. Treatments at 10-day intervals will kill existing adults and juveniles as well as new ones in ponds with summertime temperatures of 68 degrees Fahrenheit or higher. Treatment of the pond with Dipterex @0.25 ppm. Once every two weeks until no parasites are seen, repeat this therapy.

1. a 3- to 5-minute soak in a 2% solution of table salt.
2. Indefinite potassium permanganate treatments in ponds; - A five-minute dip in a 500–1000 ppm solution of glacial acetic acid
3. Forceps removal of the parasites, followed by a 2- to 3-minute soak in a mild KMnO4 solution
4. Sticks may be used as egg traps.
5. Keep the pond empty for a while.

Ich, a protozoan illness often known as "white spot sickness," affects people. Ichthyophthiriasis is the medical term for the condition, and Ichthyophthirius multifiliis is the primary culprit. While it affects all freshwater fish, it seems to be more prevalent in aquarium fish, maybe as a result of

their greater proximity and stress.

It might have an oval form with a horseshoe- or U-shaped nucleus. Symptoms of the illness - Ich symptoms are quite obvious and often involve distinctive white patches on the body and gills. The fish will get increasingly irritable and may attempt to rub or scratch against the sides and bottom of the tank. - In extreme cases, the whole body of the fish is covered with nodules/cysts. Moreover, this condition may result in respiratory discomfort, acute agitation, appetite loss, and ultimately death.

Control methods - Because of the parasites' peculiar life cycle and how water temperature affects it, controlling this illness is exceedingly challenging.

1. When temperatures range from 75 to 83°F, all arriving fish should be quarantined for at least three days.

2. The pond should be treated with quick lime @ 500kg/ha to stop the spread of illness.

3. CuSo4 @ 0.5ppm monthly treatment for ponds is recommended.

4. Sick fish should be treated with a solution of 2 to 35 common salt for a period of one week.

5. Organism responsible: Flexibacter columnaris.

A lot of fish, including catfish and immature salmonids, are affected by this deadly sickness. The microbes resemble slender rods. Its most distinctive characteristic is an odd "gliding" action that is not seen in other species. They may be observed heaped up into enormous columns in wet mounted specimens, which has given this illness one of its more well-known names.

This illness is very contagious. Little white patches on the caudal fin are often the first sign of lesions, which then spread to the head. The anal fin and caudal fin may suffer from severe erosion. The skin is often affected by many grey white sores as the condition worsens. The only place that may be damaged is the gills, which are a frequent location of harm. Necrosis of the gill filament's distal end, which advances basally to include the whole filament, characterises the gill lesions. Stress-related illnesses are usually linked to infections. High water temperature, crowding, harm, and poor water quality are risk factors for Columnaris disease [8]–[10].

Fin rot may be quite easily diagnosed, but it's best to discover it early on since that makes treatment much simpler.

1. The fish's fins or tail may develop milky white patches, especially at the margins, as the disease's first symptoms.

2. Once the illness starts to consume the tissue, the fins start to look somewhat ragged.

3. The illness eventually consumes the whole transparent fin membrane, leaving just the fin rays.

4. The fish's body may become impacted if the fin rot, also known as tail rot, has spread to the fish's tail.

In severe instances of fin rot, secondary infections or illnesses are prevalent and may cause additional symptoms in the affected fish, such tufts of white cotton wool or red streaks.

Control strategy

Reducing stress in the population of farmed fish is the optimum strategy to stop the incidence of columnaris. Regular water changes help keep the germs under control since they feed on organic waste. Disinfection of the tools and utensils to stop the infection from spreading. Salt may be used to prevent infection during transit and to manage the illness in hatchery tanks. Take 7.5g of oxytetracycline or terramycine orally every day for two weeks per 100 kg of feed.

Red Pest Causal Organism: Bacterium anguilarum

Fish are susceptible to the red pest disease, which may leave crimson streaks on the fish's body, tail, and fins. Red pests may just damage the body or fins; blood streaks do not always develop in all of these locations. In extreme instances, the sickness may result in the loss of the tail and fins. Red pest illness is rare in healthy fish in well-maintained ponds and often affects fish that are already poor. Red pest disease may infect a healthy fish, but it is far more prevalent in fish with other health difficulties. In severe instances, the tail can rot away or the fins might fall off.

1. Remove or segregate all the sick fish from the pond as a control strategy.

2. Disinfecting the tools and equipment is necessary to stop the spread of illness.

3. The best way to treat the red pest is to provide the needed amount of antibiotics to the fish meal.If the fish is too ill to handle, give it 10 milligrammes of antibiotics per litre of water.

4. Take the necessary action to fix the water issues if the water quality is inadequate.

Fish in both freshwater and saltwater are susceptible to the viral virus lymphocystis disease, which damages the skin and fins. While it is a dangerous condition, the sickness just causes the fish's appearance to be altered. They can only exist and spread inside a living host. They target the fish's bodily tissues, disrupt the body's systems, and ultimately cause the fish to pass away. Illness Symptoms - A viral infection results in growths that resemble cauliflowers on the skin or fins. Depending on the species involved, the water's temperature, and other factors, it may last up to four weeks until the swollen cells burst or shed, releasing the virus particles into the water [11], [12].

II. DISCUSSION

Fungal illness Water mould illness, or saprolagneasis

It affects fish and is a fungus. Fungal infections usually occur after some other health issue, such as a parasite infection, an injury, or a bacterial infection. These illnesses, which target dead eggs and other materials in the water, are spread indirectly via a variety of channels, including as the water supply, transportation vehicles, personnel mobility between aquaculture plants, and farm equipment like nets. Direct contact between sick fish or fish eggs and healthy ones

is how the sickness is spread. The diseases known as saprolagneasis and water mould are classified scientifically as, a grey or white development in and/or on the fish's skin and/or fins is a sign of illness. If untreated, these growths will eventually take on a cottony appearance. In extreme circumstances, fungus growth may cover 80% of the body. Early infections cause skin lesions that are grey or white in colour and have a distinctive crescent or circle form. These lesions may grow quickly and cause the epidermis to be destroyed.

Fish lassitude and lack of balance.

The fish's scales are pulled away from the body surface.

1. Fin and membranous gill necrosis is a possibility.

2. Fish that have an illness that is linked to their gills will exhibit respiratory symptoms.

3. Fish exhibits unusual movement.

4. Control strategy:

5. Eliminate or segregate all diseased fish from the pond.

6. Transporting fish in a secure manner

7. Fish overcrowding must be avoided.

8. Avoiding the addition of new fish to the fish farm until it is certain that the existing fish are disease-free.

9. Disinfection of the tools and utensils to stop the infection from spreading.

10. Dip into a 1:10 formalin solution or a 1% potassium dichromate solution in the event of a partial infection.

11. Fertilized eggs treated for 10 minutes with either 3-4% formalin or 1-5% salt.

12. A 5- to 10-minute dipping procedure using a 1:2000 copper sulphate solution or 0.3% sodium chloride.

That happens because the pond's water has little oxygen. Due to a large amount of algal bloom throughout the summer, low oxygen levels are usually an issue. When the oxygen level falls below 4 mg/lit, many fish perish. Fish start to decompose out of water, which is visible at the pond surface early in the morning. Dead fish must be removed as soon as possible to prevent secondary infections from spreading.

The fish exhibit signs of suffocation as a symptom. Fish usually rise to the surface and regularly swallow bubbles. Wide open mouth with elevated operculum and gills is visible. Fish mortality in large numbers may be visible at the pond's surface in the morning. By employing aerators, releasing ducks, swimming, or using spray irrigation, the oxygen level may be raised. Using the right number of fish or thinning out overstocked fish Liming of pond at a rate of 500 kg/ha if the issue is brought on by murky water. Put new, clean water in lieu of the pond's water.

Reason: excessive oxygen content in fish pond Symptoms

It happens when rains and increased atmospheric pressure cause all atmospheric gases to become more soluble. Little fish are most impacted by this issue. Gas bubbles may be seen on the fish's skin, gills, and mouth, and they swim at a 45-degree angle. Rainy season is when it happens.

Control strategy:

1. Stop watering the pond;

2. Don't let the birds out.

3. Tips for teachers:

4. Show slides with samples of various diseases.

III. CONCLUSION

Abnormalities and symptoms of fish illness include a fish that is not eating, sores on the body, and hazy eyes. The most typical signs of illness in an aquaculture system are fish rising to the surface and gasping for air, or higher-than-normal levels of sickness or mortality. Biosecurity methods in aquaculture may protect a facility against disease-causing pathogens that are not present in a specific system. Strict quarantine procedures, egg disinfection, traffic control, water treatment, clean feed, and mortalities disposal are all examples of farm-level biosecurity measures.

REFERENCES

[1] Q. H. Luu, T. B. T. Nguyen, T. L. A. Nguyen, T. T. T. Do, T. H. T. Dao, and P. Padungtod, "Antibiotics use in fish and shrimp farms in Vietnam," Aquac. Reports, 2021, doi: 10.1016/j.aqrep.2021.100711.

[2] S. Yilmaz, E. Yilmaz, M. A. O. Dawood, E. Ringø, E. Ahmadifar, and H. M. R. Abdel-Latif, "Probiotics, prebiotics, and synbiotics used to control vibriosis in fish: A review," Aquaculture. 2022. doi: 10.1016/j.aquaculture.2021.737514.

[3] S. Lindeberg, "Paleolithic diets as a model for prevention and treatment of western disease," Am. J. Hum. Biol., 2012, doi: 10.1002/ajhb.22218.

[4] Y. Li, B. Jiang, Z. Mo, A. Li, and X. Dan, "Cryptocaryon irritans (Brown, 1951) is a serious threat to aquaculture of marine fish," Reviews in Aquaculture. 2022. doi: 10.1111/raq.12594.

[5] R. R. Colwell and D. J. Grimes, "Vibrio diseases of marine fish populations," Helgoländer Meeresuntersuchungen, 1984, doi: 10.1007/BF01989311.

[6] K. Miyazawa et al., "Alzheimer's disease and specialized pro-resolving lipid mediators: Do MAR1, RVD1, and NPD1 show promise for prevention and treatment?," International Journal of Molecular Sciences. 2020. doi: 10.3390/ijms21165783.

[7] K. J. Bowen, W. S. Harris, and P. M. Kris-Etherton, "Omega-3 Fatty Acids and Cardiovascular Disease: Are There Benefits?," Current Treatment Options in Cardiovascular Medicine. 2016. doi: 10.1007/s11936-016-0487-1.

[8] D. Nehra, E. M. Fallon, and M. Puder, "The Prevention and Treatment of Intestinal Failure-associated Liver Disease in Neonates and Children," Surgical Clinics of North America. 2011. doi: 10.1016/j.suc.2011.02.003.

[9] E. P. S. Weber, "Itchy Fish and Viral Dermatopathies. Sampling, Diagnosis, and Management of Common Viral Diseases.," Veterinary Clinics of North America - Exotic Animal Practice. 2013. doi: 10.1016/j.cvex.2013.05.012.

[10] H. E. Roberts, B. Palmeiro, and E. S. Weber, "Bacterial and Parasitic Diseases of Pet Fish," Veterinary Clinics of North America - Exotic Animal Practice. 2009. doi: 10.1016/j.cvex.2009.06.010.

[11] G. Orso, C. Mandato, C. Veropalumbo, N. Cecchi, A. Garzi, and P. Vajro, "Pediatric parenteral nutrition-associated liver disease and cholestasis: Novel advances in pathomechanisms-based prevention and treatment," Digestive and Liver Disease. 2016. doi: 10.1016/j.dld.2015.11.003.

[12] J. N. Din, D. E. Newby, and A. D. Flapan, "Clinical review for a natural treatment," Bmj, 2004

Exploration on the Types of Aquaculture Net

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Abstract— Aquaculture net types and how they're protected After completing this chapter, the readers should be able to recognize the many forms of net and determine which type of net is best for each stage of development as well as the effectively use the various types of net.

Index Terms— Aquatic Weeds, Life Cycle, Liver Diseases, Marine Fish, Plants Weeds

I. INTRODUCTION

At a hatchery house, fry net is often utilised. Newborn fry are dragged via a tube during this operation from the maternity part into the nursery section. Separate, healthy, and alive fry are maintained. One of the most often used nets in fish farms is this one. This net has the appearance of a wall that stretches for miles. A sturdy rope and float line are used to line the top edge of the net. To hold the net in place, sinkers are supplied on the bottom edge, which is also the foot rope. Two groups of fisherman gently tugged opposite ends of the net. Diverse living things are captured in the midwater and close to the bottom [1]–[3]. It is a net that resembles a wall, with a float attached to the head and sinkers fastened horizontally overnight. The next morning, the fish are gathered. Overnight, more than two fisherman. The next morning, the fish are gathered. The net is manned by more than two fisherman. Gill nets are mostly utilised in moving rivers and streams to trap water currents that are going in one way or the other.

Throw a wide net:

It is a net that is round and shaped like an umbrella. It is expertly tossed fully extended over water while being held by a cable linked to its core. Due to the weight of the sinkers on the perimeter, the net as a whole quickly begins to sink. Fish cannot escape because the circumference has been recurved inward to create an inner circular pocket around the edge. Depending on the size, one or more people run the net. It is employed in valleys with sluggish water currents and terai's plain waters. There are several sorts of nets that may be used to visit a fishing location, according to teacher advice.

1. A slide presentation showcasing different fish gathering techniques.

2. Unit Eight: Using community ponds for fish farming Students should be able to maintain and use ancient ponds correctly after finishing this class.

3. Know and be able to manage aquatic plants and fish predators.

4. Use and management of ancient ponds

It is feasible to cultivate fish in an aquatic setting. In Nepal, fish farming is mostly carried out in small, outdated ponds. The ancient pond's fish culture does not provide a suitable output. On the one hand, managing and using an old fish pond helps to improve output while lowering production costs. The following guidelines should be followed for optimal care and exploitation of an ancient fish pond:

a) Leveling the pond bottom and draining the pond properly.

Manual or poisonous eradication of rivals and predators. Inspect the dike for leaks to avoid wasting water and nutrients. Lime application, if required. Applying fertiliser helps improve the soil's fertility and encourage the development of natural food. The installation of fine mesh screens at the entrance to block the entry of competitive and predatory species. Maintaining water depth to guarantee enough fish food development and optimum water quality [4]–[6].

b) Careful management of fish stocks- To reduce mortality, unnecessary stress when handling is minimised.

c) Adequate pond management, which includes the subsequent application of fertilisers to maintain the desired development of natural fish food.

1. Periodic water refreshing to keep the pond's water clean.

2. Adding more food if the natural food supply is inadequate.

3. Regular maintenance is required, including daily, weekly, monthly, and after-each-cropping/draining management.

Aquatic weeds and the method of control

Often, plants or weeds that grow in water are referred to be aquatic. Aquatic weeds come in many different varieties. Aquatic weeds provide oxygen during the day via photosynthesis, but at night they also take oxygen from the pond's water and compete with the fingerlings and yearlings that have been supplied. Aquatic weeds come in a wide variety of forms, and they may be generally grouped into three categories:

a) Emergent Type: Aquatic plants/weeds that sprout at the pond's bottom, stay submerged, and go through their whole life cycle. The names of these aquatic weeds include Chara, Vallisneria, and Hydrilla.

b) Sub-mergent Type: These aquatic weeds or plants develop at the pond's bottom, but their leaves and blossoms float on the water's surface as they finish their life cycle, much like Nymphaea.

c) Floating Type: Floating weeds are aquatic plants or weeds that grow at the water's surface and float on the surface of the water. Above the water's surface, these weeds finish their life cycle. Aquatic weeds that float include Lemna, Wollfia, and Water Hycainth, among others.

II. DISCUSSION

In addition to the aquatic weeds mentioned above, thread-like lower aquatic plants known as threaded algae are also grown. Such interwoven algae are quite abundant in a fish pond due to the manuring. Often, when the pond is quite shallow, these aquatic weeds grow abundantly. These aquatic weeds' excessive development harms stock fish in a variety of ways;

1) The pond's floating weeds spread over the water's surface as they grow there. As a result, it stops light from penetrating and brings down the water's temperature. In such circumstances, fish cannot create enough of their natural food, which causes them to either develop slowly or stop growing altogether [7]–[9].

2) Organic or inorganic manure is given to a fish pond to generate the fish's natural food, but when aquatic weeds are present, the weeds make the most of the manure and develop more quickly than the fish's natural food. As a result, the fish don't eat enough to develop.

3) An overabundance of aquatic weeds in a fish pond makes it an ideal place for fish predators to hide or defend themselves, which results in a significant loss of fish that were supplied.

4) Although excessive aquatic weed growth in a body of water during the day does not affect the fish that have been stocked there, at night it seriously depletes the water's oxygen supply, and the fish may even perish.

5) An excessive amount of weeds in a fish pond decompose, depositing silt and causing the water body to become marshy, shortening the fish pond's lifespan.

Together with water weeds, threaded algae are widely distributed. The fish perish as a result of the fry and fingerlings being entangled in the excessive development of the threaded algae, which also impairs locomotion. Lack of oxygen may also be caused by threaded algae growing too quickly.

With all these drawbacks of various aquatic weeds in fish ponds, encouraging their growth should be discouraged. Chemicals like Copper Sulphate and 2-4-D are used to manage these aquatic weeds, but doing so needs precise chemical dosage and follow-through on certain steps. Every slightest error might result in the complete loss of the fish. Yet the introduction of Grass Carp has greatly eased the issue today. It is strongly advised to introduce grass carp into any pond or body of water where aquatic weeds are present since

it quickly and organically eliminates the weeds. In order to boost fish output by reducing aquatic weeds, it is advised to utilise the right amount of grass carp in the pond.

Fish predators and management techniques

Animals that prey on other creatures are considered predators. Fish have a wide range of predators, which poses a severe difficulty while raising fish. Here is a list of them:

The following are examples of predators: a. fish b. amphibians c. reptiles d. birds e. mammals

Predatory fishes and their control: Fish that feed on other fish are known as predatory fishes. Fish that are predators fight among other for food and space. The following additional predatory fish breed in the pond soon before the main carps spawn. These are the most often seen predatory fish in the pond:

Singhi, Kabai, Bhuhari, Murrel, Magur, and Tengra.

Weed fish are economically small-sized fish that naturally exist or are unintentionally introduced into ponds and do not reach mature sizes. For instance, little carp, Rosbora, Mora, and Chelba.

1. Control pond drying: If at all feasible, completely eradicate nuisance fish by draining the water and drying the ponds. Remove all of the water. During a week or months, the pond should be exposed to the sun.

2. Poisoning ponds: In ponds that are difficult to drain, poisoning should be done with extreme care to prevent damage to humans, animals, and the environment. Use the Pronox at a rate of 30 litres per acre, using 1 part chemical and 5 parts waters. After 5–10 days of application, it still works.

Amphibian predators include:

Amphibians might provide severe issues for fish aquaculture as well. Predatory amphibians are the bigger frog and its species. In the pond, where there may be huge carps vying for food and space, they reproduce a lot. Frogs consume eggs and hatchlings to some extent as well. For food and room, tadpoles are likewise confined with the fingerlings. Control measures include employing a net to snuff out frog and tadpole eggs. By adding quicklime to the fish pond, we can reduce the quantity of frogs. Frog eggs and tadpoles should also be destroyed.

Aquatic predatory insects:

Many aquatic insects, whether as larvae or adults, may not only feed on fish fry and hatchlings but also compete with them for food and habitat. Water bugs, grainy water bugs, and dragon fly nymphs are among the most prevalent insects.

Control:

Ponds must always be maintained free of aquatic insects before stocking for effective fish farming. Drag nets and wire nets around the outlets and inlets points may be used to manage a large number of insects. Reptilian predators: Common reptiles seen in fish ponds include water snakes and

tortoises. In general, they consume fingerlings and even table fish directly, and a significant number of fish may be eliminated by reptiles. Snake is the most difficult of them all. Making snake traps is a method of snake management. These snakes are guided into the cages via a front entrance, making it exceedingly difficult for them to escape and harm the fish. Placing bamboo sticks around the dike where we may trap within the bamboo hole is another method of preventing the snake from accessing the fish pond [10]–[13].

Predators of birds:

Many birds offer their prayers on different fish life phases, which poses a major threat to fish aquaculture. The most dangerous of them are kingfishers, cranes, sea gulls, etc.

Control: Many approaches, which vary from region to region, have been used to control predatory birds all over the globe. several of the techniques include drumming, employing a robot-like structure, using various coloured rebins, producing loud noises, etc.

Mammal predators include:

There is just one other major mammalian predator, the "otter," apart from humans. They remain on the pond's edge and do significant harm. Get local residents to consider how to make better use of the ponds in the adjacent villages. A variety of aquatic weeds may be collected and utilised as fish food, as well as being shown in classrooms. Provide samples or slides of various fish predators in the classroom.

III. CONCLUSION

Aquafeeds are typically cited as the biggest operating expense in aquaculture. So the netting to keep fish in and predators and pests out may end up being overlooked. The industry is now paying more attention to net technology. The result of using the new hydrophobic material is nets last longer. Garware noted that when cleaned in place there may be a doubling or more in net lifetime. HDPE also has better abrasion resistance of the two materials, an important advantage for fencing intended to keep predators out.

REFERENCES

[1] L. C. Gansel et al., "Drag of Clean and Fouled Net Panels--Measurements and Parameterization of Fouling," PLoS One, 2015, doi: 10.1371/journal.pone.0131051.

[2] T. Chen, Y. Pan, D. Feng, A. Meng, and F. Gui, "Effect on hydrodynamics of unit net of a column-type net enclosure aquaculture engineering in current by fixations," J. Fish. China, 2018, doi: 10.11964/jfc.20161010589.

[3] H. Cheng, L. Li, K. G. Aarsæther, and M. C. Ong, "Typical hydrodynamic models for aquaculture nets: A comparative study under pure current conditions," Aquac. Eng., 2020, doi: 10.1016/j.aquaeng.2020.102070.

[4] F. A. Bohnes, M. Z. Hauschild, J. Schlundt, and A. Laurent, "Life cycle assessments of aquaculture systems: a critical review of reported findings with recommendations for policy and system development," Reviews in Aquaculture. 2019. doi: 10.1111/raq.12280.

[5] C. Radford and M. Slater, "Soundscapes in aquaculture systems," Aquac. Environ. Interact., 2019, doi: 10.3354/aei00293.

[6] P. Canada, A. Pereira, N. Nogueira, L. Png-Gonzalez, C. Andrade, and R. Xavier, "Analysis of bacterial microbiome associated with nylon and copper nets in an aquaculture context," Aquaculture, 2020, doi: 10.1016/j.aquaculture.2019.734540.

[7] L. Zhang et al., "Distribution of microplastics in surface water and sediments of Qin river in Beibu Gulf, China," Sci. Total Environ., 2020, doi: 10.1016/j.scitotenv.2019.135176.

[8] R. Naylor et al., "Fugitive salmon: Assessing the risks of escaped fish from net-pen aquaculture," BioScience. 2005. doi: 10.1641/0006-3568(2005)055[0427:FSATRO]2.0.CO;2.

[9] B. Cheng, C. Liang, X. Liu, Y. Liu, X. Ma, and G. Wang, "Research on a novel extraction method using Deep Learning based on GF-2 images for aquaculture areas," Int. J. Remote Sens., 2020, doi: 10.1080/01431161.2019.1706009.

[10] L. Widjayanthi and Y. A. Widayanti, "Dampak Penggunaan Keramba Jaring Apung Pada Pembudidaya Ikan Kerapu Berdasarkan Perspektif Sosial Ekonomi," J. KIRANA, 2020, doi: 10.19184/jkrn.v1i1.20310.

[11] P. A. Urbasa, S. L. Undap, and R. J. Rompas, "Dampak Kualitas Air Pada Budi Daya Ikan Dengan Jaring Tancap Di Desa Toulimembet Danau Tondano," e-Journal Budid. Perair., 2019, doi: 10.35800/bdp.3.1.2015.6932.

[12] J. Weitzman and M. Bailey, "Communicating a risk-controversy: Exploring the public discourse on net-pen aquaculture within the Canadian media," Aquaculture, 2019, doi: 10.1016/j.aquaculture.2019.04.025.

[13] Y. Pan, C. Liu, and Y. Cheng, "Study of the hydrodynamic characteristics of the net of the plie-column type aquaculture net enclosure under wave," 2020..

Study on the Determination of Salmon

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Abstract— Salmon also needs to consume enough amounts of protein, which is often given to them in the form of fish meal since it is the cheapest alternative protein. As a result, salmon farms consume more fish than they produce as a finished product

Index Terms— Chemicals Excessive, Framed Salmon, Salmon Farming, Social Issue, Wild Fish

I. INTRODUCTION

By 2010, a consensus on an environmental guideline for farmed salmon is to be reached. The following are what the WWF describes as the "seven significant environmental and social consequences" that have been discovered.

1. Benthic effects and siting: Salmon farms may affect the plants and animals on the ocean floor by dispersing chemicals and excessive nutrients from food and waste.

2. Chemical inputs: Using prohibited chemicals or excessive amounts of chemicals like pesticides, anti-foulants, and antibiotics may have unforeseen effects on human health and marine life.

3. Illness/parasites: Viruses and parasites may spread across farms as well as between farmed and wild fish.

4. Escapes: Farmed salmon that have escaped may compete with wild fish and reproduce with nearby wild stocks of the same population, changing the genetic diversity of the population as a whole.

5. Feed: To prevent further stress on the world's fisheries, a developing salmon farming enterprise must manage and lessen its dependence on fishmeal and fishoil, which are key components of salmon feed. A third of the world's fish harvest is presently made up of fish captured for fishmeal and oil.

6. Nutrient loading and carrying capacity: Extra food and fish waste may increase the amount of nutrients in the water. Algae may develop as a result of this, using oxygen destined for other

7. Social issues: Salmon farming often employs a significant number of employees on farms and in processing facilities, opening the possibility of increased public scrutiny of labour laws and worker rights. Users of the common coastal environment may also have disagreements. — World Wide Fund for Nature, Hatch and Release

As a result, the technique has mainly been used by public agencies and nonprofit organisations like the Cook Inlet Aquaculture Association to artificially increase salmon populations in situations where they have decreased as a result of overharvesting, the building of dams, and the destruction or disruption of habitat. However, this kind of population management may have unfavourable effects, such as genetic "dilution" of wild species, and many governments are now starting to prohibit supplementary fish planting in favour of harvest regulations and habitat conservation and preservation. Ocean ranching, a different approach to fish stocking, is being developed in Alaska. The baby salmon are released into the ocean there, far from any streams that contain wild salmon. They return to the area where they were released when it's time for spawning, where fisherman may capture them [1]–[3].

II. DISCUSSION

Species: American salmon

In their native streams, Atlantic salmon are desirable recreational fish that are sought after by devoted fly fishermen throughout their yearly seasons. A significant commercial fishery and a supplementary food fishery were formerly supported by the species. Unfortunately, due to massive habitat destruction and exploitation, the wild Atlantic salmon fishery is now effectively extinct. Just 0.5 percent of the Atlantic salmon sold in international fish markets are wild fish. The remainder are cultivated, mostly in Tasmania, Australia, Canada, Chile, Norway, Russia, and the UK.

European salmon

The species that is selected for farming the most often is by far Atlantic salmon. It is manageable, thrives in marine cages, demands a high price on the market, and adapts well to being farmed outside of its natural habitats.

Fish that are adults, both sexes, are sedated. When the fish has been washed and the cloth has dried, the eggs and sperm are "stripped". The eggs and sperm are combined, cleaned, and then submerged in fresh water. Adults recuperate in water that is moving, clean, and well-aerated. Cryopreservation of the eggs has been examined by several researchers.

For 12 to 20 months, fry are often grown in huge freshwater tanks. The fish are carried out to sea after they have reached the smolt stage, where they are kept for up to two years. Large cages off the shores of Canada, the United States, or portions of Europe are where the fish grow and develop throughout this period. In most cases, cages consist of two nets: an inner net that wraps around the cage to retain the salmon and an outside net that is kept in place by floats to

keep predators out.

Many Atlantic salmon that are kept in marine cages escape. Salmon that continue to reproduce likely to have less genetic variety, which lowers the species' survival and capture rates. The non-native salmon might pose an invasive danger to the West Coast of North America, particularly in Alaska and portions of Canada. They could then have to compete for resources with wild salmon as a result. To stop escapes and the possible spread of Atlantic salmon in the Pacific and elsewhere, significant measures are being made. Given that both the Canadian and American governments purposefully introduced this specie- s by the millions during a 100-year period beginning in the 1900s, the probability of Atlantic Salmon becoming a true invasive menace on the Pacific Coast of North America seems doubtful. There have been no established populations to report despite these conscious efforts to establish this species on the Pacific coast, 1,433,708 tonnes of Atlantic salmon, worth $7.58 billion, were taken globally in 2007.

In 1989, steelhead, formerly known by the bi-nominals Salmo gairdneri and S. irideus, were reclassified as Pacific trout as Oncorhynchus mykiss. Steelhead, commonly referred to as steelhead salmon or ocean trout, are anadromous rainbow trout that migrate between lakes, rivers, and the ocean.

There are several nations across the globe that grow steelhead. Production has increased dramatically since the 1950s, especially in Europe and most recently in Chile. 604,695 tonnes of farmed steelhead, worth $2.59 billion, were taken globally in 2007. Chile is the biggest producer. The production of steelhead in ocean cages has increased in Chile and Norway in order to meet demand in foreign markets. Countries like Italy, France, Germany, Denmark, and Spain have seen a sharp growth in the production of rainbow trout in their inland waters to meet local demand. The United States, Iran, Germany, and the United Kingdom are further notable producers. In fresh water, rainbow trout and young steelhead often consume aquatic bug larvae, pupae, and adults. They also consume fish eggs and adult terrestrial insects that fall into the water, most often ants, beetles, grasshoppers, and crickets. Little fish up to one-third their length, crayfish, shrimp, and other crustaceans are among their other prey. The percentage of fish eaten rises in most communities as rainbow trout populations develop. A few lake-dwelling organisms could develop into planktonic feeders. Rainbow trout consume a variety of fish eggs, including those of salmon, brown and cutthroat trout, mountain whitefish, and other rainbow trout, in rivers and streams where other salmonid species are present. Moreover, dead flesh from other fish corpses is consumed by rainbows. In the ocean, adult steelhead predominantly eat other fish, squid, and amphipods. In order to precisely mimic their natural diet, cultured steelhead are given a diet that contains fish meal, fish oil, vitamins, and minerals, as well as the carotenoid astaxanthin for coloration [4]–[6].

Enteric redmouth disease is very contagious in steelhead. Redmouth disease has been the subject of much investigation because to its important consequences for steelhead producers. Humans are not affected by the illness. Coho salmon only reach maturity after one year in the water, necessitating the yearly rotation of two different broodstocks. In freshwater tanks for maturation and spawning, broodfish are chosen from the salmon at the marine sites.

A total of 115,376 tonnes of farmed Coho salmon with a market value of $456 million were harvested globally in 2007. The majority of the world's output is produced in Chile, with the remaining 10 percent going to Japan and Canada. Because of their size and flavorful meat, Chinook salmon are known as "king salmon" in Alaska, where they are the official state fish. Those grown around Alaska's Copper River are distinguished by their vibrant colour, flavorful flavour, firm texture, and high omega-3 oil content. Finfish aquaculture is prohibited in Alaska and has been since 1989. 16.40.210 of the Alaska Statutes

11,542 tonnes of farmed Chinook salmon were caught globally in 2007, with a market value of $83 million. Almost half of the world's output of farmed king salmon is produced in New Zealand. A practise commonly referred to as "sea-cage ranching" is used to raise the majority of salmon in the water. Large floating net cages that are 15 metres deep and 25 metres broad are used for sea-cage ranching in clear, swiftly flowing coastal waters where they are tied to the sea bottom. Young fish, or smolt, from freshwater hatcheries are moved into cages with thousands of salmon and live there for the remainder of their lives. Fishmeal pellets rich in protein and oil are given to the animals[7]–[9].

Similar to how salmon are farmed at sea, Chinook salmon are also raised in net cages set up in freshwater rivers called raceways. In several hydroelectric canals in New Zealand, a distinctive kind of freshwater salmon aquaculture is practised. The highest salmon farm in the world is located in Tekapo, New Zealand, 677 metres above sea level and nourished by swift, chilly streams from the Southern Mountains.

Sometimes an herbal extract is used to anaesthetize caged salmon before they are slaughtered. They then experience a cerebral surge. The animal's heart continues to beat while being bled from its cut gills. Salmon that is killed using this technique has solid, long-lasting meat. Salmon producers in New Zealand don't use the antibiotics and pesticides that are often required elsewhere since there are no diseases in wild populations and low stocking numbers are employed in the cages [10]–[13].

Timeline

Hector Boece of the University of Aberdeen in Scotland describes the life cycle of the Atlantic salmon in 1527.

1763: Germany conducts tests on fertilising Atlantic salmon. Subsequent scientists in Scotland and France improved these.

1854 saw the construction of salmon raising ponds and

spawning beds by the Dohu-lla Fishery in Ballyconneely, Ireland.

1864: In an unsuccessful effort to establish a population in Australia, hatchery-raised Atlantic salmon fry were discharged in the River Plenty, Tasmania.

1892: In an unsuccessful effort to establish a population in Africa, hatchery-raised Atlantic salmon fry were released in the Umkomass river in South Africa.

In the late 19th century, Europe, North America, and Japan all employed salmon hatcheries to increase wild populations.

1961: In an unsuccessful effort to establish a population in the South Atlantic, hatchery-raised Atlantic salmon fry were released in the rivers of the Falkland Islands.

Norway and Scotland created their first salmon farms in the late 1960s.

1970: In an unsuccessful effort to establish a population in the Indian Ocean, hatchery-raised Atlantic salmon fry were released in the rivers of the Kerguelen Islands.

North American salmon farms are created in the early 1970s.

1975: A tiny monogenean parasite called Gyrodactylus spreads from Norwegian salmon hatcheries to wild salmon, most likely via fishing gear, and decimates certain wild salmon populations.

In the late 1970s, Chile and New Zealand constructed salmon farms.

1984: A Norwegian salmon hatchery is the site of the discovery of the viral illness infectious salmon anaemia. Fish that are engaged perish in 80% of the cases.

Australia's first salmon farms were developed in 1985.

Early mentions of escaped Atlantic salmon being found in wild Pacific salmon fisheries date back to 1987.

1. 1988: During a storm, millions of Atlantic salmon are released in the Faroe Islands.

2. In 1989, a bacterial illness called furunculosis spread throughout Norwegian salmon farms and wild fish.

III. CONCLUSION

Raising salmon in hatcheries until they are old enough to be independent is another method of producing salmon that is safer but less manageable. After that, they are often released into rivers in an effort to boost the salmon population. Before the Norwegians developed salmon farming, this practise was very popular in nations like Sweden; however, private businesses rarely engage in it because anyone can catch the salmon when they return to spawn, lowering the likelihood that an investment will yield a return on the company's capital menu. The style will adjust your fonts and line spacing. **Do**

REFERENCES

[1] O. Torrissen et al., "Salmon lice - impact on wild salmonids and salmon aquaculture," Journal of Fish Diseases. 2013. doi: 10.1111/jfd.12061.

[2] W. I. Atlas et al., "Indigenous Systems of Management for Culturally and Ecologically Resilient Pacific Salmon (Oncorhynchus spp.) Fisheries," Bioscience, 2021, doi: 10.1093/biosci/biaa144.

[3] K. J. Pitman et al., "Glacier Retreat and Pacific Salmon," BioScience. 2020. doi: 10.1093/biosci/biaa015.

[4] C. Carothers et al., "Indigenous peoples and salmon stewardship: A critical relationship," Ecol. Soc., 2021, doi: 10.5751/ES-11972-260116.

[5] M. Booman, I. Forster, J. C. Vederas, D. B. Groman, and S. R. M. Jones, "Soybean meal-induced enteritis in Atlantic salmon (Salmo salar) and Chinook salmon (Oncorhynchus tshawytscha) but not in pink salmon (O. gorbuscha)," Aquaculture, 2018, doi: 10.1016/j.aquaculture.2017.10.025.

[6] K. Overton, T. Dempster, F. Oppedal, T. S. Kristiansen, K. Gismervik, and L. H. Stien, "Salmon lice treatments and salmon mortality in Norwegian aquaculture: a review," Reviews in Aquaculture. 2019. doi: 10.1111/raq.12299.

[7] T. Ytrestøyl, T. S. Aas, and T. Åsgård, "Utilisation of feed resources in production of Atlantic salmon (Salmo salar) in Norway," Aquaculture, 2015, doi: 10.1016/j.aquaculture.2015.06.023.

[8] S. M. Colombo and X. Mazal, "Investigation of the nutritional composition of different types of salmon available to Canadian consumers," J. Agric. Food Res., 2020, doi: 10.1016/j.jafr.2020.100056.

[9] T. J. Kragesteen, K. Simonsen, A. W. Visser, and K. H. Andersen, "Optimal salmon lice treatment threshold and tragedy of the commons in salmon farm networks," Aquaculture, 2019, doi: 10.1016/j.aquaculture.2019.734329.

[10] J. C. Walsh et al., "Prioritizing conservation actions for Pacific salmon in Canada," J. Appl. Ecol., 2020, doi: 10.1111/1365-2664.13646.

[11] S. J. Martin, C. Mather, C. Knott, and D. Bavington, "'Landing' salmon aquaculture: Ecologies, infrastructures and the promise of sustainability," Geoforum, 2021, doi: 10.1016/j.geoforum.2021.04.025.

[12] I. A. Johnsen et al., "Salmon lice-induced mortality of Atlantic salmon during post-smolt migration in Norway," ICES J. Mar. Sci., 2021, doi: 10.1093/icesjms/fsaa202.

[13] T. Bjørndal and A. Tusvik, "Economic analysis of land based farming of salmon," Aquac. Econ. Manag., 2019, doi: 10.1080/13657305.2019.1654558.

Evolution of Aquaculture Systems

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Abstract— Many systems of aquaculture operations have developed with the expansion and development of aquaculture as a sustainable source of marine food. Aquaponics, organic aquaculture, and recirculating aquaculture systems are a few of them. In this chapter, the key elements of aquaculture systems are covered.

Index Terms— Aquaculture Systems, Fish Farming, Recirculating Aquaculture, Water Column, Water Treatment

I. INTRODUCTION

In home aquariums and for fish farming, recirculating aquaculture systems are employed when water exchange is limited and biofiltration is necessary to lower ammonia toxicity. To keep water clean and offer an appropriate habitat for fish, additional filtration techniques and environmental controls are often required [1]–[3].

Methods for RAS Water Treatment

In extensive fish farming operations, water quality is maintained using a number of treatment procedures. These stages are often carried out in succession or sometimes in combination. The water is cleaned for particulates after leaving the fish-carrying vessel, then it passes through a biofilter to convert ammonia, after which it goes through degassing and oxygenation, which is often followed by heating, chilling, and sterilising.

While many techniques and tools may be used to carry out each of the operations, they are all necessary to provide a healthy environment that promotes fish development and health. Ammonia is a byproduct of fish metabolism that is hazardous to most finfish at high doses. Chemoautotrophic microorganisms known as nitrifying bacteria turn ammonia into nitrite and ultimately nitrate. A biofilter gives the bacterial population a substrate, which causes a thick biofilm to form within the filter. The filter circulates water through ammonia-using bacteria, who use it as fuel. Nitrate may be removed using a denitrifying biofilter or by changing the water since it is less harmful than ammonia. For the biofilter to function effectively, a stable environment and routine maintenance are needed.

Removal of Solids

The solid waste produced by fish must also be handled in addition to the liquid waste, which is done by concentrating and flushing the solids out of the system. Eliminating solids limits the development of bacteria, the need for oxygen, and the spread of illness. The easiest way to remove solids is to create a settling basin where the water's relative velocity is low and the particles can settle to the bottom of the tank where they can then be manually sucked out with a syphon or flushed away. For RAS operations where a tiny footprint is needed, this strategy is not practical. The typical RAS solids removal method uses a particle or sand filter where solids may sometimes be backflushed out of the filter after being trapped within. The use of mechanical drum filters is another popular technique. In these filters, water is sent through a revolving drum screen that is regularly cleaned by pressured spray nozzles, and the resultant slurry is either treated or flushed down the drain. With or without the presence of ozone, a protein fractionator may be used to extract very tiny particles or colloidal materials [4]–[6].

Oxygenation

It is essential to reoxygenate the system water in order to achieve high production densities. Oxygen is necessary for fish to thrive and for bacteria colonies in the biofilter to digest food and reproduce. Aeration and oxygenation are two techniques that may be used to raise the amounts of dissolved oxygen. Air is forced through an air stone or other similar device during aeration, which produces tiny bubbles in the water column and increases the surface area available for oxygen to dissolve into the water. This approach is often regarded as inefficient since it requires high air pressure to produce tiny bubbles and sluggish gas dissolution rates. Instead, pure oxygen is pumped into the water to oxygenate it. It is made sure during oxygenation that all of the oxygen dissolves into the water column using a variety of techniques. The oxygen demand of a particular system must be carefully calculated and taken into account, and it must be satisfied using either oxygenation or aeration equipment.

Regulation of pH

pH has to be carefully watched over and managed in all RAS. The biofilter's initial stage of nitrification depletes alkalinity and lowers the system's pH. It is essential to keep the pH in the ideal range to preserve the wellbeing of the fish and the biofilter. Alkalinity, usually in the form of lime, is added to adjust pH. . High concentrations of dissolved carbon dioxide brought on by a low pH may be hazardous to fish. In intensive systems, particularly when oxygenation rather than aeration is utilised in tanks to maintain O2 levels, pH may also be adjusted by degassing CO_2 in a packed column or with an aerator.

Temperature regulation

Each type of fish has a preferred temperature range between which it will suffer poor health impacts and finally perish. Whereas cold water species like trout and salmon prefer water temperatures below 16 °C, warm water species like tilapia and barramundi prefer water that is 24 °C or warmer. Dissolved oxygen concentrations are significantly influenced by temperature, with lower concentrations of DO occurring at higher temperatures. Submerged heaters, heat pumps, chillers, and heat exchangers are used to regulate temperature. To maintain a system at the ideal temperature for optimum fish output, all four may be employed.

II. DISCUSSION

Biosecurity

When dealing with the large fish stocking densities generally used in intensive RAS, disease outbreaks are more likely to develop. Several separate systems running in the same building and preventing water-to-water contact between systems by thoroughly cleaning the equipment and workers who travel between them may help prevent outbreaks. Moreover, using an ozone or Ultra Violet water treatment system lowers the quantity of free-floating bacteria and viruses in the system water. By reducing the disease loading that occurs on stressed fish, these treatment methods lower the likelihood of an outbreak.

Advantages

Sturgeon raised in an aquaculture system with some recirculation at a high density [7]–[9].

1. Less water is needed than in raceway or pond aquaculture systems.

2. Lower land requirements because of the high stocking density

3. Flexibility in site selection and independence from a large water supply.

4. Volume reduction of wastewater effluent.

5. Better biosecurity and less difficulty in controlling disease outbreaks.

6. The capacity to carefully observe and regulate environmental factors to increase production effectiveness. Independence from the elements and shifting environmental circumstances.

7. Disadvantages

8. High initial expenditures for materials and infrastructure;

9. High ongoing expenses, mostly for power and system upkeep;

10. Need for highly skilled personnel to monitor and manage the system [10]–[12].

III. CONCLUSION

The fundamental advantage of RAS is its capacity to lessen the need for clean, fresh water while still maintaining a favourable habitat for fish. High fish stocking densities are a need for RAS to be managed economically on a commercial scale, and several researchers are now undertaking investigations to ascertain if RAS is a workable kind of intensive aquaculture

REFERENCES

[1] S. Chen, B. Mulgrew, and P. M. Grant, "A clustering technique for digital communications channel equalization using radial basis function networks," IEEE Trans. on Neural Networks, vol. 4, pp. 570-578, July 1993.

[2] J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility," IEEE Trans. Electron Devices, vol. ED-11, pp. 34-39, Jan. 1959.

[3] C. Y. Lin, M. Wu, J. A. Bloom, I. J. Cox, and M. Miller, "Rotation, scale, and translation resilient public watermarking for images," IEEE Trans. Image Process., vol. 10, no. 5, pp. 767-782, May 2001.

Special Types of RAS Aquaponics

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Abstract— Aquaponics is the practise of growing both plants and fish in a RAS. With this kind of arrangement, the plants also remove the ammonia from the water that the fish create by converting it to nitrate. Fish in an aquaponics system successfully fertilise the plants, resulting in a closed-looped system with minimal inputs and waste production. The benefit of being able to harvest and sell a variety of crops is offered by aquaponics.

Index Terms— Aquaponics Systems, Ammonia Water, Certified Organic, Fish Stocking, Organic Aquaculture.

I. INTRODUCTION

Household aquariums and inland commercial aquariums are examples of RAS where the fish stocking density is relatively modest and the water quality is well monitored. Instead of generating food, these systems aim to exhibit the fish. To lessen the demand for water exchange and to keep the water clear, biofilters and other types of water treatment are still used. Similar to typical RAS, water has to be withdrawn occasionally to stop the buildup of nitrate and other harmful pollutants. Because of their closeness to a large body of clean water, coastal aquariums often experience significant rates of water exchange and are not generally run as RAS systems.

Aquaculture that follows organic principles is produced using a comprehensive approach. The principles of this technique create sustainable marine habitats that take into account naturally existing ecosystems, the usage of pesticides, and how aquatic life is handled. As customers are worried about the negative effects of aquaculture on themselves and the environment, organic aquaculture management has gained popularity [1]–[3]. Aquaculture is the area of the food system that is expanding the quickest, and since the middle of the 1990s, certified organic aquaculture goods have been more readily accessible. In spite of the fact that this technique of cultivating seafood has gained popularity in Germany, the UK, and Switzerland, consumers may be misled or dubious about the label due to inconsistent and deceptive standards throughout the globe.

A recognised certification organisation has confirmed that the production techniques meet or surpass a nation's criteria for organic aquaculture production if an aquaculture product bears the Certified Organic Product mark. Aquaculture cannot easily implement organic laws made for soil-based systems since they often contradict with large-scale, intense practices/objectives. It is challenging to find and certify organic juvenile fish; the cost of feed is 35–40% higher; labor-intensive; the certification procedure takes longer and costs more money; the advantages are questionable. Yet, there is a clear market demand for organic seafood, and with further study, organic aquaculture may emerge as a substantial management strategy.

Certification

Several nations have established their own national certification programmes and criteria for organic aquaculture. The Global Trust, one of the biggest certifying companies that provides evaluations and certificates to meet the highest quality organic aquaculture standards, is one of the worldwide organic aquaculture standardisation processes, despite the fact that there isn't only one. One may personally inquire for further details about these criteria. Numerous certifications for organic aquaculture cover a wide range of topics, including the use of antibiotics and chemicals to treat fish, the unrestricted disposal of fish waste into the ocean, the materials used to feed fish, the habitat in which the fish are raised, and proper handling procedures, including slaughter. The majority of organic aquaculture certifications adhere to very rigid criteria and regulations. The wide range of species, including freshwater, saltwater, shellfish, fish, mollusks, and aquatic plants, makes it difficult to define appropriate activities. Fish and shellfish populations may not even be considered "livestock" under current standards due to the challenges of removing contaminants from an aquatic environment, managing food sources, and monitoring individual fish. This further demonstrates the need of an industry-wide aquaculture certification standard [4]–[6].

Challenges and Disputation

License limits are controversial because some seafood enterprises argue that wild-caught fish should be considered organic. Even while wild fish may not have been raised using pesticides or other unsustainable methods, the fishing business may not always be ecologically friendly.

Consistent organic certification has significant challenges due to the wide range of requirements, the unknown degree of real conformity, and the proximity of investigations throughout certification. The European Union proposed new regulations in 2010 to uniformly define the organic aquaculture sector. Since they permitted the use of up to 30% non-organic feed, lethal and unregulated consequences on wild species, and the unrestricted release of fish waste into the ocean, Canada's General Standards Board's planned

modifications to its guidelines in 2010 faced fierce opposition. These guidelines would have validated the organic nature of net pen systems. On the opposite end of the spectrum, Denmark's highly tight national laws has hampered the growth of the organic trout sector.

Finding feasible and sustainable alternatives to non-organic veterinary care, feeds, spit, and waste disposal is a key challenge in the development of organic aquaculture. Homeopathic remedies and production-cycle restricted allopathic or chemical therapies are examples of potential veterinary alternatives. Normal criteria call for less unsustainable fishmeal and more organic vegetable and fish byproduct substitutes. According to a recent research on organic salmon fish feed, although the loss of fish meals and oils has a substantial detrimental effect on the environment, organic feed does have some positive effects on the environmental impact of the fishes' life cycles. Another research found that certain amounts of dietary protein may be substituted without harm.

Not only must the fish be raised organically, but organic fish foods must also be created. The substitution of non-sustainable fishmeal in feed with organic vegetable proteins is the current focus of research into strategies to reduce its use. The availability of certain organic fish diets and/or the possibility of integrated multi-species systems. For instance, placing a shellfish bed close to a fish farm would allow for waste disposal and regulated nutrient delivery to the shellfish.

Certification for Organic Aquaculture in the United States

The National Organic Standards Board and the National Organics Program established the Aquatic Animal Task Force in 2005 in response to the growing demand for a certification procedure specifically created for farming practises based on the ocean. The group's goal was to make recommendations for the new certification procedure. The task force was supposed to be divided into two groups: wild fisheries and aquaculture, however no group for wild fisheries ever came together.

The Aquaculture Working Group presented a report in 2006 with recommendations for the breeding and care of aquatic animals and plants. In contrast, the group asked for additional time to thoroughly examine bivalve mollusks due to the complexity and variety of the marine eco- systems. The National Organic Standards Board accepted the aquaculture requirements in 2007 and afterwards reexamined the feed and facilities for aquatic animals before putting up a summary of the public comments in 2008. The bivalve mollusks section's proposals were accepted by the NOSB in 2010.

The legality of applying the organic label for aquatic species as well as the potential development of USDA certification requirements for organic aquaculture goods and aquatic species are both now being examined. The Office of Management and Budget will need to approve the first version of the regulation for organic aquaculture, which is expected to be issued in April or May 2016. The final

regulation should go into effect by the end of the summer or beginning of the autumn of 2016, and organic aquaculture goods should start to appear in stores by 2017. The accreditation is reportedly applicable to the contentious net-pen technology as well as aquaculture techniques for shellfish, marine, and recirculating systems. Seafood that has received organic certification may presently be imported into the US from Europe, Canada, and other nations.

Production

Internationally, organic aquaculture is estimated to have generated $46.1 billion. Although 32.2 million hectares were devoted to organic farming in 2008, only 0.4 million hectares were used for certified organic aquaculture. Nonetheless, barely 0.1% of all aquaculture productivity was produced in 2007. In Europe, particularly in France, Germany, and the UK, the market for organic aquaculture is expanding quickly. For instance, the market in France increased by 220% between 2007 and 2008. Wherever it is accessible, there is a pREFERENCES: for organic food. In the EU, inexpensive grocery companies increasingly carry organic fish. The UK, Ireland, Hungary, Greece, and France are the top five producers. Europe is home to 123 of the world's 225 certified organic aquaculture farms, which produced 50,000 tonnes in 2008. .

Customers now anticipate paying premiums of 30–40% for organic seafood goods, which are a niche industry. The most popular species is organic salmon, which retails for 50%. Danish rain-bow trout producers are moving to organic farming due to market demand. Any system that combines hydroponics with traditional aquaculture in a mutually beneficial environment is referred to as aquaponics. Excretions from the animals being grown may build up in the water during typical aquaculture, increasing toxicity. In an aquaponic system, water from an aquaculture system is supplied to a hydroponic system where the byproducts are broken down into nitrates and nitrites by nitrifying bacteria, which are then used as nutrients by the plants. The water is then recirculated back to the aquaculture system. a compact, mobile aquaponics setup. Aquaponics is a combination of the words hydroponic farming and aquaculture.

The size, complexity, and kinds of foods cultivated in an aquaponics system may vary as much as any system found in any unique farming discipline since all aquaponics systems are based on current hydroponic and aquaculture farming processes.

At a research station in Lethbridge, Alberta, a modest system was used to supplement ongoing aquaculture research to conduct the first aquaponics study in Canada. During the 1990s, Canada experienced an increase in aquaponics systems, mostly as commercial installations growing high-value crops like lettuce and trout.

When researching aquaponics from a plant science perspective in Brooks, Alberta, Dr. Nick Savidov and colleagues constructed a setup based on the deep water system created at the University of Virgin Islands. The team's

research on the fast root development in aquaponics systems and on closing the solid-waste loop revealed that the system can function effectively at a low pH level, which is preferred by plants but not fish. This is because it has several benefits over conventional aquaculture.

Aquaponic System Components

an aquaponics system used in industry. An electric pump circulates fish tank water that is rich in nutrients through a solids filter to eliminate any debris that the plants above cannot consume. The water is then cleaned and supplied nutrients for the plants before being sent to the fish tank below. Aquaponics has two basic components: hydroponics for growing plants and aquaculture for rearing aquatic animals. Because to closed-system recirculation in most aquaculture systems, aquatic effluents from uneaten feed or rearing fish build in water.

High quantities of the effluent-rich water render it poisonous for aquatic life, yet it still has vital nutrients for plant development. While largely made up of these two components, aquaponics systems are often divided into a number of sections or subsystems that are in charge of carrying out efficient solid waste removal, supplying bases to neutralise acids, or preserving water oxygenation.

The following are examples of typical parts: Rearing tank: the tanks used to raise and feed the fish; Settling basin: a device for collecting leftover food and detached biofilms, as well as for settling out fine particulates; Biofilter: a location where the nitrification bacteria can grow and convert ammonia into ni- trates, which are usable by the plants.

Sump: the lowest point in the system where the water runs to and from where it is pumped back to the rearing tanks.

Hydroponics subsystem: the section of the system where plants are grown by absorbing extra nutrients from the water.

The units for solids removal, biofiltration, and/or the hydroponics subsystem may be merged into one unit or subsystem, depending on the complexity and expense of the aquaponics system. This prevents water from moving straight from the aquaculture section of the system to the hydroponics part.

Live Elements

For an aquaponic system to function properly, it needs a variety of living components. The three primary living elements are bacteria, plants, and fish. Some systems also include extra living elements, such as worms.

Plants

Numerous plants may be used in aquaponic systems, but which ones are best for a given system depends on the fish's maturity and stocking density. These elements affect the concentration of nutrients in fish waste and the proportion of those nutrients that bacteria make accessible to plant roots. Chinese cabbage, lettuce, basil, spinach, chives, herbs, and watercress are some examples of green leaf crops that are well suited to aquaponic systems since they have low to medium nutritional needs. Some plants, including tomatoes, cucumbers, and peppers, need more nutrients and will only grow successfully in established aquaponic systems with high fish stocking densities.

Cucumbers, shallots, tomatoes, lettuce, chiles, capsicum, red salad onions, and snow peas are some of the plants that grow well in aquaponics systems. A hydroponic technique called Deep Water Culture where plants grow without soil in effluent-rich water. Since the roots do not need to spread out to support the plant's weight, plants may be placed closer together. Plant inserted into Nutrient Film Technique system's nutrient-rich water channel. Chinese cabbage, lettuce, basil, roses, toma-toes, okra, cantaloupe, and bell peppers are some productive plants for aquaponic systems. Watercress, basil, cilantro, parsley, lemongrass, sage, beans, peas, kohlrabi, taro, radishes, strawberries, melons, onions, turnips, parsnips, sweet potato, cauliflower, cabbage, broccoli, and eggplant are additional vegetable species that thrive in aquaponic systems. They also include the choys used in stir-fries. To offer adequate nutrition, fruiting plants like melons or tomatoes and plants with greater nutrient requirements need larger fish stocking densities and more mature tanks.

Fish

Aquaponic systems are most often used to produce freshwater fish, however they may also be used to raise freshwater crayfish and prawns. Saltwater aquaponics is a subset of aquaponics that employs saltwater fish. Both warm-water and cold-water fish species may thrive in aquaculture systems. As tilapia are warmwater fish that can endure crowding and fluctuating water conditions, they are the most common fish for domestic and commercial projects that are often used to grow edible fish. Moreover, barramundi, silver perch, eel-tailed catfish, jade perch, and Murray cod are employed. Bluegill and catfish are appropriate fish species for home systems in temperate locations when it is neither possible or desirable to manage water temperature. If the fish in the system are not required to be edible, koi and goldfish may also be employed. Channel catfish, rainbow trout, perch, common carp, Arctic char, large-mouth bass, and striped bass are other appropriate species.

Bacteria

One of the most crucial processes in an aquaponics system is nitrification, which involves the aerobic conversion of ammonia into nitrates. This process lowers the water's toxicity for fish and enables plants to absorb the generated nitrate molecules for nutrition. Fish excreta and gills continuously produce ammonia into the water as a byproduct of their metabolism, however this ammonia must be filtered out of the water since greater quantities of ammonia will kill fish. While plants may to some extent absorb ammonia from the water, nitrates are more readily digested and effectively lower the water's toxicity for fish. By combining healthy

populations of the bacteria Nitrosomonas, which turns ammonia into nitrites, and Nitrobacter, which turns nitrites into nitrates, ammonia may be transformed into various nitrogenous molecules.

Aquatic Subsystem

Plants are cultivated in nutrient-rich effluent water with their roots submerged, similar to hydroponic systems. This allows them to filter out ammonia or its metabolites, which are hazardous to aquatic creatures. When the water has been cleansed and oxygenated in the hydroponic subsystem, it may be redirected to the aquaculture vessels. This cycle never ends. Hydroponic systems are often used in aquaponic systems, such as: • Deep-water raft aquaponics, in which foam rafts float in troughs used for aquaculture.

1. Recirculating aquaponics: solid medium stored in a container filled with aquaculture water, such as gravel or clay beads. Closed-loop aquaponics is another name for this technique.

2. Reciprocating aquaponics uses several syphon drain types to alternately flood and drain solid medium in a container. Aquaponics of this kind is sometimes referred to as ebb-and-flow aquaponics or flood-and-drain aquaponics.

3. Other methods include nutrient film technology channels, horizontal PVC pipes with openings for the pots, plastic barrels that have been split in half, gravel, or rafts within, and towers that are trickle-fed from the top. Every strategy has advantages of its own.

Plant harvesting is staggered, with seedlings developing at the same time as mature plants, since plants at various development stages need varying quantities of minerals and nutrients. Because of the ongoing symbiotic removal of toxins from the water, this provides steady nutritional content in the water.

Biofilter

The bacteria that convert ammonia into plant-useable nutrients in an aquaponics system create a biofilm on all solid surfaces throughout the system that are in continual contact with water. The total surface area of the veggies' submerged roots provides a lot of room for germs to grow. The surface area, together with the levels of ammonia and nitrites in the water, influences how quickly nitrification occurs. It's crucial to take good care of these bacterial colonies in order to control the complete absorption of nitrite and ammonia. Because to the fact that a biofiltering unit aids in the development of these bacteria, most aquaponics systems do so. Ammonia levels typically vary from 0.25 to 2.0 ppm, nitrite levels from 0.25 to 1 ppm, and nitrate levels from 2 to 150 ppm after a system has stabilized. Ammonia and nitrite levels may increase during system starting, with nitrate levels peaking later in the process. As the nitrification process makes the water acidic, non-sodium bases like potassium hydroxide or calcium hydroxide may be added to the water to bring down its pH if it doesn't already contain enough of these compounds to act as a buffer against acidification. In addition to the fish excrement, which is the primary source of nutrients for plants, specific minerals or nutrients, such as iron, may be given. The use of worms, which liquefy the solid organic matter so that it may be consumed by the plants and/or other animals in the system, is a suitable technique to deal with solids accumulation in aquaponics systems.

Operation

Water, oxygen, light, food for aquatic creatures, and power to pump, filter, and oxygenate the water are the system's five primary inputs. To maintain a steady system, spawn or fry may be introduced to replace mature fish that are removed. An aquaponics system may produce edible aquatic species cultivated in an aquaculture as well as plants like hydroponically grown vegetables. For every U.S. gal of aquaculture water in the system, there should be.5 to 1 square feet of grow area. Depending on aeration and filtration, 1 U.S. gal of water may support between.5 lb and 1 lb of fish stock.

Based on significant research conducted as part of the Agricultural Experiment Station aquaculture programme, Dr. James Rakocy, head of the aquaponics research team at the University of the Virgin Islands, announced 10 major guiding principles for developing effective aquaponics systems. Employ a feeding rate ratio for design calculations, maintain a steady feed supply, provide calcium, potassium, and iron supplements, ensure proper aeration, remove particles, be cautious around aggregates, use oversize pipes, use biological pest management, make sure there is enough biofiltration, and regulate ph.

Supply Source

Fish meal made from low-value species is often used as stock feed, as is the case in the majority of aquaculture-based systems. This technique is unsustainable since wild fish sources are steadily being depleted. Fish feeds made from organic ingredients can show to be a good substitute for this issue. Additional options include raising black soldier fly larvae to feed the fish using composting grub growers, developing excess worms from vermiculture composting using prepared kitchen trash, and growing duckweed using an aquaponics system that feeds the same fish produced on the system.

Use of Water

Under normal operating conditions, aquaponic systems normally do not exchange or discharge water, but rather extremely efficiently recycle and reuse water. To maintain a stable aquatic environment with little variation in ambient nutrient and oxygen levels, the system depends on the interactions between the animals and plants.

The removal of biomass, such as settled solid wastes from the system, as well as absorption and transpiration by plants, evaporation into the air from surface water, overflow from the system from rainfall, and so on. As a consequence, aquaponics consumes just around 2% of the water needed by

a traditionally irrigated farm to produce the same amount of vegetables. This enables the aquaponic production of both crops and fish in locations with limited access to water or arable land. You can mimic controlled wetland conditions using aquaponic systems. Typical residential sewage may benefit from biofiltration and treatment in constructed wetlands. The nutrient-rich overflow water may be collected in catchment tanks where it can be utilised to speed up the development of crops grown on soil or it can be fed back into the aquaponic system to top up the water.

Use of Energy

In order to achieve recirculation and water/ambient temperatures, aquaponic systems depend to varied degrees on man-made energy, technical advancements, and environmental management. Yet, a system may be very energy efficient if it is built with energy conservation in mind, employing alternative energy sources and fewer pumps by letting the water flow downhill as much as feasible. Aquaponics systems may have several "single points of failure" where issues like an electrical failure or a pipe obstruction can result in a complete loss of fish population, even if good design can reduce the risk.

II. DISCUSSION

In an attempt to lessen its increasing reliance on imported food, the Caribbean island of Barbados launched a programme to set up aquaponics systems at home, with cash produced by selling vegetables to visitors [7]–[10].

The significance of aquaculture

The deterioration and loss of natural fish populations in rivers, estuaries, and the seas have been extensively discussed in literature. Large ocean fish populations including tuna, cod, and halibut have decreased by 90% over the previous 50 years due to industrial fishing's high level of efficiency. One of the fastest expanding segments of the global food system is aquaculture, a sector that has only recently evolved. Now, more than half of the world's fish demand is met by aquaculture. In the next decades, a significant rise in this proportion is forecast.

The Issue with Biofouling

In a Tasmanian fish farm for Atlantic salmon, copper alloy mesh has been placed. Chain link copper alloy mesh in the foreground, perched on a dock. The fish farm has copper alloy mesh enclosures constructed in the backdrop.

One of the main issues in aquaculture is biofouling. In the maritime environment, biofouling may form on non-copper materials like nettings and fish pen surfaces. For instance, it was discovered that biofouling caused the open area of a mesh submerged for just seven days in a Tasmanian aquaculture operation to drop by 37%.

Algae spores, marine invertebrate larvae, and other organic debris cling to surfaces immersed in marine settings to initiate the biofouling process. Bacteria then promote the adhesion of other uninvited colonists.

Aquaculture operations are significantly negatively impacted by biofouling. Clogged nets in fish cages prevent water movement and dissolved oxygen from being present. The final consequence is often sick fish brought on by parasites and diseases like netpen liver disease and amoebic gill disease. Additional negative effects include a worsened environment surrounding fish farms, an increase in fish mortalities, lower fish development rates, early fish harvesting, and decreasing value and profitability of fish products. Submerged fish nets become much heavier due to biofouling. There have been reports of weight rises of 200 times. For instance, this corresponds to 2,000 pounds of undesirable organisms stuck to a once-clean 10-pound fish pen net. South Australia has biofouling that weighs

Treatment regimens including cypermethrin, azamethiphos, and emamectin benzoate may be used to control parasites from biofouling in finfish aquaculture, although they have been proven to have negative environmental consequences, such as in lobster operations. Antibiotics are given to fish populations to cure illnesses in fish grown in biofouled nets. Consumers and the coastal habitats close to aquaculture activities may have unfavourable long-term health impacts from the antibiotics. Operators often use expensive maintenance techniques to prevent biofouling, including regular net replacement, cleaning/removal of undesired organisms from nets, net repairs, and chemical treatment, including antimicrobial coatings on nylon nets. A single salmon net might cost several thousand British pounds to antifoul. Cleaning biofouled fish and shellfish cages in certain segments of the European aquaculture business may cost 5-20% of the product's market value. In nets, heavy fouling may limit the product that can be sold by 60–90%.

Nylon nets often have antifouling coatings applied since it is less expensive than hand cleaning. Antifouling substances that are applied to nylon nets prevent biofouling for a while, often several weeks to many months. The nets do, however, ultimately become biofouling. The coatings technology employed nowadays in the fish farming business is nearly all antifouling coatings using cuprous oxide algaecide/biocide. Usually, the effects of the therapies wear off within a few weeks to six to eight months.

Depending on the environmental conditions, biofouled nets are changed after several months of use in a difficult, expensive, and labor-intensive process involving divers and expert workers. Live fish must be moved from nets to clean enclosures during this operation, which leads to unnecessary stress and asphyxiation and some fish mortality. Reusable biofouled nets are cleaned on land using high-pressure water hosing or hand brushing and scrubbing. After drying, they are once again coated with antifouling agents.

If allowed, a line of net cleaners are offered for in-situ washings. However, even in cases where it is not authorised by environmental, fisheries, maritime, or sanitary authorities, divers may be sent out with specialised in-situ cleaning

equipment to scrub biofouled nets if a situation arises where the health of fish is in danger due to a lack of dissolved oxygen in submerged pens. The detrimental effects of aquaculture activities on the environment are being addressed. Aquaculture is predicted to change through time, becoming cleaner and more environmentally friendly. Materials with anti-fouling, anti-corrosive, and strong structural qualities, including copper alloys, may be used more often in this business.

Characteristics of Copper Alloys that Prevent Fouling

Sound animal husbandry in the aquaculture sector refers to keeping fish clean, nourished properly, healthy, and not overcrowded. Keeping farmed fish contained in antifouling copper alloy nets and structures is one way to maintain their health. After 4 months submerged in the waters of the North Atlantic, a copper alloy mesh shows no signs of biofouling, whereas high-density polyethylene tubing has developed hydroids. Researchers have suggested two potential explanations for copper's ability to resist biofouling, even in temperate waters: 1) a slowing sequence of colonisation through release of antimicrobial copper ions, preventing the attachment of microbial layers to marine surfaces; and 2) a layer separation process that keeps corrosive products and the spores of juvenile or macro-encrusting organisms apart.

The copper alloys must be electrically isolated from less noble alloys and from cathodic protection in order to have the best possible biofouling resistance. Galvanic coupling to less noble alloys and cathodic protection stop the release of copper ions from surface coatings, which lowers the resistance to biofouling. In marine waterways, biofouling rates substantially increase as temperatures rise and water velocities fall. Copper, however, exhibits a high level of biofouling resistance even in temperate conditions. Research in the extreme biofouling area of La Herradura Bay in Coquimbo, Chile, showed that a copper alloy with a 90% copper, 10% nickel composition evaded macro-encrusting organisms.

Behavior of Copper Alloys Corrosion

Although having a great resistance to many localised types of corrosion, copper alloys used in seawater service also have low overall corrosion rates. There is scientific information available on different forms of corrosion, application issues, and the corrosion properties of various copper alloys used in aquaculture nets.

Hulls were nearly exclusively built of wood, often white oak, until the late 1700s. The typical method of hull protection was sacrifice planking. To reduce the chance of damage, this method included wrapping a protective covering of wood, often pine, on the hull that was 1/2 inch thick. In cases where sea borers were present, this layer was often changed. In the latter half of the 18th century, copper sheathing for bio-resistant ship hulls was created. To guard against Teredo worm attacks in tropical seas, the HMS Alarm frigate of the British Royal Navy had her whole hull completely encased with copper in 1761. Ships with copper-sheathed hulls were able to travel more quickly than those without it because the copper decreased biofouling of the hull.

Performance of Copper Alloy Mesh in the Environment

The environmental performance of copper alloys in aquaculture operations is influenced by a variety of complex elements. This REFERENCES: provides a technical summary of antibiofouling processes, fish health and wellbeing, fish losses from escapes and predator attacks, and decreased life cycle environmental consequences.

Various Copper Alloys

Commercial-scale aquaculture operations are using copper-zinc brass alloys throughout Asia, South America, and the US. Two further copper alloys, copper-nickel and copper-silicon, are now the subject of extensive study, including experiments and demonstrations. Each of these alloy types has the innate capacity to minimise biofouling, illness, pen waste, and the demand for antibiotics while preserving water circulation and oxygen requirements. For research and development in aquaculture operations, other varieties of copper alloys are also being taken into consideration.

With the sponsorship of the International Copper Association, the University of New Hampshire is now undertaking studies to assess the structural, hydrodynamic, and antifouling response of copper alloy nets. Fish pen enclosures built of copper-nickel alloy nets will be designed with the aid of the factors learned from these studies, such as drag, pen dynamic loads, material loss, and biological development, which are well known for nylon netting but less well understood for copper-nickel alloy nets. In Shanghai, China, the East China Sea Fisheries Research Institute is also carrying out experimental studies on copper alloys for ICA.

Zinc-copper alloys

A unique copper-zinc brass alloy, known as UR30, has been created by the Mitsubishi-Shindoh Co., Ltd., with aquaculture operations in mind. The alloy, which is made up of 64 percent copper, 35.1% zinc, 0.6% tin, and 0.3% nickel, is resistant to mechanical abrasion when formed into wires and made into flexible mesh, such as chain link or woven. The conditions of the ocean and submergence depth affect corrosion rates. Based on two- and five-year saltwater exposure tests, the alloy's average stated corrosion rate is 5 m/yr.

In order to grow Seriola, the Ashimori Industrial Company, Ltd. erected around 300 flexible pens with woven chain link UR30 meshes in Japan. To produce Atlantic salmon at the Van Diemen Aquaculture facility in Tasmania, Australia, the business has added 32 more brass cages. For the purpose of growing trout and Atlantic salmon in Chile, EcoSea Farming S.A. has set up a total of 62 woven chain link metal mesh cages. Demonstrations and experiments are being conducted employing flexible pens with woven chain

link UR30 and other mesh types, as well as a variety of copper alloys, in Panama, China, Korea, Turkey, and the US. Chain link mesh made by these brass alloys has not yet seen dezincification, stress corrosion cracking, or erosion corrosion in the more than ten years of aquaculture experience.

Nickel-copper alloys

Around fifty years ago, copper-nickel alloys were created especially for usage in saltwater. These alloys are now being researched for possible use in aquaculture. For maritime applications, copper-nickel alloys typically include 90% copper, 10% nickel, and trace quantities of manganese and iron to increase corrosion resistance. When exposed to clean saltwater, copper-nickel alloys' resistance to seawater corrosion causes a thin, adherent protective surface coating to naturally and swiftly grow on the metal. Temperature affects how quickly corrosion protective development occurs. For instance, fast film development and effective corrosion protection may be anticipated within a few hours at a temperature of 27 °C. The maturation of the protection might take two to three months at 16 °C. Nevertheless, when protective layers accumulate over the course of years, corrosion rates typically decline to 0.02-0.002 mm/yr after a good surface coating has formed. These alloys are not sensitive to chloride stress corrosion and exhibit excellent resistance to chloride pitting and crevice corrosion.

Alloys of copper and silicon

Copper-silicon has a long history of usage in wooden sailing boats and maritime conditions as screws, nuts, bolts, washers, pins, lag bolts, and staples. In the alloys, copper, silicon, and manganese are often included. The use of silicon makes the metal stronger [11]–[13].

The same protective coatings that grow on the surface over time give copper-silicon alloys their corrosion resistance, much as with copper-nickel alloys. In calm conditions, general corrosion rates of 0.025-0.050mm have been seen. After prolonged exposures, this rate declines towards the lower end of the range. With silicon-bronzes, pitting is often nonexistent. Moreover, up to moderate flow rates, there is considerable resistance to erosion and corrosion. Rigid pens can be made out of copper-silicon since it can be welded. Moreover, aquaculture enclosures built of copper-silicon may be lower in weight and therefore a potentially less costly solution since welded copper-silicon mesh is lighter than copper-zinc chain link. Under the brand name Seawire, Luvata

III. CONCLUSION

Appleton, LLC is doing research and developing a range of copper alloy woven and welded meshes, including a copper silicon alloy that has applied for a patent. The company has created copper-silicon alloy meshes to cultivate a variety of marine species in test trials that are now through different levels of assessment. Cobia farming in Panama, lobster farming in Maine, USA, and crab farming in the Chesapeake Bay are a few examples. In order to research its material, the corporation collaborates with a number of colleges, including the University of Arizona for the study of shrimp, the University of New Hampshire for the study of cod, and Oregon State University for the study of oysters

REFERENCES

[1] C. Anastasaki, P. Orozco, and D. H. Gutmann, "RAS and beyond: the many faces of the neurofibromatosis type 1 protein," DMM Dis. Model. Mech., 2022, doi: 10.1242/dmm.049362.

[2] Z. Ślebioda, E. Szponar, and A. Kowalska, "Etiopathogenesis of recurrent aphthous stomatitis and the role of immunologic aspects: Literature review," Archivum Immunologiae et Therapiae Experimentalis. 2014. doi: 10.1007/s00005-013-0261-y.

[3] L. Ramalingam et al., "The renin angiotensin system, oxidative stress and mitochondrial function in obesity and insulin resistance," Biochimica et Biophysica Acta - Molecular Basis of Disease. 2017. doi: 10.1016/j.bbadis.2016.07.019.

[4] N. I. Marín-Ramos, S. Ortega-Gutiérrez, and M. L. López-Rodríguez, "Blocking Ras inhibition as an antitumor strategy," Seminars in Cancer Biology. 2019. doi: 10.1016/j.semcancer.2018.01.017.

[5] I. G. Rajapaksha, L. S. Gunarathne, P. W. Angus, and C. B. Herath, "Update on new aspects of the renin-angiotensin system in hepatic fibrosis and portal hypertension: Implications for novel therapeutic options," Journal of Clinical Medicine. 2021. doi: 10.3390/jcm10040702.

[6] L. van der Weyden and D. J. Adams, "The Ras-association domain family (RASSF) members and their role in human tumourigenesis," Biochimica et Biophysica Acta - Reviews on Cancer. 2007. doi: 10.1016/j.bbcan.2007.06.003.

[7] P. Mondragón-Terán, L. B. López-Hernández, J. Gutiérrez-Salinas, J. A. Suárez-Cuenca, R. I. Luna-Ceballos, and A. Erazo Valle-Solís, "Mecanismos de señalización intracelular en cáncer de tiroides," Cir. Cir., 2016, doi: 10.1016/j.circir.2016.05.017.

[8] S. Panizo et al., "Fibrosis in chronic kidney disease: Pathogenesis and consequences," International Journal of Molecular Sciences. 2021. doi: 10.3390/ijms22010408.

[9] N. S. Kalupahana and N. Moustaid-Moussa, "The renin-angiotensin system: A link between obesity, inflammation and insulin resistance," Obesity Reviews. 2012. doi: 10.1111/j.1467-789X.2011.00942.x.

[10] M. Pinter, W. J. Kwanten, and R. K. Jain, "Renin–angiotensin system inhibitors to mitigate cancer treatment–related adverse events," Clinical Cancer Research. 2018. doi: 10.1158/1078-0432.CCR-18-0236.

[11] [11] J. I. Shin, "Second-line Glucose-Lowering Therapy in Type 2 Diabetes Mellitus," Current Diabetes Reports. 2019. doi: 10.1007/s11892-019-1171-0.

[12] S. Pelusi et al., "Renin-angiotensin system inhibitors, type 2 diabetes and fibrosis progression: An observational study in patients with nonalcoholic fatty liver disease," PLoS One, 2016, doi: 10.1371/journal.pone.0163069.

[13] S. Peltonen, R. A. Kallionpää, and J. Peltonen, "Neurofibromatosis type 1 (NF1) gene: Beyond café au lait spots and dermal neurofibromas," Exp. Dermatol., 2017, doi: 10.1111/exd.13212

Fisheries: An Integrated Field

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Abstract— Fisheries are any area where fish and other marine creatures are raised for domestic or commercial purpose. Millions of people, particularly in the third world, depend on the fishing industry for their living. This chapter provides a comprehensive review of the topic, covering all the key facets of fisheries.

Index Terms— Agricultural Organization, Fish Managements, Fish Populations, Food Agriculture, Population Dynamics

I. INTRODUCTION

A fishery is often defined as a business that raises or harvests fish and is recognised as such by a fisheries authority. The FAO states that the "people participating, species or type of fish, area of water or seabed, technique of fishing, class of boats, purpose of the activities, or a combination of the preceding factors" are commonly used to describe a fishery. The concept often refers to a combination of fish and fishermen in a location, the latter of whom fish for comparable species using comparable kinds of gear [1]–[3].

A fishery may entail the capturing of wild fish or the rearing of fish in an aquaculture or fish farming setting. More than 500 million people in developing nations rely on fisheries and aquaculture for their livelihood, either directly or indirectly. Fish populations and employment are declining due to overfishing, which is capturing fish beyond levels that are sustainable, in many parts of the globe. According to a report released in July 2014 by Prince Charles' International Sustainability Unit, the Environmental Defense Fund in New York, and 50in10, fisheries contribute $270 billion annually to the world economy. However, if sustainable fishing practises are fully implemented, that amount could increase by as much as $50 billion.

The word "fish" is most strictly used in biology to refer to any animal having a backbone, gills throughout its whole existence, and fin-shaped limbs, if any. The term "fish" is often used to refer to aquatic animals that are not really fish in the strictest sense; examples include shellfish, cuttlefish, starfish, crayfish, and jellyfish. Even early scientists could not distinguish between different species; in the sixteenth century, natural historians labelled fish as beings like seals, whales, amphibians, crocodiles, and even hippopotamuses. In fisheries, the word "fish" is used to refer to all harvested aquatic animals, including mollusks, crustaceans, and fish.

Real fish are often defined as fish that fit the above precise biological definition of a fish. To differentiate them from other aquatic species taken in fisheries or aquaculture, true fish are often referred to as finfish or fin fish. Fisheries are taken because they are valuable. They may be wild or domesticated, freshwater or saltwater. Examples include the salmon fisheries in Alaska, the cod fisheries off the Lofoten Islands, the Eastern Pacific tuna fisheries, and the Chinese shrimp farm fisheries. The three main categories of capture fisheries are industrial, small-scale or artisanal, and recreational.

In contrast to inland waters, about 90% of the world's fishing captures occur in oceans and seas. Since the middle of the 1990s, these marine catches have been mostly steady. By the shore is where most marine fisheries are located. This is owing to the fact that fish are considerably more plentiful close to the coastal shelf due to the number of nutrients that are accessible there from coastal upwelling and land runoff, in addition to the fact that harvesting from relatively shallow waters is simpler than in the open ocean. Nonetheless, there are also profitable wild fisheries in open waters, notably around seamounts, as well as in interior lakes and rivers.

Most fisheries are wild fisheries, however there are more and more farmed fisheries. Farming may take place in coastal locations, like in oyster farms, but it usually takes place inland in enclosures like lakes, ponds, and tanks. For finfish, mollusks, crustaceans, echinoderms, and therefore aquatic plants like kelp, there are species fisheries all over the globe. The majority of the world's fisheries are, however, supported by a relatively limited number of species. Herring, cod, anchovies, tuna, flounder, mullet, squid, shrimp, salmon, crab, lobster, oysters, and scallops are a few of these species. With the exception of these latter four, all contributed to a global catch of well over a million tonnes in 1999; herring and sardines produced a harvest of more than 22 million metric tonnes in that year. Smaller quantities of several additional species are gathered.

The academic field of fisheries science focuses on managing and comprehending fisheries. It is a multi-disciplinary science that makes use of freshwater biology, marine biology, oceanography, limnology, ecology, population dynamics, economics, and management in an effort to provide a comprehensive picture of fisheries. Like in the situations of bioeconomics and fisheries law, in certain instances new fields have evolved. In a university context, fisheries science is often taught, and it might be the subject of a bachelor's, master's, or doctoral degree. Fisheries science programmes with a complete integration are offered by several institutions.

Fisheries Analysis

Platforms that can pull various fishing net types, gather plankton or water samples from a variety of depths, and transport acoustic fish-finding equipment are necessary for fisheries research vessels. Often, huge fishing boats are used to designate room for labs and equipment storage instead of holding the catch. Fisheries research vessels are constructed in a similar manner.

Notable Participants

The individuals in this list satisfy one or more of the following requirements: 1) Creator of highly References: peer-reviewed fisheries publications; 2) Creator of significant fisheries References: work; 3) Creator of significant fisheries magazine, museum, or other relevant organisation. 4) A renowned individual who has also contributed to the field of fisheries research.

In order to identify measures to conserve fishery resources so that sustainable exploitation is feasible, fisheries management makes use of fisheries science. Contemporary fisheries management is sometimes described as a governmental system of suitable management rules based on specified goals and a variety of management tools to carry out the rules.

There are "no clear and widely recognised definitions of fisheries management," according to the Food and Agricultural Organization of the United Nations. The working definition, on the other hand, that the FAO uses and that is frequently cited elsewhere is: The integrated process of information gathering, analysis, planning, consultation, decision-making, resource allocation, and formulation and implementation, with enforcement as necessary, of regulations or rules that govern fisheries activities in order to ensure the continued productivity of the resources and the achievement of other fisheries objectives [4]–[7].

History

In certain regions, fisheries have been expressly regulated for hundreds of years. More than 80% of the fish and shellfish consumed commercially across the globe come from populations that are found naturally in freshwater and saltwater environments. For instance, the Mori people, who have lived in New Zealand for nearly 700 years, had rules about only taking what could be eaten and about returning the first fish that was caught as a sacrifice to the sea deity Tangaroa. There have been efforts to control fishing in the North Norwegian fisheries since the 18th century. Due to this, a legislation governing the Lofoten fisheries was passed in 1816, partially establishing what are now known as territorial use rights. "The fishing banks were split into fields where the boats were permitted to fish and then further divided into regions belonging to the closest fishing station on land. Local governing bodies, often led by the owner of the onshore facilities that the fishermen had to pay for lodging and fish drying, were in charge of allocating the fishing grounds.

A relatively new concept, government resource protection-based fisheries management was developed for North European fisheries after the first Overfishing Conference, which took place in London in 1936. A groundbreaking study on the dynamics of North Sea commercial fishing was published in 1957 by British fisheries specialists Ray Beverton and Sidney Holt. The work was the theoretical foundation for North European management plans in the 1960s.

In a 1992 article delivered at the inaugural World Fisheries Congress in Athens, Beverton, who had spent some time away from the subject of fisheries management, critiqued his previous work. His concerns were addressed in "The Dynamics of Exploited Fish Populations," highlighting how his and Sidney Holt's research had been misapplied and abused by fisheries scientists and managers during the past 30 years. Yet, the institutional groundwork for contemporary fisheries management had been established.

According to a report released in July 2014 by the International Sustainability Unit of Prince Charles, the Environmental Defense Fund in New York, and 50in10, fisheries contribute $270 billion annually to the world economy. However, if sustainable fishing practises are fully implemented, that amount could increase by as much as $50 billion.

Politics-related goals

The management of fisheries, according to the FAO, should be expressly based on political goals, especially with transparent priorities. When using a fish resource, typical political goals include:

1. Increase sustainable economic output
2. maintain and grow employment
3. maintain and grow food supply and protein production
4. raise export revenue
5. maximizing sustainable biomass output

These political aims may also be a weak point in fisheries management since they may conflict with one another. Fishing goals must be spelled out in specific management guidelines. The majority of nations should model their fisheries management laws on the worldwide, but non-binding, Code of Conduct for Responsible Fisheries that was adopted at a U.N. Food and Agricultural Organization FAO conference in 1995. The cautious approach it recommends is often put into practise in the form of specific management guidelines, such as minimum spawning biomass requirements and maximum fishing death rates. The performance of the main fishing countries of the globe in comparison to the Code was thoroughly assessed in 2005 by the UBC Fisheries Institute at the University of British Columbia. Fisheries in foreign seas must be governed by international agreements. Three conferences on the law of the sea were held in an effort to reach consensus on these and other marine concerns, and as a result, the United Nations Convention on the Law of the Sea treaty was signed. Exclusive economic zones, which stretch 200 nautical miles

from a country's shores, provide specific sovereign rights and duties to particular nations for resource management.

Further international collaboration is required in other circumstances. For example, EEZs of 200 nautical miles are irrelevant in the Mediterranean Sea and other comparably narrow bodies of water. Explicit agreements are needed for international seas that are more than 12 nautical miles from the coast. Fish populations that cross more than one EEZ and move across them provide additional difficulties. Here, the neighbouring coastal nations and fishing organisations must agree on the sovereign obligation. Often, a regional organisation established to coordinate the administration of such stock is used to do this. The management of fisheries restricted to solely international seas is not specifically outlined under UNCLOS. A few of recent fisheries, such high seas bottom trawling fisheries, are still not entirely subject to international agreement. The UN General Assembly passed a resolution on fisheries in November 2004 to provide the groundwork for future advancements in international fisheries management legislation.

Management Procedures

Numerous nations have established departments or ministries with names like "Minister of Fisheries" or something similar to manage various elements of fishing in their exclusive economic zones.

Four divisions

Limiting the average potential catch of a vessel in the fleet; banning bait; snagging; placing limits on fish traps; limiting the number of poles or lines per fisherman; limiting the number of concurrent fishing vessels; restricting the average time at sea; and prohibiting the use of fish traps.

Catch Limits

Individual Transferable Quota systems, often known as individual fishing quotas, set a cap on the overall catch and divide it among the fishermen who participate in that fishery. Shares may be bought, sold, or traded at Fisher's discretion. Strong evidence supporting the use of ITQs in preventing fishery collapse and even restoring fisheries that look to be in decline came from a large-scale research conducted in 2008. Several research have demonstrated that ITQs have detrimental socioeconomic effects, particularly on small-scale fisheries. These negative implications include the concentration of fishing quota in the hands of a small number of fishermen, a rise in the number of idle fishermen who lease their quotas to others, and a negative impact on coastal communities.

Safety First Principle

The precautionary strategy or concept should be used when "ecosystem resilience and human influence are difficult to foresee and hard to discern from natural changes," according to the Fisheries Manager's Handbook published in 2009 by the FAO of the United Nations. According to the precautionary principle, when a course of action poses a danger of damage, it should be postponed until its safety can be shown by scientific research. This idea has historically been used the opposite way around by fisheries management, who have not restricted fishing operations until it has been shown that they have already harmed existing ecosystems. Shertzer and Prager stated that if management is tougher and more immediate, there may be considerable gains to stock biomass and fisheries production.

Fishing Law

A new and specialized branch of law called "fisheries law" studies and analyses various fisheries management strategies, such as seafood safety laws and aquaculture laws. Despite its significance, there is a lack of advocacy and study in this subject since it is seldom taught in law schools all around the globe.

Changing Climate

In the past, inland and offshore fisheries have been impacted by changing climate, and similar changes are expected to continue. The hydrologic cycle changes, shifts in nutrient fluxes, and displacement of spawning and nursery habitat are among the particular driving forces behind climate change from the standpoint of fisheries. Moreover, adjustments to these variables would have an impact on resources across the board in a biological system, including at the genetic, organismal, population, and ecosystem levels.

Community Dynamics

Population dynamics is the study of how migration, birth, and death affect the growth and fall of a particular fishing population through time. Understanding shifting fishing patterns and problems like habitat degradation, predation, and ideal harvesting rates are based on this knowledge. Fisheries scientists have historically utilised the population dynamics of fisheries to estimate sustainable yields [8]–[10].

Applying population dynamics to actual fisheries requires caution. The decline of important populations has historically been sped up by too simplistic modelling, which ignores factors like fish size, age, and reproductive state, concentrates only on one species, ignores bycatch, and does actual harm to the environment. "Everyone would like to see the rebuilding of fish stocks and this can only be achieved if we understand all of the influences, human and natural, on fish dynamics," writes marine ecologist Chris Frid, citing the fishing industry's blame for the unprecedentedly low fish stocks in recent years on pollution and global warming. Moreover, overfishing has an impact. According to Frid, "Fish communities may be changed in a variety of ways. For instance, they might shrink if a species' smaller members are targeted since this alters the dynamics between predators and prey. Nevertheless, pollution is another factor that has contributed to changes in marine life in addition to fishing. Each component of the ecosystem reacts uniquely to each individual input, and no factor functions in isolation.

The ecosystem-based approach is structured in terms of ecosystem services, in contrast to the conventional method, which concentrates on a single species. In certain areas, ecosystem-based fishing principles have been put into practise. A group of scientists issued the 10 commandments below in 2007. Sustain an "old growth" structure in fish populations, since huge, elderly, and fat female fish have been demonstrated to be the greatest spawners but are also vulnerable to overfishing, and have an overall, risk-averse, and adaptable attitude.

1. Define and preserve the fish populations' natural spatial organisation such that management limits correspond to those found in the sea.

2. To ensure that fish have food and shelter, keep an eye on and manage the habitats on the seabed.

3. Maintain robust ecosystems that can sustain sporadic shocks.

4. Recognize and uphold important food-web links, such as predators and forage species.

5. Adapt to ecosystem changes throughout time, particularly those brought on by a changing climate, both in the near term and over longer cycles of decades or centuries.

Include human behaviour and the social and economic institutions that support it into all ecological calculations in order to take fishing, which tends to eliminate bigger, older fish, into account.

Older Mother Fish

By removing older, slower-growing fish, traditional management techniques hope to make space and resources available for younger, faster-growing fish. The majority of marine fish lay enormous amounts of eggs. It was anticipated that younger spawners would generate a large number of healthy larvae. Yet, a 2005 study on rockfish demonstrates that huge, older females are significantly more crucial to sustaining viable fisheries than younger fish. Compared to the offspring of younger fish, the larvae generated by these older mother fish develop quicker, resist famine better, and are significantly more likely to survive. The sudden collapse of certain important US West Coast fisheries may be explained in part by a failure to take older fish into consideration. Some equities' recovery is anticipated to take decades. Establishing marine reserves, where fishing is prohibited and fish populations are allowed to mature normally, is one strategy to stop these collapses.

Milo Adkison, a fisheries scientist, claims that the lack of high-quality data is the main obstacle to effective fisheries management decisions. Decisions about fisheries management are often based on population models, but for the models to work, good data is required. He claims that with more straightforward models and better data, scientists and fisheries managers would be better off. The FAO Fisheries Department is the most dependable source for summaries of data.

Ecopath

A software package for modelling ecosystems is called Ecopath with Echoism. The University of British Columbia's UBC Fisheries Centre played a major role in its development after it began as a NOAA programme under the direction of Jeffrey Polovina. It was listed as one of the top 10 scientific breakthroughs in the 200-year history of NOAA in 2007. Ecopath "revolutionised scientists' capacity to comprehend complicated marine ecosystems on a global scale," according to the reference. Villy Christensen, Carl Walters, Daniel Pauly, and other fisheries experts spent two decades developing this. There are 6000 registered users in 155 countries as of 2010. As a tool for modelling and visualising the intricate interactions that occur in actual marine ecosystems, Ecopath is often utilised in fisheries management.

Human variables

Fish are not the focus of fisheries management; rather, it is the management of people and enterprises. By controlling human behaviour, fish populations are regulated. The emotions of fishermen, for example, are crucial human variables that must be understood if fisheries management is to be successful. The effects on stakeholders must be taken into account while developing management rules. Much like farmers, commercial fishermen depend on their catches to support their families. A traditional trade handed down from generation to generation might be commercial fishing. Regulation changes may have an influence on the economics of a whole town since most commercial fishing is located in communities formed around the fishing industry. Reductions in harvest limits may make it more difficult for fishermen to compete with the travel and tourism sector.

Performance

Global fish populations' biomass has been allowed to decline. The number of fish that might be harvested responsibly is no longer conceivable due to the biomass's current decline. The world's fishing fleets suffer a "$US 50 billion yearly economic loss" as a result of low stocks and subpar fisheries management, according a 2008 UN research titled The Sunken Billions: The Economic Case for Fisheries Reform. According to the assessment, which was created in collaboration with the UN Food and Agricultural Organization, half of the world's fishing fleet could be destroyed without affecting catch.

"Through enhancing marine fisheries governance, society may recover a substantial portion of this $50 billion yearly economic loss. The fishing industry might support economic growth and the development of alternative livelihoods in many nations with thorough reform. In addition, the detrimental effects of fishing on the marine environment may be significantly decreased while a country's natural capital, represented by its fish populations, could be greatly expanded.

The circumstances that led to the collapse of the northern cod fishery may have been the most notable failure of

fisheries management in recent memory. A series of journalism investigations titled looting the oceans was recently created by the International Consortium of Investigative Journalists. They go into depth into investigations into the overfishing of Chilean jack mackerel, the subsidies supporting the Spanish fishing sector, and the black market for bluefin tuna. Fisheries are now divided into sustainable and wild fisheries as a result of worries about climate change and the spread of biodiversity. The chapter carefully examines and includes the main elements and fundamental ideas of fisheries, giving the reader a thorough understanding.

According to common wisdom, a sustainable fishery is one where fish are collected at a pace that prevents the population of fish from declining over time due to fishing methods. The concept of sustainability in fisheries integrates theoretical fields, such as population dynamics of fisheries, with practical approaches, such as avoiding overfishing through methods like individual fishing quotas, reducing destructive and illegal fishing practises by advocating for appropriate law and policy, creating protected areas, reviving collapsed fisheries, and accounting for all externalities associated with harvesting marine ecosystems in fishery economics.

The loss of a significant amount of potential yield due to heavy fishing pressures, such as overexploitation and growth or recruitment overfishing, stock structure eroding to the point where it loses diversity and resilience to environmental fluctuations, ecosystems and their economic infrastructures cycling between collapse and recovery, each cycle being less fruitful than the one before it, and c . According to Daniel Pauly and David Preikshot, "Sustainable management of fisheries cannot be accomplished without an acknowledgment that the long-term aims of fisheries management are the same as those of environmental protection." World wild fisheries are thought to have peaked and started to decline, and important ecosystems like estuaries and coral reefs are in grave danger. Since farmed piscivores are fed items from wild fish, such as forage fish, aquaculture or farming of piscivores, such as salmon, does not yet alleviate the issue. Salmon aquaculture has detrimental effects on wild salmon as well. Higher trophic level fish are less effective suppliers of food and energy.

Ecosystems related to fishing are a significant part of the larger maritime environment. The opinions of marine conservationists and fisheries experts about creative strategies for sustainable fishing are documented in this article. Senegalese environmentalist Baba Dioum once said, "In the end, we will save only what we love, what we understand, and what we are taught." Thomas Huxley said that overfishing or "permanent depletion" was scientifically improbable and that "all the big marine fisheries are probably inexhaustible" in his opening speech at the International Fisheries Exhibition in London in 1883. Indeed, marine fisheries had already started to collapse by 1883. To determine why New England's fisheries were failing, the

United States Fish Commission was founded 12 years earlier. The Atlantic halibut fishery had already failed when Huxley gave his speech.

Because of its "nar- row focus on target populations and the corresponding failure to account for ecosystem effects leading to declines in species abundance and diversity" and because it views the fishing industry as "the sole legitimate user, in effect the owner, of marine living resources," traditional fisheries management and the science that underpins it have been distorted. In the past, scientists who conducted stock assessments often worked in government labs and saw their job as offering services to the fishing sector. These scientists dissociated themselves from the scientists and the science that highlighted the conservation problems and disregarded them. Even though commercial fish populations were declining and several nations had ratified legally binding conservation accords, this still occurred. Since growth always depletes and damages the environment, the idea of sustainable development is frequently seen as an impossibly idealistic or even nonsensical concept.

II. DISCUSSION

University of Washington researcher Ray Hilborn specifies three approaches to define a sustainable fishery. Long-term constant yield is the theory that nature develops a steady state that changes little over time when left alone. When done correctly, fishing at the maximum sustainable yield permits nature to reach a new steady state without jeopardising subsequent harvests. While this method fails since consistency is not a characteristic of marine ecosystems, this viewpoint is unsophisticated. Natural variations in stock abundance alter the prospective yield over both short and long time horizons.

Maintaining intergenerational fairness recognises natural oscillations and only views actions that harm the genetic make-up of an organism, destroy habitat, or decrease stock levels to the point that rebuilding takes more than one generation as unsustainable. Overfishing may be economically unwise, but it is not unsustainable if rebuilding takes just one generation. This description is well recognised. The health of the human ecology and the marine environment are both taken into account while maintaining a biological, social, and economic system. As long as the ecosystem maintains its inherent integrity, a fishery that alternates between different species may deplete individual stocks while still being sustainable. Such a definition may include fishing methods that are sustainable yet reduce the population of certain species and may even cause their extinction.

Social Responsibilty

Almost 500 million people, especially in poor nations, rely on fishing and aquaculture as a source of income, either directly or indirectly. Biodiversity and social sustainability may not be compatible. If the environment of the fishery can

continue to provide goods that society can consume, the fishery is socially sustainable. As long as the supply of these items continues, significant species transitions within the ecosystem could be tolerable. Throughout the beginning of time, humans have operated under such regimes, altering several ecosystems and causing the extinction of numerous species.

Sustainability is similar to beautiful art in that it is difficult to express but is obvious when it is there. According to Hilborn, "sustainable harvests are not incompatible with the extinction of certain species or, indeed, the alteration of the ecosystem." For instance, barndoor skates have been collected as bycatch in the western Atlantic in recent years. Their population has drastically decreased, and if current capture rates continue, they will likely go extinct. There may still be viable commercial fishing of other species even if the barndoor skate becomes extinct, altering the environment. When asked how fisheries science and conservation biology could reconcile, Daniel Pauly responded, "By accepting each other's essentials: that fishing should remain a viable occupation; and that aquatic eco-systems and their biodiversity are allowed to persist." This was said at the Fourth World Fisheries Congress in 2004.

Management objectives may take into account how salmon affect bear and river ecosystems. Relationship farming is a relatively recent idea. This is a method of running farms such that they may rebuild the local food chain. The farm may autonomously filter contaminants from feed water and air, feed its own food chain, and provide high net yields for harvesting as a consequence of re-establishing a healthy food chain. The large cattle ranch Veta La Palma in southern Spain serves as an example. Joel Salatin established the first relationship farm, a 220 acre operation that was extensively featured in Michael Pollan's book The Omnivore's Dilemma and the documentaries Food, Inc. and Fresh. Building a strong food chain and then letting it do the job is the fundamental idea behind relationship farming.

Heavy bottom trawls have frequently been pulled across substantial portions of the worldwide continental shelf, depicted in cyan. It is possible to endure overfishing. Overfishing, in Hilborn's words, may be "a misallocation of societies' resources," but it is not always a danger to sustainability or conservation.

Traditional definitions of overfishing include taking so many fish that the yield is lower than it would be with fishing restrictions. As an example, Pacific salmon are often managed by attempting to estimate the number of spawning salmon, or "escapement," that are required each generation to yield the greatest harvestable excess. The escapement required to get that excess is the ideal one. When the escapement is less than half the ideal, typical fishing seems to be overfishing.

Changing Climate

Aquatic habitats are undergoing profound change as a result of rising ocean temperatures and ocean acidification.

The productivity of marine and freshwater species is changing due to climate change, which also affects fish dispersion. This lowers the sustainable catch levels in many ecosystems, puts strain on the aquaculture resources, the populations dependent on the fisheries, and hinders the oceans' capacity to sequester and store carbon. Although inland fisheries and aquaculture are impacted by shifting rainfall patterns and water usage, sea level rise puts coastal fishing communities at danger. Ocean pollution According to a recent study on the state of the world's oceans, human civilization has affected every ocean region, and 41 percent of it has been contaminated by overfishing, human-polluted runoff, and other wrongdoings. Since pollution causes are so numerous and ingrained in the economic systems we rely on, pollution is difficult to eliminate.

The effects of stressors including climate change, pollution, foreign species, and over-exploitation of resources on the seas have been tracked by the United Nations Environment Programme. According to the analysis, at least 75% of the most important fishing areas worldwide might be impacted. The input of water from a lake's drainage basin is essential. Its inflow has drastically decreased in certain regions due to intensive irrigation, which has led to water depletion and lake shrinkage. The Aral Sea, once one of the four biggest lakes in the world but now just a fraction of its previous surface size, is the most noteworthy example [11]–[13].

III. CONCLUSION

To ensure sustainable exploitation, fisheries management makes use of fisheries science. A monitoring, control, and surveillance system is used to enact required regulations based on specific goals and a variety of management strategies in modern fisheries management. Ideas and guidelines Paul Romer, an economist, thinks that technology paired with the appropriate policies might lead to sustained growth rather than just lecturing fishermen. There has been no shortage of creative approaches to fish harvesting. He defines failures as mostly occurring when necessary rules are not followed.

1. Subsidies for fishing: Much of the world's fisheries are influenced by government subsidies. European and Asian fishing fleets are able to fish in far-off seas, such West Africa, because to operating cost subsidies. Several scientists support global incentive reform to assist failing fisheries in recovering and oppose fishing subsidies.

2. Economics: Conservationists also work to reduce harmful human activities by enhancing the market structure of fisheries via strategies like salable fishing limits, such as those established by the Northwest Atlantic Fisheries Organization, or legislation, such as those mentioned below.

3. Payment for Ecosystem Services: According to environmental economist Essam Y. Mohammed, direct economic incentives that allow people to be compensated for the ecosystem services their property provides will help

establish sustainable fisheries all over the world and encourage conservation where it would not otherwise.

4. Certification for sustainable fisheries: The independent certification schemes for sustainable fishing run by groups like the Marine Steward- ship Council and Friend of the Sea represent a promising approach. These initiatives aim to increase consumer knowledge and understanding of the types of seafood they

REFERENCES

[1] P. Haapasaari et al., "Integrated governance for managing multidimensional problems: Potentials, challenges, and arrangements," Mar. Policy, 2021, doi: 10.1016/j.marpol.2020.104276.

[2] A. B. Gill, S. Degraer, A. Lipsky, N. Mavraki, E. Methratta, and R. Brabant, "Setting the context for offshore wind development effects on fish and fisheries," Oceanography, 2020, doi: 10.5670/oceanog.2020.411.

[3] D. E. Lane and R. L. Stephenson, "A framework for risk analysis in fisheries decision-making," ICES J. Mar. Sci., 1998, doi: 10.1006/jmsc.1997.0237.

[4] S. D. Gaines, S. E. Lester, K. Grorud-Colvert, C. Costello, and R. Pollnac, "Evolving science of marine reserves: New developments and emerging research frontiers," Proceedings of the National Academy of Sciences of the United States of America. 2010. doi: 10.1073/pnas.1002098107.

[5] A. M. Wieczorek et al., "Behavioural economics in fisheries: A systematic review protocol," PLoS ONE. 2021. doi: 10.1371/journal.pone.0255333.

[6] A. Kadfak and S. Linke, "Labour implications of the EU's illegal, unreported and unregulated (IUU) policy in Thailand," Mar. Policy, 2021, doi: 10.1016/j.marpol.2021.104445.

[7] D. K. Moutopoulos, O. Petriki, A. Ramfos, M. T. Stoumboudi, K. I. Stergiou, and D. C. Bobori, "Portraying fisheries and ecological status of a mediterranean lake," Acta Ichthyol. Piscat., 2020, doi: 10.3750/AIEP/02773.

[8] M. C. Rufener, K. Kristensen, J. R. Nielsen, and F. Bastardie, "Bridging the gap between commercial fisheries and survey data to model the spatiotemporal dynamics of marine species," Ecol. Appl., 2021, doi: 10.1002/eap.2453.

[9] W. A. Teniwut, C. L. Hasyim, and D. Arifin, "A Web-based DSS: Information System for Sustainable Fisheries Supply Chain in Coastal Communities of Small Islands Indonesia," Int. J. Adv. Sci. Eng. Inf. Technol., 2021, doi: 10.18517/ijaseit.11.3.12462.

[10] W. A. Teniwut, S. K. Hamid, and M. M. Makailipessy, "Selecting top fisheries sub-sector in each sub-district for sustainable development of archipelagic region in Indonesia: A hybrid fuzzy-MCDM approach," Decis. Sci. Lett., 2019, doi: 10.5267/j.dsl.2019.6.001.

[11] N. Tsolakis, D. Niedenzu, M. Simonetto, M. Dora, and M. Kumar, "Supply network design to address United Nations Sustainable Development Goals: A case study of blockchain implementation in Thai fish industry," J. Bus. Res., 2021, doi: 10.1016/j.jbusres.2020.08.003.

[12] E. Ghorbanian and M. Zibaei, "Assessment of sustainability indicators for Iranian fisheries management (case study of Persian Gulf)," Environ. Dev. Sustain., 2020, doi: 10.1007/s10668-019-00561-8.

[13] M. Hidalgo, D. M. Kaplan, L. A. Kerr, J. R. Watson, C. B. Paris, and H. I. Browman, "Advancing the link between ocean connectivity, ecological function and management challenges," ICES J. Mar. Sci., 2017, doi: 10.1093/icesjms/fsx112..

Ecosystem Based Fisheries

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Abstract— "We suggest that the objective of fishery management should be the restoration of ecosystems, not sustainability per se. Sustainability is a false objective since fishing by humans causes ecosystems to gradually become simpler in favour of smaller, higher turnover, lower trophic level fish species that are able to survive disturbance and habitat destruction.

Index Terms— Coral Reefs, Fish Species, Fisheries Managements, Fish Population, Wild Fisheries

I. INTRODUCTION

Chris Frid, a marine scientist, claims that the fishing industry blames global warming and marine pollution for the recent, historic decreases in fish populations. Frid disagrees, arguing that overfishing has also changed how the ecology functions. Everyone wants to see fish populations rebuilt, but we can't do that until we comprehend all of the environmental and human variables that affect fish dynamics. He continues, "Fish communities may be changed in a variety of ways, for instance, they might shrink if specific-sized individuals of a species are targeted, since this impacts predator and prey dynamics. Pollution is another example of how changes to marine life are caused by factors other than fishing. The ecosystem's components react differently to each individual aspect, and no one factor acts in isolation [1]–[3].

Why Preserve a structure of "old growth" in fish populations because large, aged, and fat female fish have been shown to be the greatest spawners but are also vulnerable to overfishing.

1. Define and preserve the geographic composition of fish populations in their natural state such that management limits are consistent with those found in the sea.

2. To ensure that fish have access to food and shelter, monitor and manage the habitats on the seabed.

3. Continue to support robust ecosystems that can tolerate sporadic shocks.

4. Recognize and preserve important links in the food chain, such as those caused by predators and forage species.

5. Adapt to ecosystem changes throughout time, both on a short-term basis and on longer cycles lasting decades or centuries, including changes in the world's climate.

6. Take into account how fishing, which tends to eliminate big, older fish, has altered evolution.

7. Take human behaviour, as well as their social and economic systems, into account in all ecological equations. Protected marine environments

Marine conservation approaches and strategies sometimes mix academic fields like population biology with do-it-yourself conservation tactics like creating protected places like Marine Protected Areas or Voluntary Marine Conservation Areas. While each country defines MPAs differently, they all often feature more protection for the region from fishing and other hazards.

Oceans do not have a uniform distribution of marine life. The majority of the truly valuable ecosystems are found in relatively shallow coastal waters above or close to the continental shelf, where the sunlit waters are frequently nutrient-rich due to runoff from the land or upwellings at the continental edge, allowing photosynthesis, which feeds the lowest trophic levels. The United States expanded its authority from 12 miles from the shore to 200 miles in the 1970s, mostly for reasons related to oil drilling rather than fishing. Large shelf regions became a part of its domain as a result. Several countries thereafter adopted the practise of expanding national jurisdiction into what is now known as the exclusive economic zone. This decision has important ramifications for fisheries conservation since it places the majority of the most productive marine ecosystems within national authority, which makes it possible to adopt legislation safeguarding these habitats [4]–[6].

Marine protected zones are described as "a conservation tool of revolutionary importance that is being adopted into the fisheries mainstream" by Daniel Pauly. The Pew Charitable Trusts have supported a number of programmes to support the creation of MPAs and other ocean conservation measures.

There are worries that farmed fish won't be able to provide essential yields effectively. For instance, three pounds of wild fish must be consumed before one pound of farmed salmon can be produced.

Norms and Agreements

The 1966 Convention on Fisheries and Conservation of Living Resources of the High Seas is only one of the international statutes and agreements that deal with marine conservation. The Marine Mammal Protection Act of 1972, the Marine Protection, Research and Sanctuaries Act of 1972, which created the National Marine Sanctuaries programme, and the Magnuson-Stevens Fisheries Conservation and Management Act are among the laws pertaining to marine conservation in the United States.

Sensitization efforts

The public is educated, stakeholders are informed, and

conservation legislation and policy are lobbied for by a number of groups. On the list are the International Council for the Exploration of the Sea, Langkawi Declaration, Oceana, PROFISH, and the Sea Around Us Project, Marine Conservation Biology Institute and Blue Frontier Campaign in the United States, The Society for Environmental Exploration and Marine Conservation Society and Australian Marine Conservation Society, World Forum of Fish Harvesters and Fish Workers, Fr.

Target 7 of the Millennium Development Goals, or objective 2, states that we must "limit biodiversity loss, achieving, by 2010, a considerable decrease in the pace of loss," which includes better fisheries management to slow the depletion of fish stocks.

The Marine Stewardship Council and Friend of the Sea are two organisations that certify members of the fishing industry for ethical or sustainable practises.

Those in the public who eat sustainably may get help from other groups. Callum Roberts, a marine conservation scientist, suggests that there are four considerations when selecting seafood:

1. Is the species in danger where the animals were collected in the wild?

2. Does fishing for the species harm marine environments?

3. Are significant amounts of bycatch collected together with the target species?

4. Do the fisheries have a problem with discards, which are often captured but not sold undersized animals?

5. The following organisations provide links to wallet-sized cards with excellent and terrible options for download:

6. United States: Monterey Bay Aquarium Seafood Watch

7. Blue Ocean Institute, United States

8. Marine Conservation Society, United Kingdom

9. Australian Marine Conservation Society; Southern African Sustainable Seafood Initiative

Problems with Data Data Validity

Lack of data is one of the main barriers to the sensible management of marine resources. Poor data is the main constraint on fisheries management choices, according to fisheries expert Milo Adison. Population models are often used to inform choices about fisheries management, however for the models to be accurate, quality data is required. With less complicated models and better data, scientists and fisheries managers would benefit more.

The phrase was originally used in a work titled "Anecdotes and the Shifting Baseline Syndrome of Fisheries" by fisheries expert Daniel Pauly. When it comes to fisheries management, Pauly coined the phrase because occasionally fisheries experts are unable to determine the proper "baseline" population size and must instead operate with a shifting baseline. He shows how specialists judged fisheries that had been drastically reduced using the condition of the fishery at the beginning of their careers rather than the fishery in its unspoiled form. The level of decades ago is regarded as the proper reference point for present populations even if areas that were swarming with a particular species hundreds of years ago may have endured long-term decline. Hence, significant reductions in ecosystems or species over extended periods of time were and are being concealed. As each generation redefines what is "natural," the impression of change is lost.

Ocean Plundering

The International Consortium of Investigative Journalists has adopted the phrase "looting the seas" to describe a number of journalistic inquiries into issues that have a direct impact on the sustainability of fisheries. They have looked into three cases of carelessness, fraud, and overfishing so far:

Bluefin tuna in the illegal market

The overfishing of southern jack mackerel and subsidies supporting Spanish fishing industries A fishery is a location where a fish or aquatic population is present and is used for commercial purposes. Both freshwater and marine fisheries exist. They may be raised in the wild or in farms.

Sometimes referred to as catch fisheries, wild fisheries. The aquatic life they sustain must be "caught" or fished since it is not meaningfully under human control. Wild fisheries are mostly found in the seas, especially around the coastlines and continental shelves. Lakes and rivers also contain them. Pollution and overfishing are problems with wild fisheries. Because of pollution and exploitation, significant natural fisheries have failed or are in risk of doing so. Globally, the output of wild fisheries has stabilised and may perhaps be beginning to fall.

Farmed fisheries, as opposed to wild fisheries, may function in protected coastal waters, rivers, lakes, and ponds, as well as in confined bodies of water like tanks. Aquaculture innovations are crucial to the technical aspect of farmed fisheries. Fish farms are growing, and Chinese aquaculture in particular is advancing significantly. Yet, wild fisheries continue to provide the bulk of the fish that people eat. The sole substantial source of wild food for humans as of the early 21st century is fish.

During interglacial eras, such as the present epoch, relatively shallow oceans and gulfs cover the expanded perimeters of each continent and its accompanying coastal plain.

The shelf often terminates at a slope-decreasing point. The continental slope is found below the break. The rise of the continent lies below the slope, merging into the abyssal plain, the deep ocean bottom. The continental margin includes the slope and the continental shelf. Continental shelves may be teeming with life since they are shallow. Fishing banks are the continental shelf's shallowest areas. The plankton, which fish consume, thrives when sunlight reaches the ocean bottom.

Contiguous Shelves: Information

The shelf break, where the continental slope starts,

drastically alters the shelf's characteristics. The shelf break is situated at a very constant depth of around 140 m, which is probably a remnant of earlier ice ages when sea level was lower than it is now.

The breadth of the continental shelf varies greatly; it is normal for a region to have almost no shelf at all, especially when the front edge of an advancing oceanic plate subducts under continental crust in an offshore subduction zone, such as off the coast of Chile or the west coast of Sumatra. The Siberian Shelf in the Arctic Ocean, which is the biggest shelf, has a breadth of 1500 kilometres. The Sunda Shelf, which connects Borneo, Sumatra, and Java to the Asian mainland, is another sizable portion of the continental shelf over which the South China Sea is located.

The North Sea and the Persian Gulf are two other well-known bodies of water that exist above continental shelves. Continental shelves typically measure around 80 kilometres wide. While it might vary, the shelf's depth is typically confined to water that is less than 150 metres. The continental shelves are teeming with life as opposed to the biotic desert of the ocean's abyssal plain because of the sunlight that is accessible in shallow waters.

Coral reefs are aragonite formations made by living creatures that can only be found in shallow tropical marine waters with very little nutrients. The development of algae is aided by high nutrient levels, such as those present in runoff from agricultural regions, which may damage the reef. Reefs only develop in a zone that stretches at most from 30°N to 30°S of the equator, despite the fact that corals may be found in both temperate and tropical environments.

II. DISCUSSION

About coral reefs

Coral reefs are thought to occupy 284,300 square kilometres, with 91.9% of that area being in the Indo-Pacific region, which includes the Red Sea, Indian Ocean, Southeast Asia, and the Pacific. 32.3% of that amount is attributable to Southeast Asia, while 40.8% is attributable to the Pacific, which includes Australia. Just 7.6% of all coral reefs in the world are found in the Atlantic and Caribbean. On the west coast of the Americas and Africa, there are either few coral reefs or none at all. This is largely caused by strong cold coastal currents and upwelling, which lower local water temperatures. Moreover, corals are prohibited from being taken offshore throughout South Asia, from Pakistan to Bangladesh. Because to the massive releases of freshwater from the Amazon and Ganges Rivers, respectively, they are also prohibited along the coasts of northeastern South America and Bangladesh.

The Great Barrier Reef, the world's biggest coral reef system, is located in Queensland, Australia; other well-known coral reefs and reef areas include:

1. The Belize Barrier Reef, the second-largest in the world, stretches from southern Quintana Roo, Mexico, down the whole Belizean coast, all the way to the Honduran Bay Islands.

2. The Red Sea Coral Reef, which is along the Egyptian and Saudi Arabian coasts.

3. Pulley Ridge, Florida's deepest photosynthetic coral reef

4. Several of the many reefs found dispersed across the Maldives

• With a length of around 1,500 km, the New Caledonia Barrier Reef is the second-longest double barrier reef in the world.

Despite being in tropical seas with low levels of nutrients, coral reefs maintain an astonishing variety of life. Why coral reefs thrive in these waters may be attributed to the process of nutrient cycling between corals, zooxanthellae, and other reef creatures because recycling guarantees that less nutrients are required overall to feed the population.

The vibrant parrotfish, angelfish, damselfish, and butterflyfish are just a few of the tropical or reef fish that may be found on coral reefs. Groupers, snappers, grunts, and wrasses are some of the other fish species that inhabit coral reefs. Coral reefs are home to more than 4,000 kinds of fish. According to some theories, the large diversity of fish species seen on coral reefs is able to coexist because the first planktonic fish larvae that find a free dwelling place there quickly fill it. The fish remain there for the remainder of their lives. It has been called "a lottery for living space" since the species that use the open area are determined at random. Sponge, Cnidarians, which include some types of coral and jellyfish, worms, crustaceans, molluscs, echinoderms, sea squirts, sea turtles, and sea snakes are just a few of the other species that can be found on reefs.

Such bioerosion might result from coral bleaching.

The biggest danger to coral reefs on Earth may come from human activities. Particularly major challenges to these habitats include pollution and overfishing. Another issue is the physical destruction of reefs brought on by boat and cargo activity. The trade in live fish for human consumption has been blamed for cyanide use's negative effects on the environment and the plight of tropical people. According to Hughes et al., "the extent of human effects on reefs has expanded exponentially as a result of greater human population and better storage and transport networks. For instance, the globalisation of fish and other natural resource markets has met the demand for reef resources far from their tropical origins.

Researchers are now attempting to ascertain the extent to which certain elements have an influence on the reef systems. The long list of causes includes, among others, the oceans' role as a carbon dioxide sink, changes in the Earth's atmosphere, ultraviolet light, ocean acidification, biological viruses, the effects of dust storms that spread contaminants to remote reef systems, various pollutants, the effects of algal blooms, and others. Reefs are in danger outside of coastal regions, therefore the issue goes beyond land development and pollution, even though both are also significantly affecting dam- age.

Coral reefs in Southeast Asia are under danger due to destructive fishing methods, overfishing, sedimentation, pollution, and bleaching. To safeguard these reefs, a number of initiatives are being undertaken, including legislation, education, and the creation of marine protected zones. For instance, Indonesia has coral reefs covering over 33,000 square miles. A third of the world's corals and a quarter of the fish species are found in its waters. At the centre of the Coral Triangle, Indonesia's coral reefs have suffered damage from unrestricted tourism, destructive fishing, and bleaching brought on by climatic changes. Just 6% of Indonesia's coral reefs are in outstanding condition, while 24% are in good condition, and over 70% are in poor to fair condition, according to data from 414 reef monitoring stations throughout Indonesia in 2000. .

According to general estimations, 10% of the coral reefs in the world are already extinct. The issues vary from ocean acidification to the above-described environmental implications of fishing methods. Another symptom of the issue is coral bleaching, which is occurring in reefs all around the world.

In six regions of their reef lagoon, the people of Ahus Island, Manus Province, Papua New Guinea, have prohibited fishing for centuries. Line fishing is allowed, however net and spear fishing are prohibited due to cultural customs. As a consequence, compared to locations where fishing is completely free, both the biomass and individual fish sizes are much bigger in these areas. Over 60% of the world's reefs are thought to be in danger as a result of destructive human-related activities. In Southeast Asia, where a staggering 80% of reefs are deemed threatened, the threat to the health of reefs is especially severe.

Restoration efforts for coral reefs and atolls are now being carried out by organisations including Coral Cay, Counterpart, and the Foundation of the Peoples of the South Pacific. They are achieving it by propagating plants using straightforward techniques. Practical Action and other organisations have made available educational papers on how to set up coral reef restoration. free sea

The abyssal plain, which makes up a large portion of the ocean bottom in the deep ocean, is a flat, featureless underwater desert. These plains are travelled by a large number of pelagic fish in quest of spawning or alternative feeding places. Larger predator fish follow smaller migratory fish, which may provide lucrative, albeit transient, fishing grounds [7]–[10].

Seamounts

A seamount is a mountain that rises from the seabed but does not reach the sea level, preventing it from qualifying as an island. Oceanographers describe them as autonomous features that rise at least 1,000 metres above the ocean's surface. Pacific Ocean seamounts are common. There may be 30,000 seamounts in the Pacific Ocean, 1,000 in the Atlantic Ocean, and an undetermined number in the Indian Ocean, according to recent research [11]–[13].

III. CONCLUSION

Focusing on a particular specialty has been the conventional approach to fisheries research and management. In contrast to this is the ecosystem-based strategy. Several areas have adopted ecosystem-based fisheries principles. The following ten guidelines for ecosystem-based fisheries scientists were presented in 2007 in an attempt to "stimulate much needed debate" and "clarify the important components" of the field. "Maintain an adaptable, risk-averse, and comprehensive point of view.

REFERENCES

[1] M. Cucuzza, J. S. Stoll, and H. M. Leslie, "Evaluating the theoretical and practical linkages between ecosystem-based fisheries management and fisheries co-management," Mar. Policy, 2021, doi: 10.1016/j.marpol.2020.104390.

[2] K. N. Marshall et al., "Ecosystem-Based Fisheries Management for Social–Ecological Systems: Renewing the Focus in the United States with Next Generation Fishery Ecosystem Plans," Conserv. Lett., 2018, doi: 10.1111/conl.12367.

[3] S. Hornborg et al., "Ecosystem-based fisheries management requires broader performance indicators for the human dimension," Mar. Policy, 2019, doi: 10.1016/j.marpol.2019.103639.

[4] H. Townsend et al., "Progress on Implementing Ecosystem-Based Fisheries Management in the United States Through the Use of Ecosystem Models and Analysis," Front. Mar. Sci., 2019, doi: 10.3389/fmars.2019.00641.

[5] W. S. Patrick and J. S. Link, "Hidden in plain sight: Using optimum yield as a policy framework to operationalize ecosystem-based fisheries management," Mar. Policy, 2015, doi: 10.1016/j.marpol.2015.08.014.

[6] S. J. Hall and B. Mainprize, "Towards ecosystem-based fisheries management," Fish and Fisheries. 2004. doi: 10.1111/j.1467-2960.2004.00133.x.

[7] S. J. Barbeaux, K. Holsman, and S. Zador, "Marine Heatwave Stress Test of Ecosystem-Based Fisheries Management in the Gulf of Alaska Pacific Cod Fishery," Front. Mar. Sci., 2020, doi: 10.3389/fmars.2020.00703.

[8] K. Kroetz, M. N. Reimer, J. N. Sanchirico, D. K. Lew, and J. Huetteman, "Defining the economic scope for ecosystem-based fishery management," Proc. Natl. Acad. Sci. U. S. A., 2019, doi: 10.1073/pnas.1816545116.

[9] R. Pomeroy, L. Garces, M. Pido, and G. Silvestre, "Ecosystem-based fisheries management in small-scale tropical marine fisheries: Emerging models of governance arrangements in the Philippines," Mar. Policy, 2010, doi: 10.1016/j.marpol.2009.07.008.

[10] K. N. Marshall, L. E. Koehn, P. S. Levin, T. E. Essington, and O. P. Jensen, "Inclusion of ecosystem information in US fish stock assessments suggests progress toward ecosystem-based fisheries management," ICES Journal of Marine Science. 2019. doi: 10.1093/icesjms/fsy152.

[11] [P. Christie, D. L. Fluharty, A. T. White, L. Eisma-Osorio, and W. Jatulan, "Assessing the feasibility of ecosystem-based fisheries management in tropical contexts," Mar. Policy, 2007, doi: 10.1016/j.marpol.2006.08.001.

[12] [M. J. Juan-Jordá, H. Murua, H. Arrizabalaga, N. K. Dulvy, and V. Restrepo, "Report card on ecosystem-based fisheries management in tuna regional fisheries management organizations," Fish Fish., 2018, doi: 10.1111/faf.12256.

[13] W. S. Patrick and J. S. Link, "Myths that Continue to Impede Progress in Ecosystem-Based Fisheries Management," Fisheries, 2015, doi: 10.1080/03632415.2015.1024308..

Analysis of Seamounts

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Abstract— Seamounts often extend upward into shallower regions that are friendlier to marine life, creating habitats for marine species that are not present on or near the nearby deeper ocean floor. The seamount itself may deflect deep currents and induce upwelling in addition to just giving physical presence in this region. As nutrients are introduced into the photosynthetic zone via this mechanism, a region of activity is created in what would otherwise be an open ocean desert. So, seamounts could serve as crucial resting places for certain migratory species, including whales. Recent studies suggest that whales could utilise these characteristics as navigational aids all throughout their trip.

Index Terms— Ecosystem Based, Fisheries Management, Fresh Water Lakes, Heavy Metals, Marine Life.

I. INTRODUCTION

Owing to overexposure by the fishing industry and the greater fish populations in these places, several seamount fauna species have seen a significant decline. The hydrographic features of the seamount often allow for an increase in the primary productivity of the epipelagic waters above the submerged peak. This results in higher zooplankton densities and higher fish concentrations in certain locations. Another explanation is that the seamount's existence prevents zooplankton from migrating during the day, which keeps them in the region where the fish are found. It's also likely that fish life cycles and interactions with the seamount's benthic fauna are more to blame for the high fish concentrations. Sponge and true corals, as well as other suspension feeders, make up the majority of the seamounts' benthic flora. Benthic macroalgae is typical for several seamounts with maxima between 200 and 300 metres below the surface. Polychaete worms dominate the infauna of sedimentary environments [1]–[3]. It has long been hypothesised that many pelagic creatures visit seamounts to forage, but there has never been concrete evidence to support this theory. Recently, the first proof of this hypothesis was made public. Russia, Australia, and New Zealand began trawling the seamounts in the 1960s in search of new fisheries. Most of the invertebrates mentioned are corals, which are mostly employed in the jewellery industry. Orange roughy and pelagic armourhead were the two main fish species, and both were swiftly overfished because of factors such as late maturation, poor fecundity, a restricted geographic range, and fishery recruitment. The trawling equipment also devastated benthic communities in addition to overfishing the fish. The Census of Marine Life project a worldwide census of marine life on seamounts called CenSeam

Fisheries in freshwater Lakes

Freshwater lakes cover 1.5 million square kilometres of land worldwide. An additional one million kilometers2 are covered by inland seas with salt. 28 freshwater lakes totaling more than 5,000 square kilometres in size make up 1.18 million square kilometres, or 79% of the total.

Rivers are polluted

Contaminants are introduced into the ecosystem via pollution. Oceans, lakes, and rivers have abundant wild fisheries, but the introduction of contaminants is a problem, particularly when it comes to plastics, pesticides, heavy metals, and other industrial and agricultural pollutants that do not degrade quickly in the environment. Industrial, agricultural, and domestic trash are dumped into rivers and the ocean as a result of runoff from the land. Ship pollution is another issue.

Waste Plastic

Marine trash is rubbish produced by humans that floats in the ocean. Oceanic trash, sometimes referred to as beach litter, regularly washes ashore near the convergence of gyres and beaches. Plastic, a substance that has been steadily accumulating since the conclusion of World War II, makes about 80% of all known marine waste. Polymers build up because they don't biodegrade as quickly as many other things do; although they will photodegrade when exposed to sunlight, this only occurs in dry environments since water slows down the process. Animal life and fisheries are put in risk by discarded plastic bags, six-pack rings, and other plastic garbage that ends up in the ocean. Threats to aquatic life include entanglement, asphyxia, and ingestion.

Nurdles, sometimes known as mermaids' tears, are little plastic pellets that contribute significantly to marine trash. They are generally under five millimetres in diameter. They are assumed to enter the natural environment as a result of unintentional spillages and are employed as a raw material in the production of plastics. Larger plastic trash that has been physically weathered produces nestles as well. They remarkably resemble fish eggs, but any marine organism that consumes them is likely to starve, get poisoned, or die.

Due to the fact that flotsam often resembles their natural food, many creatures that live on or in the water accidentally eat it. When bulky or knotted, plastic waste is challenging to pass and may permanently lodge in these animals' digestive

systems, obstructing the passage of food and leading to death by malnutrition or illness. Small floating particles may be mistaken for zooplankton by filter feeders, allowing them to penetrate the ocean food chain. The amount of plastic in samples collected from the North Pacific Gyre in 1999 by the Algalita Marine Research Fund was six times more than the mass of zooplankton. Some statistics suggest that the amount of plastic in the ocean may be 30 times more than that of plankton, which is the most prevalent kind of marine life [4]–[6].

When exposed to water, toxic chemicals used in the production of plastic products might leak out into their surroundings. Plastic litter is even more dangerous in the ocean than it would be on land because waterborne hydrophobic contaminants accumulate and amplify on its surface. Apex predators are under a lot of stress since hydrophobic pollutants have been shown to bioaccumulate in fatty tissues and biomagnify up the food chain. When taken, certain plastic additives are known to interfere with the endocrine system. Others have been shown to depress the immune system or lower fertility rates.

Some poisons that do not degrade quickly in the marine environment, apart from plastics, are a special worry. Heavy metals are metallic chemical elements that are dangerous or hazardous at low concentrations and have a comparatively high density. Mercury, lead, nickel, arsenic, and cadmium are among examples. PCBs, DDT, insecticides, furans, dioxins, and phenols are further persistent poisons.

In a process known as bioaccumulation, such poisons may build up in the tissues of several species of aquatic life. Also, they are known to build up in benthic settings like estuaries and bay muds, which serve as a geological archive of human activity from the previous century.

Many such instances include

1. The Amur River's fish populations have been decimated, and its estuarine soil has been harmed by industrial pollutants from China and Russia, such as phenols and heavy metals.

2. The previously top whitefish lake in the region, Wabamun Lake in Alberta, Canada, now contains unacceptable amounts of heavy metals in both its sediment and fish.

3. It has been shown that both acute and long-term pollution episodes have an influence on the kelp forests of southern California, while the severity of the damage seems to depend on both the kind of contaminants and the length of exposure.

4. Mercury levels may be high in bigger species like bluefin and albacore due to their high position in the food chain and the consequent buildup of heavy metals from their diet. As a consequence, the FDA of the United States released recommendations in March 2004 urging pregnant women, nursing mothers, and kids to reduce their consumption of tuna and other predatory fish.

5. Certain crabs and shellfish may thrive in contaminated areas and accumulate heavy metals or poisons in their tissues. For instance, mitten crabs have the amazing capacity to endure in drastically altered aquatic environments, including contaminated waters. Mining has a terrible environmental track record.

6. The growing and harvesting of such species need careful management if they are to be utilised as food. For instance, the Western US's 40% of watersheds have had sections of their headwaters poisoned by mining, according to the US Environmental Protection Agency. Heavy metals enter the environment via oil spills, as the Prestige oil leak off the coast of Galicia, or from other human or naturally occurring sources.

Eutrophication

A rise in chemical nutrients, usually those containing nitrogen or phosphorus, causes eutrophication in an environment. In addition to further impacts including a shortage of oxygen and drastic reductions in water quality, fish, and other animal populations, it may lead to an increase in the ecosystem's primary productivity.

The primary offenders are rivers that flow into the ocean, carrying with them the many chemicals used as agricultural fertilisers as well as animal and human waste. Hypoxia and the development of a dead zone may result from an overabundance of substances in the water that deplete oxygen.

Eutrophication's impact on marine benthic life

According to surveys, 54% of lakes in Asia, 53% in Europe, 48% in North America, 41% in South America, and 28% in Africa are eutrophic. Since nutrients from the land are concentrated when runoff reaches the marine environment in a limited channel, estuaries also tend to be naturally eutrophic. The 375 hypoxic coastal zones that the World Resources Institute has identified are mostly found in coastal regions of Western Europe, the Eastern and Southern Coasts of the United States, and East Asia, notably Japan. Red tide algae blooms are common in the ocean and when they get near to shore, they may harm people and certain domestic animals by causing respiratory issues. They also kill fish and marine mammals. In addition to entering the open ocean by runoff from land, atmospheric nitrogen fixed by humans may also do so. According to a 2008 research, this may be responsible for up to 3% of the yearly new marine biological output and around one-third of the external nitrogen supply to the ocean. Reactive nitrogen buildup in the environment has been linked to effects that have been compared to those of carbon dioxide emissions.

Acidification

As a natural carbon sink, the seas typically take up carbon dioxide from the atmosphere. The seas are growing more acidic as a result of rising atmospheric carbon dioxide levels. While the possible effects of ocean acidification are not completely known, there are worries that calcium

carbonate-based structures may become more susceptible to breakdown, which might have an impact on corals and shellfish's capacity to create shells.

A study by NOAA scientists revealed that a lot of somewhat acidified water is upwelling to within four miles of the North American Pacific continental shelf. The study was published in the journal Science in May 2008. The majority of the local marine life lives or is born in this region, which is a crucial zone. Although the article solely focused on the region from Vancouver to northern California, comparable impacts could also be present in other continental shelf regions.

Consequences of Destroying Fishing Habitat

Ghost nets are fishing nets that fishermen have dropped or lost in the ocean; they may entangle fish, dolphins, sea turtles, sharks, dugongs, crocodiles, seagulls, crabs, and other animals. As intended, these nets prevent mobility, leading to malnutrition, laceration, infection, and, in the case of those who must return to the surface in order to breathe, asphyxia.

Overfishing Many concrete instances of overfishing.

The overfishing of sharks in the region has significantly reduced the availability of bay scallops throughout the east coast of the United States. Until recently, a variety of sharks consumed rays, which are the major predator of bay scallops.
• The once-thriving oyster populations in Chesapeake Bay historically filtered the estuary's entrail water volume of excess nutrients every three to four days.

However, with the shark population reduced, in some places almost completely, the rays have been free to dine on scallops to the point of greatly decreasing their numbers. Currently, the process takes about a year, and nearby waterways may have issues due to debris, fertilisers, and algae. These contaminants are filtered by oysters, which either consume them whole or form them into harmless little packages that they drop to the bottom.

In 2006, the Australian government claimed that Japan had unlawfully overfished southern bluefin tuna by removing 12,000 to 20,000 tonnes annually rather than the 6,000 tonnes that had been agreed upon; the value of this overfishing might have reached US$2 billion. Stocks have suffered significant harm as a consequence of such overfishing. Unless fisheries agree to more stringent restrictions, Japan's enormous desire for tuna would push the most valuable populations to the verge of commercial extinction, according to the WWF. Japan rejects this number but admits that there has sometimes been overfishing in the past.

Decrease in biodiversity

The other species within an ecosystem have an impact on each species inside that ecosystem. There aren't many connections between a single prey and a single predator. Most predators have more than one prey, and most predators devour more than one prey at a time. Several environmental elements can have an impact on their interactions. When one species is eliminated from an ecosystem, it usually has a negative impact on other species, sometimes to the point of extinction.

The variety of species greatly contributes to the resilience of ecosystems. A decline in biodiversity is less likely to have an effect on an organism when it uses a variety of resources. Yet for a creature that uses little resources, a decline in biodiversity is more likely to have a significant impact. The balance of biodiversity is often tipped by habitat loss, fishing and hunting that drives certain species to extinction or dangerously close to it, and pollution.

Endangered species

The IUCN Red List of Endangered Species is the international standard for cataloguing endangered marine species. The cornerstone of global marine conservation priorities is this list. If a species is deemed to be vulnerable, endangered, or severely endangered, it is included in the threatened category. Some categories are at danger and lack sufficient data.

II. DISCUSSION

Due to concerns including overfishing, bycatch, climate change, invasive species, and coastal development, many marine species are at an increased danger of extinction and marine biodiversity is possibly facing permanent loss. The IUCN has evaluated roughly 3,000 maritime species by 2008. This comprises evaluations of the known species of grouper, shark, ray, chimaera, coral reef-building, marine turtle, seabird, and marine mammal. About a quarter of these groups are considered to be in danger. Since they are deep-water pelagic species, sharks, rays, and chimaeras are challenging to see in the wild. About their ecology and population size, nothing is known. The majority of what is now known about them comes from intentional and unintended net capture. The overfishing of these slow-growing species by shark fisheries across the globe is preventing many of them from recovering [7]–[10].

Overfishing poses a serious danger to groupers, especially when it targets young animals and adults who are spawning. Coral reefs: Bleaching and disease, which have been linked to a rise in water temperature, are the main risks to corals. Additional dangers include sedimentation, pollution, coral extraction, and coastal development. The Indo-Malay-Philippine archipelago area, sometimes known as the coral triangle, contains the greatest variety of coral species and the greatest number of reef-building coral species that are endangered. Several marine animals as well as humans who rely on reef resources for their livelihoods will be severely harmed by the loss of coral reef ecosystems.

Whales, dolphins, porpoises, seals, sea lions, walruses, sea otters, marine otters, manatees, dugongs, and polar bears are examples of marine animals. Ghost net entanglement, targeted harvesting, seismic sonar noise pollution, boat hits, and entanglement in ghost nets are significant risks. Water

pollution, habitat loss owing to coastal development, loss of food supplies due to fisheries failure, and climate change are further problems. Significant dangers to seabirds include gillnets and longline fishing, oil spills, and rodent and cat predation on their nesting habitats. Additional dangers include pollution, deforestation, and habitat destruction brought on by coastal development.

Sea turtles: These creatures lay their eggs on beaches and are threatened by things like coastal development, sand mining, and predators, including people who, in many areas of the globe, take the eggs for food. Marine turtles may be caught as bycatch during longline and trawling operations, targeted by small-scale subsistence fishermen, caught in ghost nets, hit by vessels, or get entangled in them.

By 2012, additional 17,000 marine species will have IUCN Red List evaluations completed as part of the ambitious Global Marine Species Assessment initiative. The approximately 15,000 known marine fish species, significant primary producers of habitat like mangroves, seagrasses, certain seaweeds, and the surviving corals, as well as significant invertebrate groups like molluscs and echinoderms, are among the groups targeted.

In comparison to other eco-systems, freshwater fisheries have a disproportionately high species diversity. More than 25% of known vertebrates, more than 126,000 known animal species, around 24,800 species of freshwater fish, molluscs, crabs, and dragonflies, as well as over 2,600 macrophytes, all call freshwater ecosystems home, despite less than 1% of the world's surface being covered by them. These freshwater systems are under a great deal of stress from ongoing industrial and agricultural expansion. Lakes are heavily contaminated or exploited, wetlands are dried up, rivers are channelled, forests are cleared, which causes sedimentation, exotic species are introduced, and overharvesting takes place.

Around 6,000, or 22%, of the known freshwater species have been evaluated globally for the 2008 IUCN Red List, leaving over 21,000 species to be evaluated. This proves that freshwater species are much more vulnerable than those in marine fisheries globally. Further field studies are required since a significant number of freshwater species are classed as data poor [11]–[13].

III. CONCLUSION

The National Academy of Sciences of the United States recently issued a warning that "synergistic effects of habitat destruction, overfishing, introduced species, warming, acidification, toxins, and massive runoff of nutrients are transforming once complex ecosystems like coral reefs and kelp forests into monotonous level bottoms, transforming clear and productive coastal seas into anoxic dead zones, and transforming complex food webs topped by big animals into simplified food webs.

REFERENCES

[1] T. Morato, S. D. Hoyle, V. Allain, and S. J. Nicol, "Seamounts are hotspots of pelagic biodiversity in the open ocean," Proc. Natl. Acad. Sci. U. S. A., 2010, doi: 10.1073/pnas.0910290107.

[2] A. R. Baco, N. B. Morgan, and E. B. Roark, "Observations of vulnerable marine ecosystems and significant adverse impacts on high seas seamounts of the northwestern Hawaiian Ridge and Emperor Seamount Chain," Mar. Policy, 2020, doi: 10.1016/j.marpol.2020.103834.

[3] F. Althaus et al., "Impacts of bottom trawling on deep-coral ecosystems of seamounts are long-lasting," Mar. Ecol. Prog. Ser., 2009, doi: 10.3354/meps08248.

[4] J. A. Koslow, K. Gowlett-Holmes, J. K. Lowry, T. O'Hara, G. C. B. Poore, and A. Williams, "Seamount benthic macrofauna off southern Tasmania: Community structure and impacts of trawling," Mar. Ecol. Prog. Ser., 2001, doi: 10.3354/meps213111.

[5] C. R. McClain, "Seamounts: Identity crisis or split personality?," Journal of Biogeography. 2007. doi: 10.1111/j.1365-2699.2007.01783.x.

[6] T. Morato et al., "Evidence of a seamount effect on aggregating visitors," Mar. Ecol. Prog. Ser., 2008, doi: 10.3354/meps07269.

[7] L. Watling and P. J. Auster, "Vulnerable Marine Ecosystems, Communities, and Indicator Species: Confusing Concepts for Conservation of Seamounts," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2021.622586.

[8] M. J. Lima, I. Sala, and R. M. A. Caldeira, "Physical Connectivity Between the NE Atlantic Seamounts," Front. Mar. Sci., 2020, doi: 10.3389/fmars.2020.00238.

[9] E. García-Seoane et al., "Distribution and diversity of mesopelagic fauna on seamounts of the Madeira-Tore complex (Northeastern Atlantic)," Reg. Stud. Mar. Sci., 2020, doi: 10.1016/j.rsma.2020.101434.

[10] S. L. Goode, A. A. Rowden, D. A. Bowden, and M. R. Clark, "Resilience of seamount benthic communities to trawling disturbance," Marine Environmental Research. 2020. doi: 10.1016/j.marenvres.2020.105086.

[11] A. A. Rowden et al., "A test of the seamount oasis hypothesis: Seamounts support higher epibenthic megafaunal biomass than adjacent slopes," Mar. Ecol., 2010, doi: 10.1111/j.1439-0485.2010.00369.x.

[12] F. Campanella, M. A. Collins, E. F. Young, V. Laptikhovsky, P. Whomersley, and J. van der Kooij, "First Insight of Meso- and Bentho-Pelagic Fish Dynamics Around Remote Seamounts in the South Atlantic Ocean," Front. Mar. Sci., 2021, doi: 10.3389/fmars.2021.663278.

[13] J. E. Hunt and I. Jarvis, "The lifecycle of mid-ocean ridge seamounts and their prodigious flank collapses," Earth Planet. Sci. Lett., 2020, doi: 10.1016/j.epsl.2019.115867..

Pond Site Selection, Design & Construction

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Abstract— Especially waves and flood floods may affect artificially constructed ponds. Nonetheless, Denila noted that the negative impacts of floods and waves may be avoided or reduced with correct planning, layout, and constructionKeep an eye on the tides and record their heights, particularly in the months of June, July, November, and December when the tides are affected by torrential rain. The height of ponds will vary depending on the highest and lowest tide levels. Ask the locals about the flood waters' levels to learn more. The height of your main dike should be determined using this information..

Index Terms— Feet Elevation, Nursery Pond, Prawn Ponds, Tide Table, Water Supply

I. INTRODUCTION

Understanding the local crop-ping schedules and rainy and dry seasons can help you manage the fishponds more effectively. You will require additional work for stocking, harvesting, dikes, and gate repairs. Plan them for when you can get sufficient local labour, which is often before and after rice planting and harvesting and after the sugar milling season. Recognize the regional traditions and customs since they have a significant impact on labour expenses [1]–[3]. The kind of soil and plants that were or are growing on the location of your fishpond will also have an impact on construction expenses. The ideal materials for building dikes are sandy clay or sandy loam since they are sturdy and do not break when dried. Use of soil made from decomposed bakawan roots is not advised since it quickly catches fire when dry. A fully sandy soil should also be avoided since it is the most costly to transport. Moreover, lablab does not do well on sandy soil. Your primary water supply source should be indicated in the interim. Your pond's water supply might be the ocean, a river, or a stream, but having a freshwater source nearby gives you more control over the pond's salinity. Salinity regulation is crucial for the development of fish and fish food. Make sure that no waste from companies like sugar refineries, distilleries, sawmills, or other industry pollutes the water.

Consult qualified and experienced fish farmers as well as the Bureau of Fisheries' technicians with the planning, design, and building of fishponds. They may provide you with helpful advice so you won't have to spend as much money on constructing and subsequent maintenance. Fish farming involves more than just using our understanding of how to keep fish alive and flourish. The effective use of engineering concepts is key to the success of commercial fish farming.

How To Estimate The Perfect Water Level For Fishponds

The water elevation at the fishpond location is crucial for effective water management. By taking accurate measurements of the height of the water at the location at various tidal levels and comparing those data with the anticipated heights from the forecasts in the tide table, it is possible to calculate the elevation of the water. The Bureau of Coast and Geode- tic Survey, located on Baranca Street in Manila, can provide you with a copy of the tide table. For instance, if the tide table predicts a height of four feet for the water at the location, but the actual height is four feet, the elevation in that region is zero. If the region has six feet of water while the forecast is for four, then the area has two feet of elevation. On the other hand, if the region is three feet above 0 datum if the water level is one foot deep while the projected tidal level is four feet.

Based on the water supply, the appropriateness of an estuary environment for a fishpond project may be summed up as follows:

1. since fishponds may be irrigated or drained even under normal tide circumstances, locations with elevations between 0 and 3.5 feet from the optimal elevation for fishponds. For fishpond purposes, those between 1 and 4.5 feet in elevation are also ideal.

2. Areas between -2 feet and -1 foot in height can only be appropriate if they are filled, whereas regions between 4.5 and 7 feet in elevation can only be suitable if they are dug.

3. Since they are not irrigated, areas over 7 feet are undesirable. Locations with a constant water level below -2 feet are likewise undesirable since it would be too costly to fill them up unless they were raised by natural processes.

What Charactersistics A Good Nursery Powd or Semillahan

At least a month should pass before supplying the nursery pond. This is particularly true if fry are to be placed directly into the nursery pond following acclimation. Ideally, a nursery pond would include the following characteristics:

1. For water to flow from the sea or river even at low tide, it must have a low, flat bottom.

2. The bottom soil must have at least 16% organic matter, have a pH between 7 and 8, and have a substantial layer of clay in the subsoil to hold water.

3. The pond needs two water gates for simple water entrance and departure from the drainage canal to the supply canal.

4. To make it simpler to gather and catch juvenile fish, the

bottom of the pond should slope towards one water gate.

5. For quick water drainage while the centre is being prepared, the pond should include a perimeter channel at least 15 centimetres deep. This canal also acts as a catch-all for debris, dirt, and other materials that fall over the dikes, protecting the feeding zone from contamination.

6. The nursery needs sturdy surrounding dikes to prevent seepage from crab or eel-caused holes and to prevent overflowing during torrential downpours and typhoons.

Pond and Bank Protection Structures

Dikes and embankments may slowly disintegrate due to wind, water movement, and waves; you might not even notice the damage until it is too late. Provide safeguards like breakers, jetties, and barriers to be safe. The following methods are suggested by SEAFDEC engineer Rodolfo Tolosa for shielding your pond from severe waves, water currents, and wind action:

1. Breakwaters might be made of wood, debris mounds, or a mangrove tree buffer zone. Stone or boulders are used to create a rubble-mound, while wood is used to create a wooden-type one by driving two lines of mangrove piles and filling the area in between them with tree branches. By putting mangrove seedlings in areas that need to be protected, a mangrove buffer zone may be created [4]–[7].

2. Zigzag-patterned jetties minimise scouring at river bends. Bamboos or coconut trunks may be utilised. Twigs and branches need to be placed in the gap between the jetty and the river bank. Particularly around river bends, jetties help to reduce the effect of rushing waves on the coast.

3. Embankment safety measures. Unless barriers are built, internal waves consume embankments. Some of these barriers may be constructed from riprap, old rubber tyres, and bamboo wave breakers. Creeping or close-growing grasses may be grown atop embankments as a low-cost and efficient solution.

4. Barriers with screens. Debris may obstruct the mouth of pond gates. Install a screen barrier in front of the gates to stop this. Floating trash will be collected by bamboo or nylon screens placed a distance in front of the opening of the main gate.

Use inexpensive materials to construct ponds

Pond construction, particularly for nursery ponds, might be done using less expensive and locally accessible materials. According to Flor Apud of the SEAFDEC Leganes brackishwater research station, these materials are just as durable as the ready-to-use but more expensive ones, although being more time-consuming to produce. They will also cost significantly less.

For instance, a canal system composed of bricks and hollow blocks may be employed in lieu of PVC materials, which are often used for distribution lines, according to Apud. As an alternative to PVC materials, wooden pipes or bamboo poles may be utilised as input or outlet pipes. Coconut trunks and large bamboo poles are other items that

may be used.

Use the water supply pipe rather than the ice gate.

It is pricey in the beginning since it needs larger and more materials. Second, since the siding and flushboards, which decay readily, need to be replaced on a regular basis, the expense of upkeep is relatively expensive. Thirdly, wooden sluice gates have significant water seepage problems. Little pipes may be used to quickly manage this water seepage issue, according to Apud.

According to Apud, a wooden pipe or bamboo pole may readily supply and manage water for a tiny nursery pond while also being more affordable and useful. These are soils with significant concentrations of the mineral pyrite. Iron disulfide appears in crystal form as pyrite. Pyrite may be abundant in pond sites even if the acidity of the soil may not be immediately apparent because, when submerged in water, pyrite doesn't undergo much alteration. But, after the pond site is dried up and the dirt is removed, the mineral pyrite comes into touch with the air and reacts with the oxygen to produce sulfuric acid. Acid sulphate soil is pyrite-containing soil that has reached an extremely high acidity. Acid sulphate soils are unproductive and may need a lot of lime to neutralise them—up to 20 to 100 tonnes per hectare. Moreover, acidic soil has a high capacity for fixing phosphate, which results in phosphorous, a crucial ingredient for the development of plants like algae, being trapped in the soil and unavailable to plants.

Iron, aluminium, and manganese are just a few of the minerals that the acid destroys in the soil. The availability of other soil nutrients is limited by these minerals in their active state. As a result, not even algae can thrive in severely acidic sulphate soils.

It is suggested that you get the soil tested to see whether or not the chosen location for a fishpond has an acid sulphate soil, particularly the subsoil. To collect your soil sample, descend one to two metres under the surface.

You must decide whether to go on with development if your site is found to have acidic or potentially acidic sulphate soil. The expense of excavation as well as the cost of purifying the pond soil to neutralise the acidic state must be considered against the cost of excavating the area to a depth that would take advantage of the tidal fluctuation. If you want to have a shallow pond bottom, you must also take the expense of running a water pump into account. A shallow bottom could prevent access to the pyrite-containing soil layer.

The following are some of the recommendations for neutralising acid sulphate soils: repeatedly drying the pond soil and flushing it with seawater; applying burnt lime in sufficient amounts; covering the excavated pond bottom with more suitable soil; good water management that regulates the water table in the pond to limit the oxidation of pyrite and acid formation; and preventing the erosion of dike soils by planting grasses

The Principles Differing Sugpo Farming from Bangos

Farming

Sugpo and bangos are a productive fish farming combo. According to Mr. Ricardo S. Esguerra, a fish cultivator and researcher with the SEAFDEC Aquaculture Department, there are two methods to go about achieving this. One is the conventional approach, which can produce 300 kilos of prawns and 1,000 gramme of bangos per acre annually. The other can produce one tonne of prawns and 300 kg of bangos in a hectare each year utilising the better method of cultivating prawns. Because to the greater price of the prawn in this case, a significantly bigger profit is anticipated [8]–[10].

Esguerra emphasised the need of understanding the fundamental distinctions between sugpo cultivation and bangos fanning. These variations include the following ones:

1. Bangos ponds often don't need a certain size or design. The compartmentalised size of the raising ponds varies from 5 to 20 hectares. In contrast, prawn ponds need to be long and thin, between one and two hectares in size, and aligned northeast to southwest. A setup like this makes the most of wind motion to aerate pond water.

2. Since bangos fishponds are large, dikes must be between 3 and 5 metres at the base and 2 metres in height.

In order to keep water at a depth of one to one and a half metres, prawn pond dikes are bigger, with a base of five to seven metres and a height of two metres.

3. Prawn ponds need an inlet gate and an exit gate to accomplish water flow-through, but each milkfish pond just needs one gate for every ten hectares.

4. To cultivate lablab, bangos ponds need clay-loam soil. On the other hand, prawn ponds need soft sandy clay soil so that the prawns may readily burrow and find cover.

5. Aerating equipment like air blowers and pumps are necessary for intensive prawn production. They are not necessary for bangos growing unless the oxygen level is low.

6. Bangos ponds need crystal-clear water to support healthy lablab development. Green water is preferred for prawn ponds to avoid cannibalism.

7. Prawn ponds need a change of at least one-third of the entire volume once a week, while bangos pond water has to be changed every two weeks.

8. Bangos fry may be placed straight into the nursery pond in one corner, where they will spread out across the whole pond within an hour. When sugpo are stocked in a pond's corner, they remain there, making it simple for a predator to eliminate them. Hence, sugpo fry should be dispersed sparingly around the whole pond.

9. Diseases are not contagious in bangos. Sometimes, at times of excessive water salinity, para-sites attack them. On the other side, prawn fry are prone to bacterial and fungal illnesses.

10. Bangos may be delivered frozen or iced. Sugpo may be transported while alive in dry sawdust. Prawns are decapitated, deveined, and blast frozen for export transportation.

II. DISCUSSSION

According to Mr. J.L. MacLean, a specialist in fish farming in Australia, aquaculture management seeks to increase yields by minimising the death or depletion of the fish being grown owing to the damaging qualities of the natural environment. According to MacLean, the environment is harsh and rife with hazards for fish life. In order to improve fish survival rates, management seeks to reduce or completely remove as many of these natural threats as possible. The detrimental and restrictive elements imposed by the natural environment are the root of fish farmers' troubles everywhere. Fish food shortages are a limiting factor, whereas fish pests and illnesses are detrimental ones [11], [12].

A hatchery, an enclosure like a pond, a fish pen, or a floating cage, fertiliser, feed supplements, and a system of water circulation are the essential elements of the management system that modern fish farming has evolved. The risks that result in fry deaths are removed in a hatchery. The fry or fingerlings are prepared at a hatchery for release into the ocean or to a fish farm. The fry is quite fragile if left on its alone. The dangerous influences in the environment may quickly kill it. the hatchery follows.

By keeping the fish out of the reach of predators or other creatures that feed on them, the enclosure—a fish pond or fish pen—lessens the negative impacts of the environment even more. Fertilizers, whether organic or artificial, increase the productivity of pond water. More organisms that fish eat, like lablab, can be cultivated thanks to fertilisers. Food, or a lack thereof, is a constraining element. In order to grow more fish in a given space, more food is provided.

III. CONCLUSION

Last but not least, recirculating the water through the fish pond or fish cage will eliminate the risks brought on by the buildup of contaminants like waste. In addition, it provides the fish with an endless supply of oxygen. The majority of environmental risks are eradicated at this level of management. The only constraint you would then encounter as a fish farmer or cultivator is space. In conclusion, modern fish culture practises include safeguarding fry from natural hazards and preparing them for release into grow-out ponds or the sea, safeguarding fish from predators, boosting water fertility, supplementing feed, and removing poisonous materials in the water through water circulation

REFERENCES

[1] S. Chen, B. Mulgrew, and P. M. Grant, "A clustering technique for digital communications channel equalization using radial basis function networks," IEEE Trans. on Neural Networks, vol. 4, pp. 570-578, July 1993.

[2] J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility," IEEE Trans. Electron Devices, vol. ED-11, pp. 34-39, Jan. 1959.

[3] C. Y. Lin, M. Wu, J. A. Bloom, I. J. Cox, and M. Miller, "Rotation, scale, and translation resilient public watermarking

for images," IEEE Trans. Image Process., vol. 10, no. 5, pp. 767-782, May 2001.

Understanding The Pond Ecosystem Better

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Abstract— A strong understanding of certain fundamental knowledge about how and why changes in the pond's circumstances occur is necessary for fish farming, particularly prawn farming. These alterations are mostly the consequence of interactions between the pond's diverse creatures, soil, water and air..

Index Terms— Carbon Dioxide, Fish Farming, Oxygen Level, Puddle Trench, Soil Water

I. INTRODUCTION

1. The many creatures in the pond constantly interact with the soil, water, air, and one another. The amount of light and the weather affect how well or poorly the encounter goes.

2. Water ingests almost all things, including gases, sediments, and other

A map of the Philippines' climate

Type 1 climates have two distinct seasons: dry from November to April and rainy the rest of the year.

Type 2 has no dry season and a maximum rainfall that is highly noticeable from November to January.

TYPE 3 - Seasons are not extremely obvious, and the remainder of the year is damp despite being reasonably dry from November to April.

Type 4 rainfall is spread almost equally throughout the year.

3. Water becomes heavier or denser when salted. Salinity, which is measured in parts per thousand, or ppt, is the measurement of the quantity of salt. Freshwater contains 0 ppt of salinity, whereas the salinity of seawater is between 32 and 34 ppt. Freshwater will thus float on top of saltwater. It is pretty typical for fishpond water to achieve a salinity of 60 ppt or more during dry months.

4. Water density is also influenced by temperature. The density decreases as the temperature increases. Cold water will float on top of warm water.

5. Salinity and temperature both affect how easily oxygen and other gases dissolve in water. Less oxygen is contained in saltier and warmer oceans.

6. Even though oxygen and hydrogen make up the majority of water, aquatic creatures do not breathe in this form of oxygen.

7. Decomposing animals, vegetation, and uneaten food in the pond all deplete oxygen and generate toxic byproducts like ammonia and hydrogen sulphide.

8. Air bubbles in the water, wind activity on the surface, and paddle churning may all increase the amount of dissolved oxygen in the water. Adding fresh water also raises the concentration of dissolved oxygen.

9. Free hydrogen and hydroxyl ions are present in water to some degree. The pH value scale, which ranges from 1 to 14, is used to quantify the concentration of free hydrogen ions. At a pH of 7, pure water is neutral and contains an equal number of hydrogen and hydroxyl ions. Water is acidic when its pH is less than 7. It becomes alkaline at a pH level higher than 7. pH levels between 7 and 9 are necessary for the preservation of plant and animal life [1]–[3].

10. The pond's plants create oxygen, but they also breathe and use it up, just as creatures do. Plants create carbon dioxide as a result of the process. Plants create more oxygen throughout the day than they can use. They continue to use it up and make carbon dioxide even when they cease creating oxygen at night. Plants reduce the dissolved oxygen level in the pond by doing this, sometimes to the point of exhaustion.

11. The quantity of carbon dioxide in the water and the pH of the soil both impact the pH of the water. Certain pond soils are acidic by nature. Soil with a high acidity is often reddish. That soil must be treated to reduce its acidity since it is unsuitable for fish fanning.

12. Ponds' salinity, temperature, dissolved oxygen content, and pH all fluctuate throughout time and from one to the next. A fish farmer has to be able to tell the difference between long-term changes and short-term changes. Hour by hour fluctuations within a day are considered short-term changes, but seasonal variations and abrupt changes like those brought on by a strong downpour are considered long-term changes.

13. The rise and fall of the dissolved oxygen level over the course of a day is the most noticeable alteration that may have a significant impact on fish. Usually, it reaches its lowest point an hour or two before daybreak. After then, it gradually increases until it reaches its peak in the early afternoon and then gradually decreases as the sun sets until it reaches its lowest in the early morning hours just before daybreak.

14. The temperature also varies during the day, although these variations are often not dangerous—with the exception of ponds that are just knee-deep or shallower. Salinity and pH fluctuations over a 24-hour period are likewise not alarming.

15. In contrast, salinity changes significantly throughout a year, especially in areas with distinct wet and dry seasons. During the dry season, salinity will increase to 60 or 70 ppt unless freshwater is continuously provided. On the other side, salinity may drop to levels that are almost fresh during the wet season.

16. Excessive rainfall causes the most significant alterations. Such modifications can be harmful. A significant flood may abruptly reduce the salinity of pond water. Ponds with acidic soil may see a rapid drop in pH from 8 to 3 as a result of runoff from the dikes. During a downpour, freshwater accumulates on top of saltwater, preventing the exchange of gases between the two. This will quickly reduce the oxygen level in the pond's water, particularly under motionless conditions.

Prior to stocking, fish farmers may gain an accurate estimate of the quantity of fish in the ponds by grading the fish to a consistent size. More importantly, when the stock is collected, you lower the amount of fish that are too little to sell. Often, fingerlings are culled or chosen for stocking using sorting tables. Yet using sorting tables still leaves room for sloppy and aggressive treatment, particularly if employees are pressed for time. This technique often causes damage to fingerlings.

The usage of fish grading panels that are the same width as the holding tanks is a novel concept. The tank is set up with fish grading panels, and the fish are all gathered on one side. The fingerlings smaller than the slots on the grading panels may pass through them since the slots have fixed sizes. The ones that cannot pass are the right size for stockings [4]–[7].

Another option is to employ floating grading boxes that have metal bar panels at the bottom or sides. The size of fish that cannot be maintained for stocking is determined by the distance between the metal bars. Those who can squeeze between the gaps between the bars do so. Retained for stocking are those that cannot pass. This technique of sorting fingerlings has the benefit of avoiding dipnet handling, which may harm and stress the animals.

A dike that doesn't leak is a good dike. Poor dike construction, inappropriate dike soil, and animals that chew through the dike are the causes of leaky dikes. It matters what sort of soil was utilised to construct the dike. Dikes will eventually leak if they are constructed on sandy or silty soil that contains very little clay. Water tends to infiltrate between the original soil surface and beneath the dike if no puddle trench is built during construction because of the difference in material composition. Dikes may be breached by crabs, eels, snakes, and other digging creatures.

Always build a puddle trench in the centre and bottom of a new dike to stop leaks or seepage. Construct the dike with adequate foundation thickness to withstand pressure from both sides of the water. Remove any organic material from the area of soil where a new dike is going to be constructed, such as roots, twigs, stumps, and dead leaves.

As a substance for diking, use clayey soil. Dig a fresh puddle trench along the inner of the dike and fill it with fresh clayey soil if seepage continues after some time. If animals have dug holes, kill the creatures there by putting poisoned bait inside the holes, filling them with hydrated lime, digging the animals out, and then covering the holes with fresh soil. Build a berm or a shoulder to broaden the dike if the base is

too narrow.

Fishpond construction need not deplete mangrove regions since you may replant the surrounding areas and get additional money from the bakawan harvest. Fish farming in mangroves or bakawan areas can be lucrative. According to Mr. H.R. Rabanal, fisheries officer of the South China Sea Fisheries Development and Coordination Programme located in Metro Manila, this has been shown by several fishpond owners in coastal and estuary locations.

Mangrove seedlings are planted by the fishpond builders on the tidal flats around the sites to provide an extra buffer zone that may shield the fishpond from strong winds and waves, particularly during typhoons. According to Rabanal, mangrove seedlings placed in a proper location may effectively serve as a haven for fish and other aquatic species. Also, a good nursery area may emerge during the fifth year, when the trees have grown to a height of half a metre. As the trees are taken down for forest products in the future, the operator might get money from the trees. Nonetheless, replanting is necessary to keep the mangrove region protected.

The best mangrove locations for fish farming, according to Rabanal, are those with elevation below the lower high tides and those that can be drained during the lower tides. He mentioned Legaspi, Cebu, and Davao as the best cities for effective fishpond management.

II. DISCUSSION

For fish producers, acidic soils may provide major challenges. Fish deaths may occur on very acidic soils. Less acidic soils may restrict the availability of soil nutrients and hence hinder the development of organisms that provide fish food, such as algae and planktons, even if they may not directly cause fish mortality. The management of soil acidity is crucial for productivity [8]–[10].

The oxidation of soil sulphides is a significant contributor to soil acidity in coastal fishponds. This may result in very acidic soil, particularly in recently constructed ponds. Fish fatalities, inadequate fertiliser use, low natural fish food production, and delayed fish development are all issues brought on by acidic soil. Leaching, often known as soil conditioning, is one method of enhancing very acidic soils. To lessen the soil's acidity, leaching entails creating a strong drainage system before alternately drying and flushing the soil. The time it takes for leaching to reduce acidity, however, is not well understood and may vary depending on the kind of soil and other elements.

While the quantity of lime required makes liming potentially quite costly, it may be an effective therapy for soil acidity. Lime comes in three different forms: agricultural lime, slaked lime, and burnt lime. The kind of lime that acts most quickly is burned lime. Crushed limestone or seashells are heated to create it. Nevertheless, it has been determined that its usage in the Philippines is impracticable due to its expense and handling challenges. While slaked lime, which

is effectively burnt lime with water added, also has a quick action, its high cost prevents it from being widely used. Agricultural lime, the third kind, is less effective than the first two. Despite its somewhat delayed action, it may be the most practical method for long-term soil acidity reduction because to its lower cost and simplicity of use [11]–[13].

III. CONCLUSION

Get your soil analysed to find out how much lime you need to add if you must. Understanding the right application rate aids in boosting output and avoiding overliming. Additionally keep in mind that phosphate and lime may combine to generate insoluble compounds. To put it another way, the calcium in lime will react with the phosphorus in the soil to create a molecule that locks the phosphate with the calcium, making it unavailable for plant development

REFERENCES

[1] D. L. Sutherland, J. Park, P. J. Ralph, and R. Craggs, "Ammonia, pH and dissolved inorganic carbon supply drive whole pond metabolism in full-scale wastewater high rate algal ponds," Algal Res., 2021, doi: 10.1016/j.algal.2021.102405.

[2] L. Ross and L. Fanning, "Mobilizing values: Using perceptions of barachois ponds in Nova Scotia to advance informed management," Facets, 2021, doi: 10.1139/FACETS-2020-0060.

[3] L. Ho and P. L. M. Goethals, "Municipal wastewater treatment with pond technology: Historical review and future outlook," Ecological Engineering. 2020. doi: 10.1016/j.ecoleng.2020.105791.

[4] K. Song, C. Winters, M. A. Xenopoulos, J. Marsalek, and P. C. Frost, "Phosphorus cycling in urban aquatic ecosystems: connecting biological processes and water chemistry to sediment P fractions in urban stormwater management ponds," Biogeochemistry, 2017, doi: 10.1007/s10533-017-0293-1.

[5] I. A. Thornhill et al., "The functional response and resilience in small waterbodies along land-use and environmental gradients," Glob. Chang. Biol., 2018, doi: 10.1111/gcb.14149.

[6] M. A. R. Hossain, M. Ahmed, E. Ojea, and J. A. Fernandes, "Impacts and responses to environmental change in coastal livelihoods of south-west Bangladesh," Sci. Total Environ., 2018, doi: 10.1016/j.scitotenv.2018.04.328.

[7] S. Varty, I. Lehnherr, K. St. Pierre, J. Kirk, and V. Wisniewski, "Methylmercury Transport and Fate Shows Strong Seasonal and Spatial Variability along a High Arctic Freshwater Hydrologic Continuum," Environ. Sci. Technol., 2021, doi: 10.1021/acs.est.0c05051.

[8] A. Ghadouani, "Ecosystem function in waste stabilisation ponds: Improving water quality through a better understanding of biophysical coupling," EGU Gen. Assem. Conf. Abstr., 2014.

[9] M. S. I. Sohel and M. H. Ullah, "Ecohydrology: A framework for overcoming the environmental impacts of shrimp aquaculture on the coastal zone of Bangladesh," Ocean Coast. Manag., 2012, doi: 10.1016/j.ocecoaman.2012.03.014.

[10] J. Merecí-Guamán, F. Casanoves, D. Delgado-Rodríguez, P. Ochoa, and M. Cifuentes-Jara, "Impact of shrimp ponds on mangrove blue carbon stocks in Ecuador," Forests, 2021, doi: 10.3390/f12070816.

[11] R. B. Setubal et al., "Biotic factors determine ecosystem processes in environments with different hydrological regimes," Freshw. Biol., 2020, doi: 10.1111/fwb.13506.

[12] J. McLaughlin and K. Webster, "Effects of climate change on peatlands in the far north of Ontario, Canada: A synthesis," Arctic, Antarct. Alp. Res., 2014, doi: 10.1657/1938-4246-46.1.84.

[13] Y. Y. Yang and M. G. Lusk, "Nutrients in Urban Stormwater Runoff: Current State of the Science and Potential Mitigation Options," Current Pollution Reports. 2018. doi: 10.1007/s40726-018-0087-7.

Organic Fertilizers: How They Improve Fishpond Yields

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Abstract— Use of organic fertiliser is strongly advised for fishponds that have just been constructed or for those with insufficient levels of organic matter. Chicken dung, which typically includes 1.5 percent nitrogen, 0.4 percent phosphorous, and 0.37 percent potassium by volume, is the most popular organic fertiliser used in fishponds. Cattle dung, pig manure, composted rice straw, and other plant materials are additional sources of organic fertiliser.

Index Terms— Hog Dung, Net Screen, Organic Fertilizer, Pipe Culvert, Pond Bottom

I. INTRODUCTION

Types of manure are utilised at a rate of 1,000 to 3,000 kilogrammes per hectare, while dried chicken dung is put at a rate of 500 to 1,500 per hectare. The following advantages of using organic fertilisers are provided: an improvement in soil texture; an increase in the soil's ability to store water; assistance in preserving soil fertility; and a consistent supply of important plant nutrients and other minerals [1]–[3]. Organic manures in fishponds aid in the growth of zooplankton and lablab, two fishfood species. Zooplanktons are little creatures that float freely in water.

Hog Manure's Value as a Fishpond Fertilizer

Hog dung has a weighted percentage of 0.5 percent nitrogen, 0.4 percent phosphorus, and 0.3 percent potassium. Around 0.09 percent calcium, 25% organic materials, and 1% additional components are present. Of course, 71% of it is made up of water. Application of hog manure in ponds results in a larger percentage turbidity response, which indicates that the pond water gets cleaner after application, according to the experiences of an Iloilo integrated bangus-piggery operator. Better yields, consistent increases in the abundance of lablab and other natural foods.

To get hog dung ready for use as a fertiliser:

Combine 112 kilogrammes of new manure and 8 gallons of water in a large plastic bucket. Overnight, let the mixture sit.

Filter the mixture to get rid of the large particles using a clean jute bag.

Use the filtrate, or filtered water, as the fertilising solution. A tiny quantity of urea should be added at a rate of 0.3 grammes per litre of water. To the pond's water, add this.

Moreover, 13.5 sacks of dried hog dung may be spread over each acre. A tonne of ammonium sulphate is said to have the same fertilising impact as 20 to 30 pigs' worth of manure spread over an entire year.

2. "Integrated Fish Farming in Thailand," written by Soursak Janesirisak, NIFI, Bangkok.

Use Both Organic And Non-Organic Fertilizers To Fertilize Your Fishponds.

According to Atty. Ceferino de los Santos, Jr., a successful fishpond operator in Iloilo, fishponds should be treated with a blend of inorganic and organic fertilisers. Start by applying organic fertilisers. In new ponds or ponds with little organic muck, chicken, cow, or pig manures are added at a rate of 2,000 to 5,500 kilos per hectare. When the pond bottom has been dried and drained, spread the manures. By placing them in bags and letting the manure fall out in ribbons as the spreader walks over the pond, dry and powdered manures should be scattered uniformly over the surface of the pond. If they are wet, they are spread out with shovels or spades after being placed in piles at evenly spaced points around the pond [4]–[6].

After seeing its efficacy in Taiwan, Atty. de los Santos embraced molasses as an organic fertiliser. He said that it functions both as a pesticide and a fertiliser. Use it at a 400 kg/ha rate. Add pond water to the molasses to dilute it. Then, pour it into the water gates when the pond is filled with water. For at least a week under the hot sun, keep the water depth between 5 and 10 cm, or longer if the sun's intensity is not too high. The pond could be filled with fish after two weeks. To the pond's full holding capacity, water must be elevated. Put a few fish in as a test run before filling the area with fish. This will establish if the amount of oxygen in the water is sufficient for fish to survive.

Inorganic fertilisers like 18-46-0 or 16-20-0 should be used after organic fertilisers. With 18-46-0, the rate is 22 kilos per hectare. Add it to platforms while feeding on plankton. Apply the lab food by platforms or by platforms first, then by platforms again. In contrast, use 16-20-0 at a rate of 50 kg per hectare every 14 to 21 days, or as required. Nonetheless, you must make sure that water visibility is kept between 20 and 30 cm.

Your Fishpots Should Be Fertilized With Animal Manure.

Organic manures from animals like pigs, chickens, cows, and carabaos are inexpensive sources of fertiliser for tilapia farming. In fact, some creative fishpond owners have built pigs and chicken coops so that animal faeces may be washed

right into the pond.

Particularly in freshly created fishponds with a deficiency in organic matter content, organic fertiliser should be used. These are a few of its benefits:

1. The soil's texture is better.

2. The ability to store more water is improved

3. The soil is improved.

4. The main plant nutrients and other minerals are released gradually.

5. Promotes the development of zooplankton and lablab, which are excellent natural sources of fish food.

Decomposed organic fertiliser should not, however, be applied to the whole pond bottom. The amount of oxygen in the water will decrease if you do that. The necessary application should be piled up in 20–30 kilogramme portions. Put 500 to 1,000 kg of dry chicken manure per acre. Between 1,000 and 2,000 kg of other manures are applied each acre.

How to Really Destroy Fishpond Pests

One: Avoid using chemical formulations containing hydrocarbons in ponds since over time, these substances have a tendency to sterilise or make infertile the pond soil. Use alternative organic compounds high in Retenone or Saponin instead, such as tobacco dust.

Two: While rice straw makes fantastic compost, it decomposes slowly. It is preferable to create compost piles on top of the dikes using a mixture of rice straw, pond muck, and ammonium sulphate. To keep air out of the compost, cover the mound with mud. If available, combine compost and clostridium bacteria. This bacterium thrives in anaerobic environments and speeds up the decomposition of rice straw. Lastly, since it is more quickly effective and less expensive than agricultural lime, use hydrated lime instead. Additionally, the pond bottom will get harder from an excess of agricultural lime [7]–[10].

Remove Predator Access To Your Pond

These are several methods for keeping predators out of the pond. These actions will also stop the farmed fish from escaping.

Placing closure slabs in a parallel line from the bottom to a height that is level with the water line necessary for fish culture will seal the water gates. Between the slabs, compact the mud firmly. Place a pair of slabs that have been cut to suit the pipe or culvert when utilising pipes or wooden culverts to collect water. After that, tack on two additional slabs. A bag of wire screen or fine mesh nylon net should be tied to the pipe using rubber strips or ropes. On the pond side of the pipe or culvert, the net or screen is put in place. To allow the fish farmer to view the net or screen for cleaning when it becomes clogged, the pond water should be a few inches below the pipe or culvert.

An alternative method involves creating a sleeve-like contraption and tying one end to the pipe and the other to a bamboo pole within the pond. The net or screen will stop the escape of the farmed fish or fry as well as the introduction of undesirable species. Another technique is to fill the pipe or culvert with materials that do not dissolve in water, such as steel wool, a fabric bag packed with coarse sand, or other filtering materials.

Progressive Fishfarmer Urges Use of Organic Pesticides

Pests in the pond soil such polychaete worms, snails, and chironomid larvae feed on lablab and compete with fish for food, thus fish farmers need get rid of them. What insecticides to employ is a crucial decision when putting a pest control programme into action. Should we use chemical or organic pesticides?

Successful fishpond owner in Iloilo, Mr. Ceferino de los Santos Jr., advises fishfarmers to exercise caution while selecting and using chemical pesticides. He said that the majority of chemicals had harmful aftereffects that endanger both people and fish. For instance, long-term residual effects of chlorinated hydrocarbons like DDT, Endrin, Chlordane, and Gamma BHC are thought to contribute to soil sterility and poor development of lablab and other natural foods. Gusathion is one of the organic-phosphate group of chemicals that has a two-week residual impact. The chemical, or the most of it, is eliminated if the pond is properly cleaned and emptied of treated water. Since animals killed by this poison should not be consumed by humans or other animals, it should only be used with the utmost discretion. Triphenyltin compounds, which are marketed under the trade names Duter, Brestan, Baylucide, and Aquatin and are known to be poisonous to worms and snails, should not be used in ponds since they also affect soil fertility and may hinder fish.

II. DISCUSSION

Tobacco dust, Derris roots, and other substances containing Saponin and Rotenone, such as tea seed cake or Gogo bark, should be utilised as organic insecticides rather than synthetic ones, according to de los Santos. Depending on the pest density, tobacco dust should be treated at a rate of 200–400 kg per hectare. When the pond has been fertilised, dried, and drained, spread this stuff over it. But, you must overnight immerse the bags holding the tobacco dust in water. Then, distribute them uniformly across the pond's soil. This will stop the wind from carrying the dust or shavings away. By placing water drums above the water gate, tobacco dust or shavings might also be applied. The water is allowed to flow very slowly into the pond when you pour the mixture of water and tobacco dust into the incoming water when it's time to start the development of lablab. Transporting and distributing the material throughout the whole pond will not be necessary, saving time and effort. To give the nicotine time to work on the pests for 10 to 2 weeks, the water in the pond is maintained at a maximum depth of 5 to 10 centimetres. Moreover, Lablab will begin to expand during this time.

The same method is used to distribute derris root solution. 40 kg of roots should be applied to a hectare of land with 10

cm of water. To lessen the amount required, decrease the volume of water. If accessible, tea seed cake is a useful pesticide that targets certain pests. Moreover, it will kill fish, but not prawns or shrimp. The key issue is that this substance is difficult to come by in significant numbers throughout the nation. Saponin is the main active component. Fish may be killed by a part per million of saponin. Shrimp won't perish from treatment at concentrations up to 11 parts per million. High temperatures make it more effective [11]–[13].

Ways to Avoid Pollution Caused By Fish Wastes

Throughout development, fish and other aquatic creatures emit urine and faeces. The pond water is polluted by these waste materials as well as other degraded materials. These waste products, or metabolites, may become hazardous under conditions of high stocking rates, stressing or killing fish.

Don't let your fish stock stay in a single pond for more than a month to prevent this. After a month, move the fish to a different pond, empty it, and dry it out to get rid of the metabolites.

Yet, since prawns have a propensity of hiding in the mud during the day, it is impossible to transfer or relocate prawns in prawn ponds. Instead, prawn raisers move a chain across the pond's canals. This will agitate the pond's bottom and clear the water.

Management of Oxygen Depletion

Fish farming poses a serious risk of oxygen deprivation, which might result in the eradication of an entire fish population. During the months when this issue is most serious, routine monitoring of all ponds should be done at dawn. When crayfish emerge at the pond's edge, fish, snails, or tadpoles arrive at the water's surface, or when black streaks form, low oxygen levels are indicated. Musty stench, methane odour, and hydrogen sulphide odour are signs of oxygen deficiency.

Fish begin to surface and display distress signals if there is less than 2 ppm of oxygen in the water 18 inches below the surface. Usually, the problem may be temporarily fixed by partially emptying the pond and replenishing it with well water or by adding significant amounts of water from a nearby pond's surface. The greatest long-lasting remedy for low oxygen levels is fresh water and a decrease in fecundity.

It may be inferred that there is either no photosynthetic activity or bacterial decomposition is utilising the oxygen faster than it can be created if the dissolved oxygen level is less than 3 ppm at dawn and does not increase throughout a bright day.

III. CONCLUSION

To kill bacteria and oxidise organic materials in this environment, the farmer may spread 25to 50 pounds of hydrated lime over each surface acre. This may be done as many times as necessary, but lime must be applied evenly throughout the whole surface of the pond. The addition of ammonium phos- phate fertilisers may quickly reestablish the bloom if there are insufficient algae present. There shouldn't

be any fertiliser supplied if there is an algal bloom

REFERENCES

[1] K. W. Chew, S. R. Chia, H. W. Yen, S. Nomanbhay, Y. C. Ho, and P. L. Show, "Transformation of biomass waste into sustainable organic fertilizers," Sustainability (Switzerland). 2019. doi: 10.3390/su11082266.

[2] Menino et al., "Agricultural value of Black Soldier Fly larvae frass as organic fertilizer on ryegrass," Heliyon, 2021, doi: 10.1016/j.heliyon.2020.e05855.

[3] C. Tao et al., "Bio-organic fertilizers stimulate indigenous soil Pseudomonas populations to enhance plant disease suppression," Microbiome, 2020, doi: 10.1186/s40168-020-00892-z.

[4] B. E. Daadi and U. Latacz-Lohmann, "Organic fertilizer use by smallholder farmers: Typology of management approaches in northern Ghana," Renew. Agric. Food Syst., 2021, doi: 10.1017/S1742170520000228.

[5] Y. Xu et al., "Antibiotic resistance genes in different animal manures and their derived organic fertilizer," Environ. Sci. Eur., 2020, doi: 10.1186/s12302-020-00381-y.

[6] M. A. Salam, M. N. I. Sarker, and S. Sharmin, "Do organic fertilizer impact on yield and efficiency of rice farms? Empirical evidence from Bangladesh," Heliyon, 2021, doi: 10.1016/j.heliyon.2021.e07731.

[7] Y. Wang, Y. Zhu, S. Zhang, and Y. Wang, "What could promote farmers to replace chemical fertilizers with organic fertilizers?," J. Clean. Prod., 2018, doi: 10.1016/j.jclepro.2018.07.222.

[8] P. Fang, D. Abler, G. Lin, A. Sher, and Q. Quan, "Substituting organic fertilizer for chemical fertilizer: Evidence from apple growers in china," Land, 2021, doi: 10.3390/land10080858.

[9] R. Ji, G. Dong, W. Shi, and J. Min, "Effects of liquid organic fertilizers on plant growth and rhizosphere soil characteristics of chrysanthemum," Sustain., 2017, doi: 10.3390/su9050841.

[10] Z. Zhou and H. Yao, "Effects of composting different types of organic fertilizer on the microbial community structure and antibiotic resistance genes," Microorganisms, 2020, doi: 10.3390/microorganisms8020268.

[11] J. Wu, C. Sha, M. Wang, C. Ye, P. Li, and S. Huang, "Effect of organic fertilizer on soil bacteria in maize fields," Land, 2021, doi: 10.3390/land10030328.

[12] D. B. Graves, L. B. Bakken, M. B. Jensen, and R. Ingels, "Plasma Activated Organic Fertilizer," Plasma Chem. Plasma Process., 2019, doi: 10.1007/s11090-018-9944-9.

[13] R. Nattassha, Y. Handayati, T. M. Simatupang, and M. Siallagan, "Understanding circular economy implementation in the agri-food supply chain: the case of an Indonesian organic fertiliser producer," Agric. Food Secur., 2020, doi: 10.1186/s40066-020-00264-8..

Identification of Fish Diseases

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Abstract— An expert may need to perform a laboratory study to diagnose a disease, but an attentive fish farmer may quickly see ill fish. Changes in behaviour, diminished vigour, inability to eat, and the appearance of lesions are four typical signs.

Index Terms— Fish ice, Fish balls, Fresh water, Minced meat, Shrimp prawns

I. INTRODUCTION

Alteration in behaviour: Fish in excellent condition are only visible in ponds while they are eating. Disease should be suspected if the fish congregate in the vegetation close to the incoming water supply or in any specific location of the pond where they are easily visible [1]–[3]. Indicators of diminished vitality - A healthy fish swims swiftly away from disturbances near the shore. When a fish farmer arrives, fish should flee immediately, therefore there may be a disruption. Additional signs include losing balance, falling fins, and overall sluggishness.

Failure to feed - Under ideal water conditions, healthy fish feed enthusiastically, often consuming food right away. Fish may stop eating due to illnesses, high water temperatures, or low oxygen concentrations, but their refusal to eat is a warning that the circumstances in the pond are not acceptable. The farmer has to act right now to determine why his fish aren't eating.

Wounds - The majority of illnesses that affect warmwater fishes cause lesions or sores. Open sores or sizable portions of the body that are discoloured are the apparent ones. Others include hematomas in the head, body, or fins; cysts in the muscles, skin, or internal organs; and swollen regions around parasites. Every lesion is a strong sign of trauma or illness and warrants a thorough evaluation. The first stage in illness control is a proper diagnosis. One should be aware of the water, the fish, and the chemical to be employed before beginning any therapy [4]–[6].

Virus Signs and Symptoms in Fish and Prawns

The bacteria Vibrio anguillarum, which causes vibriosis in fish, has drawn more and more attention in recent years. Vibrio is now recognised as a pathogen in various species of fish, despite first being connected to the red illness of eels. Researchers from SEAFDEC have discovered that fish sickness is what kills prawns. Vibrio is known to cause gastro-enteritis in humans in Japan and the United States, yet it is unclear how it ails prawns.

Vibriosis apparently occurs even in water as cold as 4°C at any time of the year. Summertime is when it is most common. As the water temperatures go to between 14 and 20 °C, outbreaks are to be anticipated. Vibriosis normally doesn't show any symptoms until the fish have been in seawater for two weeks. Fish farmers may notice decreased feeding activity, irregular, whirling swimming patterns, and gathering at the borders of the enclosures. Fish that are ill exhibit bleeding at the bases of their anal and pectoral fins or a bloody vent discharge.

How to maintain fish in ice longer

Here are some things you need to know if you often sell your fish on ice in order to preserve the fish throughout storage and transportation. According to a research from the Food and Agricultural Organization, or FAO, bacteria, chemical reactions, or the fish's own enzymes are often to blame for spoiling any food, but especially fish. When a fish perishes, spoiling starts. The most popular method of decreasing temperature is by "icing" or keeping the fish in ice. This will slow down the rate of decomposition [7]–[10].

Fishermen who create the fish and merchants who sell it may reduce losses from spoiling by being aware of the frozen fish's storage life. Here are some suggestions on what types of fish last longer and how to pack fish to prevent it from spoiling quickly:

1. Little fish often don't survive on ice as well as larger ones.

2. Fish that have been extensively consuming food just before being harvested spoil more rapidly than fish that have been fasting for a while.

3. Flat fish retain their shape better on ice than spherical fish.

4. Fatty fish rots quickly, even when kept under ice.

5. Rapid spoiling might result from inadequate ice or improper packaging techniques.

Ways To Avoid Fish Spolage

One of the issues facing bangos producers and sellers is keeping the fish from spoiling. When the market expands, the issue gets more severe. These recommendations are based on research done by the Food Terminal. Incorporated.

1. Fish must be cooled before packaging in order to be transported by boat over a 24-hour period. Pack them in a reinforced one-cubic metre container with drainage ports at the bottom for optimal results. The wooden dividers in this container keep the fish bags apart from one another.

2. Prior to packing, refrigerate the fish at 0 degrees Celsius for air transport with an hour's flight duration. Styrofoam

boxes with a net weight capacity of 60 kilogrammes should be used to pack them. You don't have to add ice, but if you do, add one kilogramme of ice for 20 kg of fish.

3. Baeras with drainage holes for fish fluids and melted ice were proven to be significantly more affordable and long-lasting than polystyrene boxes for land transportation and to protect the quality of the fish. For transporting unchilled fish via land, however, polystyrene cartons are used over baeras.

Recently, a technique for partly freezing fish was introduced in Japan. Using this novel method, the fish is refrigerated to -3°C. As the cold fish doesn't need to be thawed, its proponents in Japan assert that the raw "sashimi" prepared in this manner is just as delicious as live fish.

The Tokai Regional Fisheries Research Institute of the Japanese Fisheries Ministry created the partial freezing method. Prior until this, fish freezing technology has been focused on rapid freezing at or below -30 degrees Celsius. The technique' creator, Mr. Ken Uchiyama, was worried about the loss of protein and taste in fish kept at these low temperatures.

Just around 30% of the fish in the chilling or partial freezing procedure reach -3 degrees Celsius. After being refrigerated for ten days, fish may be utilised for sashimi. Additionally, chilled fish is easier to transport than live fish, and partial freezing techniques may result in better utilisation of fish because heads, tails, and internal organs can be removed at the original production centres and turned into fish meal. Cold storage facilities for chilled fish are less expensive than those for very low temperature quick freezing.

The Japanese inland fishermen's cooperatives had taken notice of these benefits. Since late last year, they have been delivering chilled carp and rainbow trout to Tokyo. The novel method may also be used to saltwater fish, it is hoped.

Using leftover fish to make fish balls

Fish balls may be made with tilapia and trash fish. This was shown by experiments on the capacity of tilapia and garbage fish to produce gels. Fish balls composed with garbage fish and tilapia are white and springy.

Making fish balls out of rubbish fish is advised by the Singapore-based SEAFDEC Marine Fisheries Research Department.

1. Gut the fish after beheading it.
2. Distinguish fish flesh from bones and skin.
3. Use water that has been filtered through a nylon bag to wash chopped meat.
4. Remove extra water from minced meat by pressing. A hydraulic press may do this.
5. Use water to bleach minced meat twice.
6. Before packaging and freezing at -30°C, blend bleached minced meat with 2.5 percent sugar and.2 percent preservative in a grinder.
7. Form minced meat into balls for fish. To prevent the minced meat from crumbling, add a little flour.

8. Before frying, dip fishballs in water that is 40°C.
9. Deep-frying.

The Right Manner of Packaging Fish for Shipment

Fish is quite fragile. Fish should be packed and transported with the utmost care.

1. If the fish have not been sorted in the fishpond, sort them according to size and quality. Sort the fish into high- and low-quality categories. Fish of high grade has a silvery white colour, is spotless, rigid, and fresh, is fatty, has tiny heads, and has rounder bellies. Poor grade fish include those with soft, crimson eyes, huge heads, flat bellies, discoloured, or missing scales.

2. Use fresh, clean water to wash the fish.

3. Create a large box that is ideally eight feet long, four feet wide, and four feet high. This is typically built of wood with reinforcements at each corner in the form of flat iron bars. Nipa leaves, lawanit sheets, or styropor may be used to line the box.

4. Fill the box with crushed ice that is piled up to 30 cm high. Palletize them to compact them. With their heads pointing in the same way, arrange the first layer of fish on top of the ice. The fish's body should be positioned with its back facing down and at a 45-degree angle. This will avoid fish deformation by keeping the fish's fleshy portion constantly in touch with ice. On top of the fish, add a second layer of crushed ice that is 20 centimetres thick. Then spread out more fish on the ice. Up till the box is full, repeat the operation. But, be sure to leave a gap of around 30 cm from the boxes top. The fish in the box will be arranged in 8 to 9 layers.

5. Add crushed ice to the empty area on top of the box. Then use a pallet to tamp them down. Cover the box with insulation material first, then a wooden top that has been tightly fastened down all the way around. The package is now prepared for delivery.

Because of their softer bodies, shrimp and prawns are packed differently. They are often sent by air in styropor or carton boxes with some ice. Before packaging, they are separated, properly rinsed in fresh, clean water, and refrigerated in ice. The box mentioned before, meanwhile, might also be used for fish. Put the shrimp or prawns in bamboo baskets or kerosene cans this time instead. The cans or baskets are then put into the box on top of a layer of crushed ice. Make sure there is enough room between cans or baskets so that crushed ice can be added. Crushed ice should be placed on top of the cans or baskets. Continue this technique until the box is filled with four layers or more of cans or baskets. Crushed ice makes up the top layer, which is likewise coated in a similar way to how fish is packed.

Some fishermen who sell their catch directly to customers engage in preliminary processing. The shrimp and prawns may be purchased whole, headless, or peeled and deveined. They are often sent by air or by boat in chilled boxes after being quickly frozen and packaged in carton boxes. Buyers who want to utilise the heads, skin, and other components of the shrimp and prawns to make shrimp meal or sauce may

purchase them individually.

These are some reminders that you have to constantly bear in mind:

1. Only top-notch fish need to be sent and packaged.

2. Layer the fish so that it will be thoroughly chilled by the ice.

3. Distribute the weight of the fish and ice to prevent the bottom levels from being crushed.

4. Avoid using really tall containers.

5. For larger fish, use coarsely crushed ice, while for tiny fish, use finely crushed ice.

6. After packaging, ship the fish as quickly as you can.

7. If the fish could not be sold right away after arriving at the destination, repack the fish box with enough ice to keep it cool.

8. If there are cold storage facilities available and the fish can't be sold right away, it's best to store it there. Nevertheless, avoid freezing stonehard since it will soften and go red around the eyes, which will lessen its attraction for selling.

II. DISCUSSION

The preparation and cleanliness of the fish during preparation have a significant impact on the quality of dried fish. Keep in mind that poor-quality fresh fish also results in poor-quality dried fish. When there is an abundance of fresh fish that has not been sold, drying is often used because the taste of dried fish may partially mask the flavour of stale raw fish. Unfortunately, improper drying of the fish results in a low-quality dried product. Make sure the fish is completely cleaned, and check that the tools, machinery, and drying racks are all hygienic. Before drying the fish, try to cool it. Your losses will be reduced the better the goods [11]–[13].

A. Advice for Fish Drying

Keeping insects away from the fish is the first stage in the drying process, which may be sped up by lifting the fish off the ground. Simple drying racks may be constructed from bamboo, wood, and other locally available materials. In case of rain, be prepared with a cover. A plastic sheet is often simple, affordable, and practical. To speed up the drying and preservation process, fish that will be dried is salted. A simple solar dryer may be used for solar heating. It is constructed like a tent out of translucent and dark polyethylene plastic sheets and sticks. If you place the black plastic sheet behind the transparent plastic and turn it so that it faces the sun, you may get a temperature of 45 degrees centigrade. Provide top and bottom vents. The common bug that attacks dried fish, the blowfly, may be killed in all phases with a drying duration of 20 hours at 45 degrees Celsius.

C. Drying fish after salting it

Fish that is being prepared for drying is slated to enhance the flavour and acceptability of the dried fish. Salt shortens the time needed for air or sun drying by accelerating the elimination of water from the skin. Fish may be salted by being divided into layers and stacked with dried salt between them, or by being submerged in brine or a salt solution. To cut the drying time in half for oily fish like sardines, submerge the fish in saturated brine for 15 minutes. Fish becomes rotten and discoloured after an extended period of drying. Salt may also be used to kill germs and insects like flies and beetles. Yet, following processing, the salt in dried fish has a tendency to reabsorb moisture. You are thus suggested to appropriately wrap salted dried fish. Often, the market price of the fish is not set by the fish producer. He often benefits the least from fish marketing. These are some of the results of a research on fish selling in Iloilo, Bacolod, and Zamboanga that the Bureau of Fisheries and Aquatic Resources and the Bureau of Agricultural Economics jointly undertook.

III. CONCLUSION

The research found that major intermediaries who greatly influence pricing fluctuations, such as brokers and wholesalers, get the largest share of the profit. Overall, the three cities' fish marketing infrastructures are underdeveloped and riddled with issues. For instance, several government regulations and policies that reduce fish output are being criticised by fish farmers. Among these are the ban on trawl fishing in seas seven fathoms deep or fewer and the closure of fishing sites in Samar, Leyte, and Sorsogon. Further fuel expenditures would result in losses to the fish producers if efforts were made to find new fish sources outside of these restricted fishing areas. In order to prevent potential spoiling and losses, the research listed a further justification for producers not wishing to capture more fish as the absence of storage facilities.

REFERENCES

[1] J. L. Geoghegan et al., "Virome composition in marine fish revealed by meta-transcriptomics," Virus Evol., 2021, doi: 10.1093/ve/veab005.

[2] H. Pu, X. Li, Q. Du, H. Cui, and Y. Xu, "Research Progress in the Application of Chinese Herbal Medicines in Aquaculture: A Review," Engineering, 2017, doi: 10.1016/J.ENG.2017.03.017.

[3] J. Singh, K. Steele, and L. Singh, "Combining the Best of Online and Face-to-Face Learning: Hybrid and Blended Learning Approach for COVID-19, Post Vaccine, & Post-Pandemic World," J. Educ. Technol. Syst., 2021, doi: 10.1177/00472395211047865.

[4] K. W. Vollset et al., "Wild salmonids are running the gauntlet of pathogens and climate as fish farms expand northwards," ICES J. Mar. Sci., 2021, doi: 10.1093/icesjms/fsaa138.

[5] Y. R. Hasanah, E. Ellyke, and P. T. Ningrum, "Praktik Higiene Personal dan Keberadaan Bakteri Escherichia coli Pada Tangan Penjual Petis (Studi di Pasar Anom Kecamatan Sumenep Kabupaten Sumenep) Personal Hygiene Practice and Existence of Escherichia coli Bacteria In Fish Paste Seller's Hand (Study in," Pustaka Kesehat., 2018, doi: 10.19184/pk.v6i1.6770.

[6] B. Bang Jensen, A. Mårtensson, and A. B. Kristoffersen, "Estimating risk factors for the daily risk of developing clinical

cardiomyopathy syndrome (CMS) on a fishgroup level," Prev. Vet. Med., 2020, doi: 10.1016/j.prevetmed.2019.104852.

[7] K. Rehberger, I. Werner, B. Hitzfeld, H. Segner, and L. Baumann, "20 Years of fish immunotoxicology–what we know and where we are," Critical Reviews in Toxicology. 2017. doi: 10.1080/10408444.2017.1288024.

[8] E. A. Lescak and K. C. Milligan-Myhre, "Teleosts as model organisms to understand hostmicrobe interactions," J. Bacteriol., 2017, doi: 10.1128/JB.00868-16.

[9] A. G. McCoy et al., "Identification of fungal communities within the tar spot complex of corn in Michigan via next-generation sequencing," Phytobiomes J., 2019, doi: 10.1094/PBIOMES-03-19-0017-R.

[10] M. F. Castanheira et al., "Coping styles in farmed fish: consequences for aquaculture," Reviews in Aquaculture. 2017. doi: 10.1111/raq.12100.

[11] G. Jacobson et al., "Omics and cytokine discovery in fish: Presenting the Yellowtail kingfish (Seriola lalandi) as a case study," Dev. Comp. Immunol., 2017, doi: 10.1016/j.dci.2017.04.001.

[12] S. Henry, D. S. Wijesinghe, A. Myers, and B. T. McInnes, "Using Literature Based Discovery to Gain Insights Into the Metabolomic Processes of Cardiac Arrest," Front. Res. Metrics Anal., 2021, doi: 10.3389/frma.2021.644728.

[13] C. T. Perry et al., "Elasmobranch microbiomes: emerging patterns and implications for host health and ecology," Anim. Microbiome, 2021, doi: 10.1186/s42523-021-00121-4..

Criteria For Selecting Fish Pen Site

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Abstract— It has been discovered that fish pen farming is quite lucrative, with a high and rapid return on money. Owners of fish pens in Laguna Lake, who mostly produce bangos, are a prime example of this. It seems that losses only happen during typhoons or sometimes fish deaths.

Index Terms— Cage Culture, Coal Tar, Fish Pens, Fish Farming, Pond Culture

I. INTRODUCTION

Fish pens may be constructed from synthetic netting such as kuralon, nylon, cremona, or tamsi or from bamboo screen, known locally as banatan. Fish pens come in shapes like squares or circles and range in size from one-fourth to one hectare. Yet a square pen is more cost-effective and useful. Fish reared in enclosures rely on the lake's natural food supply. Yet, the majority of farmers supplement their meals with items that are readily accessible in the area, such as rice bran, bread crumbs, maize meal, coconut meal, fish meal, dried shrimps, lumut, ipil-ipil leaves, and kangkong [1]–[3].

The length of culture is determined by the fish's size and market demand. The timing of harvest is often determined by bad weather. Drag seines, gill nets, and cast nets are the most typical harvesting tools. With one hectare of pens, as much as 1.5 to 4 metric tonnes may be taken out annually, which is ten times the catch of fish in open waters.

But, make sure the following conditions are satisfied before starting a fish pen farming business:

1. You can buy fingerlings.
2. Even at the lowest tide, the water doesn't dip below one metre.
3. Moderate current flow.
4. The pH is steady.
5. Clay-loam and muddy-clay make up the bottom soil.
6. Locally, affordable labour is accessible.
7. The fish pens are wind-sheltered.

What is wrong with the fish pen market?

The concerns that affect the Philippines' fish pen business have been recognised by a senior official of the Laguna Lake Development Authority; knowing about these issues should be beneficial to investors and fishpen aquaculturists. The general manager of LIDA, Teodoro Baguilat, listed the following five issues:

1) Typhoons are the leading cause of fish pen deaths. Fish nets may collapse when there are strong winds creating waves and a significant rain. While it can seem like a blessing to the poor fisherman capturing them in open seas, fish escape represents a big loss to the fish farmer.

2) According to Baguilat, fish mortality causes the recovery rate to be only 40–50% of the stocking rate at the time of harvest. Because of physiological stress, there is often a significant percentage of mortality at the fingerling stage, shortly after their introduction in the fish cages. The alleged "summer fishkill" is a typical phenomenal cause.

3) Accessibility issues are brought on by dense growths of water hyacinth in the areas between fish cages and in navigational channels. By pushing on the bamboo barrier during heavy wind events, these accumulations can harm fish enclosures. Water plant populations may actually worsen the impact of a typhoon on fish cages.

4) Issues with predators may be quite dangerous. The most significant of these carnivores are mudfish and catfish.

5) Baguilat refers to the fifth issue as the societal problem emphasised by the rise in reported poaching. Operators of fishpens claimed that 38 percent of their fish losses were attributable to poaching. It is difficult to pinpoint the precise form of poaching, the LLDA official concedes, but he highlighted stories of milkfish being let out of fishpens via net enclosures that had been cut below the water's surface and subsequently captured elsewhere. According to Baguilat, several fishpens owners go as far as adding a second bamboo fence around their existing one or employing private security personnel to deter poaching.

A floating structure with fish pens

Such a device, according to Chua, would assist fishermen who are struggling with a decreasing catch in inshore seas. It has been discovered that fish cage culture is sometimes more suitable than pond culture. Since the family would be involved in the fish cage culture, he continued, the family unit might serve as a training ground for next generations of fish farmers.

The group consists of four rafts, each of which has eight net cages. To accommodate the family living at or working at the fish farm, a floating home is also constructed. An 8-cage raft has half the space of the home. Each of the eight-cage rafts measures 5.4 by 8.4 metres, while the floating home is 9.6 by 15.6 metres. Plastic barrels are used to make the object float. The home contains a working platform for cleaning, drying, or repairing the nets as well as room for preparing meals, and it can house at least a family of four. Wooden pegs hold the home and the floating cages to the ocean floor. In the event that the situation worsens, the whole family unit may be

transferred and hauled away [4]–[6].

Pond fish losses due to oxygen deprivation are significant. When fish die in cage culture due to oxygen deprivation, the loss is often 100 percent. Fish in ponds have the freedom to roam around and may disperse when the dissolved oxygen level declines or to locations with greater oxygen concentrations. Fish in cages, however, are unable to leave their confinement. Due to the packed fish's rapid oxygen consumption at the expense of the oxygen supply, losses are often total. Aeration and trash disposal depend on efficient water circulation throughout the cage. Appropriate cage location has a significant impact on circulation, which is heavily influenced by wind-induced water currents and is helped by the fish's swimming movement.

1) The longer side of the cage should face the dominant wind when it is placed.

2) There should be at least a 20-foot space between cages.

Cages should be placed over deep water to allow solid wastes to descend where water stratification keeps them out of the water where the fish reside.

The Philippines' pond culture fishery appears to have very promising futures—brighter than those of Japan, in fact—due in large part to its high growth rates, low pollution levels, vast expanses of undeveloped swamps and estuaries, ability to culture fish year-round, and relative ease of growing natural fishfoods. Hiroshi Motoh, a Japanese specialist in fish ecology and culture who has spent more than four years at the SEAFDEC Aquaculture Department situated in Tigbauan, Iloilo, Philippines, has made this evaluation. Mr. Motoh is in charge of the SEAFDEC's ecological research project.

He bases this assumption on the following arguments for why pond culture fisheries in this country has a better future than in Japan:

1. Due to the constant high water temperature, fish raised in ponds in the Philippines develop more quickly. Fish and shrimp may be raised year-round because to the mild temperatures.

2. Industrial facilities and sewage disposal cause less contamination of coastal waterways.

3. Vast tracts of undeveloped marshes and estuaries still exist, and constructing pond areas here would be far less expensive than in Japan.

4. Compared to temperate zones, the Philip-pine forests have longer spawning seasons for important species, allowing for the spawning of more fry over a longer period of time.

5. Pond water management is simple owing to the long time between low and high tides. Because of this, rivals and predators of farmed fish and shrimp may be readily managed.

6. Lablab, a complex of diatoms and Zoo-planktons, naturally develops in nursery and culture ponds and provides bangus and other species with an affordable source of food.

For Fishpond Raisers: Conversion Guides

Some of the specifics required in the day-to-day administration of fish ponds are rather straightforward. Yet, if instructions call for amounts and measures that fish farm employees may not be acquainted with, they might be perplexing. The fish farmer may benefit from converting units of measurement between several systems while he does routine but crucial pond preparations [7]–[10].

The quantity of chemicals to be used in fish farming may be calculated using both metric and English units, and potentially confusing mixes of the two. This is a list of common units used in fish culture:

Water weighs 62.4 pounds and has a volume of 7.5 gallons in one cubic foot. A pond's cubic feet are determined by multiplying its length, breadth, and average depth.

The area of your pond times the average depth of the water yields its volume. 5,000 cubic metres of water, or 50 million cubic centimetres, or millilitres, are present in one acre of water that is half a metre deep. It might also be 13,382 gallons. 3,800 cubic centimetres . 3,800 grammes, or 8.34 pounds, make up one gallon of water. When measuring tiny quantities of chemicals, metric units are usually utilised. So, we may use a certain amount of chemical grammes per gallon, chemical grammes per cubic foot, chemical grammes per cubic centimetre, or chemical grammes per cubic centimetre.

It is standard procedure when treating fish to add enough chemicals to the water to get the required concentration. Parts of chemical per million parts of water, or PPM, is the standard unit of concentration. For instance, adding one gramme of water to 999,999 grammes of water results in a solution with a concentration of one PPM in a total weight of one million grammes.

Chemical addition to fish diet is another therapy strategy. Based on the fish's weight, this therapy is given. If a standard unit of treatment is given in grammes of a chemical per 100 pounds of fish per day, then the amount of feed given each day must contain 2.5 grammes of the chemical or drug. For example, terramycin is given at a rate of 2.5 grammes per 100 pounds of fish per day when treating 100 pounds of fish. Fish are typically fed at a rate of around 3% of their body weight every day, or 3 pounds of feed for every 100 pounds of fish. Every 3 pounds of feed must include 2.5 grains of terramycin for treatment. Terramycin is consequently present in feed at a rate of 3 divided by 100 multiplied by 2.5, or.075 grammes, per pound of feed.

Formulation use and disposal

We are presuming for the sake of these examples that all of the chemicals are pure substances or contain a 100% active component. There aren't many pure chemicals among the substances we use today, however. Dividing 100 by the percentage of the active component specified in the formulation can help you determine how much of this combination is required. If, for instance, that the chemical to be employed has a 25% active component, you would need four times as much of the formulation as you would for a pure chemical by dividing 100 by 25%. One last thing to remember is to always calculate parts per million using the

weight of the active chemical.

Polyculture Is Used by Most Panay Fishfarmers

Over half of the fish farmers in the Philippines use polyculture, which involves raising shrimp and bangus in separate ponds. This was discovered in a research done for her master's thesis by Rose Tenedero of the SEAFDEC Institute of Aquaculture. The research comprised around 72 cooperators who were trained at SEAFDEC between 1974 and 1976 and came from Iloilo, Capiz, and Aklan. The survey also revealed that one-third of bangus were raised in monoculture, with the remaining two-thirds dedicating certain ponds to polycultures of bangus and prawns. At the time of the research, milkfish was still the most important agricultural output among these cooperators; among cooperators in Iloilo, it made about 80–100% of the pond crop. Aside than sugpo, additional goods included crabs and shrimp. Around 37% of the cooperators were from Iloilo. Capiz and Aklan reported allocating between 1% and 20% of their total pond area for the production of sugpo. The majority—nearly three-fourths—did state they intended to expand the prawn area.

The research also demonstrates the cooperators' very little exposure to prawn culture. None of the three had more than 10 years' worth of experience in the prawn industry, and two of the three had less than a year's worth. All of the respondents said that they had just attended the prawn cultivation instruction they received at SEAFDEC at the time.

Study Reveals Panay Farmers' Pond Management Practices

According to research involving 72 cooperators from Aklan, Capiz, and Iloilo, many of the pond culture approaches that Panay farmers had been using closely matched the suggested procedures. The techniques of pond drying, acclimatisation of shrimp fry, regular water changes with the high tide, and keeping a water depth of between 30 and 90 cm were among the techniques that were frequently used.

However according to reports, feeding varies depending on the foods' availability. And while Iloilo pond cultivators ranked the growing of lablab, method of stocking, and accli- mation techniques as the most crucial aspects of pond management, their counterparts in Capiz and Aklan prioritised building strong dikes, maintaining well-kept gates, installing screened water intakes, and accli- mation.

Because of the ponds' high elevation and rather high salinity, particularly in the summer, the cooperators who participated in the study's interviews admitted that their ponds weren't particularly suited for prawn production. They said that a reliable source of freshwater was their biggest issue. The fact that many fish farms stock whenever fry is available, a reflection of the erratic availability of fry, is an important result. More fish are caught in the creek's instant pond than in the ponds of Capiz. In Barangay Hipuna, Pontevedra, Capiz, the majority of fishermen used to be completely dependent on the little fish harvests they caught from the sea, which sometimes weren't even enough to feed their family.

Yet it was prior to them coming together, creating a cooperative, and constructing an emergency fishpond in a stream. Alimango, bango, and sugpo totaled 480 kg from the 400 square metre instant fishpond. This translates to 12,000 kilogrammes per acre, which is 60 times the Capiz minimum average fishpond production.

The Tugbongan-Libakaw Fish Farmers' Cooperative's 62 members who are farmers in Barangay Hipuna have received enough revenue from this initiative to support their families. A second 500 square metre quick fishpond was built in the stream by the cooperative as a result of the project's success. The quick fishpond is not a novel concept in fish farming, according to Nelson Oquendo, a fishpond operator who was involved in the project's inception. Fishermen in Laguna de Bay already utilise nylon nets exclusively as walling material in their fishponds, which is similar to the instant fishpond. The fishpond in question uses marine plywood in conjunction with nylon netting. The plywood, which is 3/4 inch thick, four feet wide, and eight feet long, was first placed in a container of coal tar and left there for a week or more. Coal tar was also used to cure 12-foot-long wood posts that were three by four inches in size.

According to Oquendo, the plywood and posts may be made to endure up to ten years by soaking them in coal tar. The stakes were then pushed into the creek's bottom at intervals of eight feet. They have the marine plywood tacked on them. The plywood was buried three feet underwater and one foot deep in the pond silt. Oquendo said that due of the plywood fence, the pond would still have water even if the stream dried up.

Three feet wide nylon net is used to line the plywood wall's top. As a result, every time the tide goes out, the water in the pond will be altered and become fresh once again.

In seawater, wood is attacked by two main kinds of marine organisms. The shipworm and Martesia are members of a group that is linked to mollusks and clams. The timber is severely damaged by these borers. The wood that is submerged is attacked by the shipworm larvae by drilling holes in it. The worm digs a tunnel along the woodgrain after it has entered the wood. As the shipworm expands, the tunnel becomes bigger. The Martesia, in contrast, is operational all year round. The other category of marine borers is that which affects crustaceans, notably Limnoria. They only cause harm up to the water's surface. Pressure-treated timber should be used for ships, fishing boats, and other marine construction to prevent marine wood against these marine borers. Employ wood species with an inherent resistance to sea borers. Yakals, manggachapuis, and yakal-gisok are species that have not been seriously harmed. Almon, Palosapis, and Guijo are three tree species having a modest lifespan. White Lauan should not be used because marine borers may cause significant damage to it.

The location you choose will have a direct impact on how your milkfish farming venture turns out. Before to building a fishpond, inspect the area. You may select the best website by keeping the following advice in mind: Climate. In warm water exceeding 23 degrees centigrade, milkfish, also known as bangos, develops more quickly. But, when the water's salinity, or salt concentration, exceeds 45 ppt, its development is slowed. A helpful indication is the sort of climate that predominates in a location. As opposed to areas with uniformly distributed rainfall throughout the year, those with a brief dry season followed by a reasonably rainy season are more suitable for growing bangos. It will be challenging to produce lablab in the latter, which is an excellent natural food source for bangos. In this area, grass green algae, or "lumut," will predominate; nevertheless, the output of bangos will be reduced as a consequence of this kind of feeding.

Soil. Clay, clay loam, and sandy clay are the greatest kinds of soil for bangos ponds. The hard mud described above is preferred over the soft and loose kind. A pond's bottom made of hard mud is ideal for lablab development and is also useful for diking. Avoid soils with a high acidity level. Yellowish to reddish granules in this kind of soil are distinctive, often becoming crimson when exposed.

Topography. Excellent locations include level marshes and tidal flats. Large capital expenditures are required for excavation and levelling in undulating or rolling regions. Moreover, extensive surface irregularity excavation may reveal poor soil that needs a lengthy conditioning time to become productive for the pond bottom. While swamps typically have a flat surface, some may have a little slope towards the river or the ocean. A thorough understanding of the site's layout enables you to minimise earthwork and design your farm's layout to complement the terrain of the area naturally.

Elevation. For appropriate water supply and to be drained when required, a bangos fishpond must be at the right height. At such an elevation, the pond may be filled during normal high tides and can be drained during normal low tides. Discover the local tidal features before building a pond so you can choose the optimal pond elevation.

Providing water. All year round, there ought to be enough high-quality water. It could originate from a tidal river, stream, creek, or the ocean itself. Depending on the river's proximity to the open sea and the local environment, the salinity or salt content of the water may vary significantly. To determine if the river's water is pollutant-free, it needs also be tested. It is advantageous to have a freshwater supply nearby, particularly during a prolonged dry season. To stop the salinity of the pond's water from rising, you'll need it. Vegetation. Avoiding densely vegetated regions can save you money on labour costs to remove the trees and other vegetation. The region may still still be covered with tree stumps. Socioeconomic Elements. If competent labour is readily accessible and inexpensive, if suppliers of building supplies and production inputs are close to the farm site, and

if the neighbourhood is generally peaceful and orderly, building and managing ponds will be simpler, less expensive, and more effective.

Ensure That You Have A Quality Water Source

One of the most essential requirements for brackishwater fish farming is a plentiful supply of clean, unpolluted freshwater and tidal water. As long as the water from these sources is pure and unpolluted by industrial, agricultural, and human settlement contaminants, you are able to get freshwater by digging ground wells, taking for artesian wells, or tapping from springs, rivers, or lakes.

A coastal estuary or water area away from polluting sources would be a great supply for saltwater. In Taiwan, shallow wells are dug on the seashore at levels below the lowest water level by fish farmers to acquire pure sea water. Sand serves as a water filter. Reservoir. If there are no reliable water sources close by, you may need to construct a reservoir. High tide might completely flood the reservoir. Provide the reservoir adequate water gates so that it may benefit from the tidal power. It is necessary to filter the water entering the reservoir. To encourage a healthy development of algae and phytoplanktons, you are also suggested to fertilise the reservoir water. Highly oxygenated "green water" is used. A reservoir should be able to provide all of the water needed for the nursery and transition ponds, as well as a seven-day supply at 10% of the daily volume needed for the other ponds' water needs. Remember that there are three to four days with low tidal amplitude every two weeks. As a result, you are unable to use the tide to bring in fresh saltwater during these times. As a result, you will need the water stored in the reservoir.

To prevent flooding, construct a strong main gate.

One of the key components of the bangos farm is the main gate. As secondary and tertiary dikes are considerably smaller and lower than the perimeter dikes, if they are unable to regulate the water coming from the source, the whole fishpond might get overflowed.

While the main gate might be built of wood, reinforced concrete would provide more security. Consider these four needs while constructing a concrete gate: a solid base, enough reinforcement against side pressure, good mixing and curing, and the avoidance of undercutting. By confining the land with temporary dikes, work on the gate may begin. Drive bamboo poles one foot apart, centre to centre, up until the layer of soil with the greatest density is reached, to provide a solid foundation. Moreover, a single line of wood posts that are 2 inches thick, 6 inches wide, and 6 feet long should be driven closely together, exactly below the centre of the wall and aprons. Hence, bottom scouring will be decreased.

Using medium-sized rocks, round the piles. After that, add steel bars with a diameter of 1/2 inch for vertical reinforcement and 3/8 inch for horizontal reinforcement on top of this. Pour style a 20-centimeter-thick layer of concrete.

Add water to the produced concrete or cover with damp bags.

The gate's sides should be spaced approximately a metre apart, rise vertically to the crown, and span the whole dike, with the central edge curving outward to create the wings. Three pairs of grooves should be provided on the walls: one in the centre for the detachable slabs to manage water and one at each end for the screen to keep fish from entering or escaping. The smaller gates that lead to the nursery, transition, and raising ponds are also smaller. While they might be built of concrete or hollow blocks, they are often composed of wood that has been coated with coal tar. Sizes are in proportion to the dikes, and designs range from the common open sluice type to the culvert or monk type. For sporadic requirements to dirt seal the gates, it is helpful to create two sets of middle grooves spaced 30 cm apart. Between two sets of slabs, mud packs are kept in place.

Flooring may or may not be present in the gates. Attach 2 foot wide wooden board's right below the central slab grooves to minimise scourings. The gates may be replaced with pipes for small ponds. They might be constructed of asbestos, concrete, or wood. The pipe's length and diameter depend on how wide the base of the dike is in most cases. To manage the water and stop predators from entering or fish from escaping, they are given slabs, screens, or plugs.

II. DISCUSSION

How to begin converting a barren region into a successful farm for bangos. With a well thought-out work schedule, a potential bangos pond operator should be able to respond to this question.

The first thing you'll need to do is select if the whole region can be developed or just a portion of it. You may not be able to afford the region due to its size. If this is the case, you may begin developing a small portion of the region and then increase it as you raise more money. The early activities' profits might be reinvested in the company to further improve the surrounding region.

Fishponds are often constructed by hand, especially if the area is submerged and cannot be accessible by large machinery. Build the outer dikes first to regulate the water level. Without intervention, water on the project site will fluctuate with the tides and impede the earthwork. Start erecting the main gate while constructing the peripheral dikes. It is necessary to construct a benchmark at this time as well, depending on the tide's zero datum. This benchmark will establish how high to raise the farm's dikes, gates, pond floors, and other structures.

A topographic study of the region would be highly beneficial, especially if the development area is large. A qualified surveyor is able to conduct an accurate survey. The water surface is often used as the level in practical surveying procedures by skilled pond contractors to evaluate relative variances in land elevations. Build partition or secondary dikes to create pond compartments while the perimeter dike construction is ongoing. To facilitate the passage of flatboats

or dozers during clearing, excavation, and levelling, you may leave a portion of the dikes open [11]–[13].

III. CONCLUSION

When the compartments have been constructed, clearing and levelling may be done right away. Nonetheless, you might wait till the trunks have degenerated before doing so. In excavating, save the rich top soils. Make a big pile of them. Push the top dirt back into the pond after the excavation to create the top layer. Strip excavation is another technique for preserving topsoil. Every three to four metres, sections of land are alternatively excavated. The unexcavated regions are then levelled and made to fill the excavated strips with its top soil.

REFERENCES

[1] T. Kulić, G. Lončar, M. Kovačević, and R. Fliszar, "Application of agent-based modelling for selecting configuration of vertical slot fishway," Gradjevinar, 2021, doi: 10.14256/JCE.3150.2021.

[2] A. Vazirzadeh, A. Imani, and M. Naseri, "Changes in plasma vitellogenin, phosphorus and calcium in wild-caught female carp (Cyprinus carpio) as potential criteria for selecting brood-fish for restocking natural populations," Iran. J. Sci. Technol. Trans. A Sci., 2015.

[3] L. Alvarez-Lajonchère and L. Ibarra-Castro, "Relationships of Maximum Length, Length at First Sexual Maturity, and Growth Performance Index in Nature with Absolute Growth Rates of Intensive Cultivation of Some Tropical Marine Fish," J. World Aquac. Soc., 2012, doi: 10.1111/j.1749-7345.2012.00591.x.

[4] [4] the ecological quality of freshwater reservoirs in Central Europe," Knowl. Manag. Aquat. Ecosyst., 2017, doi: 10.1051/kmae/2017043.

[5] J. Slembrouck et al., "Gender identification in farmed giant gourami (Osphronemus goramy): A methodology for better broodstock management," Aquaculture, 2019, doi: 10.1016/j.aquaculture.2018.08.056.

[6] D. R. Bellwood, A. S. Hoey, J. L. Ackerman, and M. Depczynski, "Coral bleaching, reef fish community phase shifts and the resilience of coral reefs," Glob. Chang. Biol., 2006, doi: 10.1111/j.1365-2486.2006.01204.x.

[7] Sularto, L. E. Hadie, R. Febrianti, and Imron, " Effectiveness of Grading on Population Growth Performance for Giant Gourami (Osphronemus gourami) in Selection Program ," E3S Web Conf., 2021, doi: 10.1051/e3sconf/202132202010.

[8] C. Rodde, B. Chatain, M. Vandeputte, T. Q. Trinh, J. A. H. Benzie, and H. de Verdal, "Can individual feed conversion ratio at commercial size be predicted from juvenile performance in individually reared Nile tilapia Oreochromis niloticus?," Aquac. Reports, 2020, doi: 10.1016/j.aqrep.2020.100349.

[9] C. A. Drew and D. B. Eggleston, "Juvenile fish densities in Florida Keys mangroves correlate with landscape characteristics," Mar. Ecol. Prog. Ser., 2008, doi: 10.3354/meps07430.

[10] S. J. Hamilton, "Review of selenium toxicity in the aquatic food chain," Science of the Total Environment. 2004. doi: 10.1016/j.scitotenv.2004.01.019.

[11] [K. MacKenzie and P. Abaunza, "Parasites as biological tags for stock discrimination of marine fish: A guide to procedures

and methods," Fish. Res., 1998, doi: 10.1016/S0165-7836(98)00116-7.

[12] Y. Murakami, T. Mitsudomi, and Y. Yatabe, "A screening method for the ALK fusion gene in NSCLC," Frontiers in Oncology. 2012. doi: 10.3389/fonc.2012.00024.

[13] C. D. Lefèvre and D. R. Bellwood, "Disturbance and recolonisation by small reef fishes: The role of local movement versus recruitment," Mar. Ecol. Prog. Ser., 2015, doi: 10.3354/meps11457.

Research Project Aims to End Shortage of Bangos Fingerlings

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Abstract— The insufficient availability of fingerlings is a significant barrier for bangos growers. Seldom are fish ponds or enclosures filled to the maximum level. A study that might lead to the creation of fingerling distribution facilities throughout the nation to meet the demands of both large and small fishfarms may soon provide the answer to this challenge.

Index Terms— Aquaculture Fish, Blue Green Algae, Fish Framers, Stocking Fingerlings, Nursery Pond

I. INTRODUCTION

The U.P. Faculty of Fisheries' Brackish-water Aquaculture Center in Leganes, Iloilo is making progress with a project that aims to set up a test distribution unit for milkfish fingerlings in Panay. The director of the BAC, Dr. Arsenio B. Camacho, said that indoor tanks and reservoirs outfitted with the required life-support systems and facilities for fingerling counting, sorting, and distribution would be used for the functioning of the fingerling distribution unit [1]–[3].

According to him, fry will be gathered from the wild and raised utilising an all-indoor technique to stocking size of 1-2 grammes per fish. Since 1978, BAC researchers have been testing different diets on fry in an effort to develop a feeding strategy that would combine artificial diets with natural feed sources. According to Camacho, experiments with artificial meals for fry raised in all-glass aquariums had positive results. After a 28-day culture period, the food with 50% protein generated the maximum net increase and survival [4]–[6].

The Best Natural Food in Bangos Are Diatoms and Blue-Green Algae

Brackishwater ponds often have four different types of fishfood organisms living there: diatoms, phytoflagellates, filamentous blue-green algae, and filamentous grass green algae. Only the blue-green algae and the diatoms have been shown to be the preferred foods of bangos at different phases of development. They are delicious and wholesome, and they are ideal for the way bangos eat. Fresh grass-green algae , on the other hand, is not good for milkfish or for managing ponds because it grows so quickly that it crowds the fish, obstructs rotational stocking and harvesting, and is too fibrous and coarse for young milkfish to consume. Bangos can only eat grass-green algae after it has decomposed and died. Its protein content will become digestible to milkfish due to degradation.

The phytoflagellates, a different category, are toxic for the following reasons:

1) A dense phytoflagellate growth in ponds reduces milkfish grazing activity by making their eyes blind; 2) it prevents the growth of desirable types of algae on the pond bottom by blocking sunlight; and 3) it can result in fish kills by depleting the dissolved oxygen due to the decay of a large number of dead flagellates.

Applying copper sulphate at a concentration of 2 parts per million and keeping the chemical suspended in the pond water will suppress these types of organisms. The development of undesired and hazardous species would be stifled by a healthy population of lablab and blue-green algae, which would improve the environment for milkfish growth.

Lablab Growth for High Bangos Yield: Techniques

According to the Fisheries Statistics of the Philippines 1974, growing bangos with lablab as the main meal is still the most often used method in Iloilo, where the average output is 1,000 kilos per hectare - the most in the nation. Two harvests of bangos are raised by owners of fishponds in Iloilo each year: the first from March to August and the second from September to February. Experiences of fish farmers in Iloilo state that a healthy lablab population is necessary for an improvement in bangos productivity. In turn, the quality of pond preparation affects lablab development.

The pond may be made ready for the first farming season as follows:

1. Before the earth begins to fracture, drain and dry the pond. The surface need to be firm enough to prevent your feet from sinking more than one centimetre when you stand on it. Do not overdry as this will turn the delicate top crust to powder.

2. Add organic fertilisers to the soil, such as compost, rice bran, filter press cake, and manures from chickens, pigs, cows, carabaos, or horses. These organic fertilisers should be applied to the pond's bottom. 500 to 1,000 kilos of low grade rice bran or 1 to 3 tonnes of the other types should be sufficient for one acre.

5 to 10 cm of water should be added to the pond to fill it up. The water passageway should then be sealed, and the water should be allowed to entirely evaporate. If water is allowed to enter, immediately add urea or ammonium sulphate to speed

the breakdown of the organic fertiliser. It is typical to use 25–50 kilos of urea or 50–100 kilogrammes of ammonium sulphate per acre. As soon as the water is crystal clear, drain the pond and re-dry the pond bottom.

3. When the earth has dried, let water to enter the pond a second time. Place screens on the sluice to filter the incoming water, then shut it again when the water is 5 to 10 cm deep.

After three to four days, you will see a thin mat of lablab developing. 50 to 100 kilos per hectare of 16-20-0 or 18-46-0 inorganic fertiliser should be uniformly distributed over the pond. Gradually raise the water level until it reaches 20 cm as the lablab layer becomes thicker. Keep the water at this level. Enough lablab will have developed in 10 to 15 days to allow for the stocking of fingerlings.

The process for the second cropping season is as follows:

During the brief dry spell that follows the shift in monsoons, the pond is dried and prepared for lablab cultivation. Poison any pond areas that can't be completely exposed since they could hold unwelcome fish.

Typically, it takes one to two years following the use of pesticides like Aquatin, Brestan 60, Duter, and Cercon for snails to re-infest the ponds. Water is permitted to reach a depth that barely covers the places where the snails are present if they haven't already been controlled. Apply any one of these substances after that at a concentration of 0.3 parts per million, or roughly 0.3 grammes of the active components dissolved in one cubic metre of water. Avoid using these chemicals excessively; if more than 300 grammes of the active components are treated per acre, fish won't be able to develop healthily.

Seldom are organic fertilisers utilised. Given the short time for decomposition and the potential for oxygen deficit, the amount, if any, is far lower than that used in the first cropping season. It is impossible for the pond to dry out again.

A Nursery Pond Preparation Guide Using Lablab as the Main Food

A nursery pond, also known as "semillahan," "pabiayan," or "palakihan" locally, is a crucial part of a bangos farm. Its goal is to provide healthy, stunted fingerlings to the fish farmer. Depending on the kind of natural food that will develop in the pond, the procedure for preparing the nursery pond for fry rearing will vary. Lablab and plankton have shown to be the most beneficial foods for bangos so far. Small plants and animals are gathered together to form a film-like material known as lablab. Its typical hues include brownish, greenish, and yellowish. As lablab expands, new layers build on top of one another, producing a flabby mat at the bottom of the pond. Some patches separate and float. On the other hand, all microorganisms floating in water are collectively referred to as plankton. Zooplankton and phytoplankton make up the majority of this.

Fry and fingerlings may get enough of food from both lablab and plankton. The majority of bangos farmers now utilise lablab. With lablab as the primary food, create the nursery pond as follows: One to two months before to

stocking the fry, begin preparing the pond. Level the pond's bottom first. The pond should then be completely drained and left to dry for one to two weeks, or until the earth begins to crack. Avoid overdrying. The earth would become crumbly and hard.

Put two tonnes of chicken manure per acre. After a shallow flood that just covers the bottom of the pond, spread one bag of 16-20-0 or half a bag of 18-46-0 per hectare two to three days later. Spread urea at a rate of 15 kilos per hectare to expedite the decomposition of chicken manure. After the stocking level of 25 to 30 centimetres is achieved, gradually increase the water depth over a period of 1 to 1-1/2 months, adding 3 to 5 centimetres each time. Lablab separates and floats in response to any rapid rise in water depth. Put fine-mesh screens at the entrances to keep predators and wild fish from returning. Afterwards, at intervals of one to two weeks, you may use 16-20-0 or 18-46-0 to promote lablab development.

Avoid Bad Weather For Lablab.

Ponds may experience lablab degradation because to prolonged periods of little sunlight, intense winds, and high waves. Fish deaths might occur if deteriorating lablab is left unmanaged. What might be done to prevent these undesirable circumstances in lablab? Refresh the water to counteract rain's negative effects. Keep the pond water shallow over a prolonged stretch of inclement weather so that sunlight may reach the bottom. Apply hydrated lime across a broad area around the borders of the rotted lablab to stop it from spreading. Moreover, you may spread out 400 kg of hydrated lime per acre. The fish growers in Iloilo have reported decent results from this. Put up branches and twigs in the opposite direction of the wind to reduce wind and wave motion.

How to Keep Good Lablab Growth

For lablab to continue growing while bangos are being raised, it must have enough nourishment. To do this, the fish farmers in Iloilo periodically add fresh water to the pond. The fresh nitrogen, phosphorus, potash, minerals, and other ingredients required for healthy lab-lab growth are typically present in this new water. As fish get bigger, they consume more lablab, so the nutrients in their urine and other waste products may not be sufficient. To be safe, fertilise the pond two weeks after stocking, preferably in the morning on sunny days. Ammonium phosphate should be sprayed over the pond at a rate of 25 to 35 kilogrammes per hectare.

Control Lablab Pests

High salinity, or salt concentration, in the water produced by a pond that has been properly prepared for lablab growth kills nearly all undesirable organisms, including snails and marine worms. This does not always occur, particularly in ponds farther inland where fresh water from rice fields, irrigation canals, and creeks dilutes the tide waters. In this situation, getting rid of the marine worms and snails is difficult.

Here are some tips from forward-thinking bangos farmers in Iloilo on how to manage snails and other lablab pests. Use tri-phenyltin compounds, also known as Aquatin, Brestan 60, Duter, and Cercon, to kill marine worms and snails. Apply at a 0.3 parts per million concentration, which is equivalent to 0.3 grammes of active ingredient per cubic metre. Avoid using these chemicals excessively; if more than 300 grammes of the active components are treated per acre, fish won't be able to develop healthily. If you make the water shallower, you could use a much lower dose.

If pests like tilapia, mosquito fish, and slow-growing mullets have not been eliminated before the second watering of the pond, they should be poisoned with Gusathion A. About 0.1 cc per cubic metre of water is the recommended dosage. Install sufficient screens in the sluice to stop the pond from becoming infested again.

Infestations of "bloodworms" or chronomid larvae typically take place in the months of June, July, and August. These pests hatch from eggs laid in the pond by gamo gamo. A significant incidence may result in a lablab's rapid depletion. Apply Basudin 10 granules at a rate of 0.8 to 1 gramme per cubic metre of water to get rid of them without harming the fish. Granules of lindane are also efficient at concentrations of 1.3 to 1.5 grammes per cubic metre of pond water. However, these pesticides give the fish an unpleasant smell. Therefore, the fish must be harvested at least three weeks after pesticides were used.

Use Lablab Completely Through Stock Manipulation

The next crucial step in increasing bangos production after properly preparing the pond for good lablab growth is proper stocking and stock manipulation. To make the most of the lablab in the pond, you must add the greatest number of fingerlings at the proper time. The majority of Iloilo bangos farmers stock their ponds with up to 3,000 fingerlings of one size group per hectare. Fingerlings range in length from 5 to 10 centimetres and weight from 2 to 10 grammes.

However, some farmers stock their ponds gradually over the course of two or more weeks as follows:

First stocking: 1,000 to 1,500 fingerlings with an average weight of 80 grammes, weighing in at 80 to 100 kilogrammes per hectare; second stocking: 1,000 to 1,500 fingerlings with an average weight of 20 grammes, weighing in at 20 to 30 kilogrammes; and third stocking: 1,000 to 1,500 fingerlings with an average weight of 2 grammes, weighing in at 2 to 3 kilogrammes per hectare. For 45 to 120 days, the fish are raised in the pond. When the fish reach marketable size, which is between 200 and 500 grammes per fish, harvesting begins. To decrease the stock if the fish are consuming the lablab too quickly, partial harvesting must be carried out earlier. Keep in mind that the total weight of the fish cannot be greater than the pond's food supply. 600 to 800 kilogrammes per hectare is possible. The fish stock is thinned once this point is reached. Harvest periodically until there is only a small amount of lablab left for the remaining fish. If there is still enough food, a late batch of fingerlings may be added if their needs at harvest outweigh those of the old stock. The first stock for the second cropping season will be these fingerlings.

II. DISCUSSION

Fertilization, predator and pest control, and fish population manipulation or crop rotation are three different management techniques that have worked together to increase bangos yields in Taiwan by ten times, from 200 to 2,000 kilogrammes per hectare. According to the report, which was authored by FAO inland fisheries expert Dr. Yun-an Tang of Taiwan, fertilisation alone increased yields from 200 to 800 kilogrammes, or 300 percent more than yields from unfertilized ponds; pest control also increased production to 1,000 kilogrammes per hectare, or 25 percent more than fertilisation alone; and crop rotation, or the management of fish population, increased yields by another 100 percent, or from 1,000 to 2,000 kilo-grams per [7]–[10].

The following are key components of Taiwanese improved pond management techniques:

1. Fertilization promotes the growth of beneficial algae such as filamen- tous blue-green and diatoms.

2) The protection and replenishment of the growth of desirable algae is provided by pest control and additional feeding. The right chemicals get rid of bugs and pests, and extra food stops algae from overgrazing.

3) Fishpond farmers can control and group fish populations at the ideal range by properly cropping fish in rotation. This would then make it possible to utilise fish food produced by fertilisation fully and effectively.

These methods are not brand-new; the report can be found in the National Bangos Symposium proceedings from Manila five years ago.

One factor contributing to Taiwan's high bango yield is stock manipulation.

T.P. Chen claims in his book Aquaculture Practices in Taiwan that stock manipulation is the secret to the high yield of bangos ponds in Taiwan. Taiwan produces more bangos per unit area than the Philippines, despite having a much smaller production area. While the Philippines' average yield per hectare of pond was only 600 kilogrammes in 1975, Taiwan's yield per hectare was 1,600 kilogrammes in 1972.

Stock manipulation enables full utilisation of the pond's benthic algae food resources. This is achieved in Taiwan using the following management approach:

The pond is stocked with overwintering fingerlings in the first few days of April, ranging in size from 5 to 150 grammes. The term "overwintered fingerlings" refers to either undersized fish kept in wintering ponds by fish farmers at the end of the rearing season or to late fry landed from the sea in July and August and stocked in wintering ponds. Depending on size, between 3,000 and 5,000 fingerlings are planted.

The Nursery Pond Is Being Ready, Using Plantton as the Main Food

For the complete eradication of pests and wild species, drain the pond. Allow water to reach a depth of at least 65 cm, preferably 75–100 cm. Install fine-mesh screens at gates to prevent wild species from reentering. On a platform, sprinkle one bag of 16-20-0 or half a bag of 18-46-0. A few days should pass before plankton blooms. By that time, the pond's water was thick with green plankton and only a few centimetres of it could be seen through. Apply fertiliser once more if the plankton doesn't bloom. However, do not add any more fertiliser and replace about 1/4 of the pond's water with fresh water if plankton is excessively abundant and so dense that you cannot see more than 15 centimetres through the water. Now is the time to stock the pond.

Platform Method Saves You Up To 40% on Fertilizer

In fishponds, there are two ways to apply fertiliser. One method is to evenly distribute the fertiliser on the pond bottom before letting the water flow into the pond. Utilizing a fertiliser platform is the alternative. The platform method uses between 20 and 40 percent less fertiliser than the other method does. Filipino fish farming experts who created the Philippines Recommends for Bangos, a document produced by PCARR for Filipino fish farmers, claim that it also reduces labour costs. A fertiliser platform is a flat, table-like structure made of wood, bamboo, or other materials that is positioned between 15 and 20 centimetres below the pond's water level. Placing the platform in convenient locations and fixing it by burying its legs in the pond's soil [11]–[13].

III. CONCLUSION

Put the necessary quantity of fertiliser on the platform so that it can slowly dissolve there. The platform method has the advantage that the fertiliser does not touch the pond's bottom, allowing the nutrients to be evenly distributed throughout the pond by the action of the water and the wind. The experts claim that this technique is efficient for generating and sustaining plankton growth.Prior to harvesting the fish, you are advised not to fertilise for two weeks.

REFERENCES

[1] M. Tirrell, S. Sibener, M. Gottlieb, and M. C. Negri, "Collaborative research projects aim to make clean water more accessible," Membr. Technol., 2015, doi: 10.1016/S0958-2118(15)30122-1.

[2] E. Seghezzi et al., "Towards an occupancy-oriented digital twin for facility management: Test campaign and sensors assessment," Appl. Sci., 2021, doi: 10.3390/app11073108.

[3] T. Cochrane et al., "A DBR framework for designing mobile virtual reality learning environments," Australas. J. Educ. Technol., 2017, doi: 10.14742/ajet.3613.

[4] Z. A. Hassan, P. Schattner, and D. Mazza, "Doing A Pilot Study: Why Is It Essential?," Malaysian Fam. physician Off. J. Acad. Fam. Physicians Malaysia, 2006.

[5] V. M. Jiménez, P. B. Prieto, I. R. Sanz, and J. H. Izquierdo, "Infodemic and perception of media discourse: Students of journalism in Spain face with the COVID-19," OBETS. 2021. doi: 10.14198/OBETS2021.16.2.09.

[6] J. Lindley, H. A. Akmal, and P. Coulton, "Design Research and Object-Oriented Ontology," Open Philos., 2020, doi: 10.1515/opphil-2020-0002.

[7] K. Pasanen et al., "Predictors of lower extremity injuries in team sports (PROFITS-study): A study protocol," BMJ Open Sport Exerc. Med., 2017, doi: 10.1136/bmjsem-2015-000076.

[8] J. Wilkens, H. Thulesius, E. Arvidsson, A. Lindgren, and B. Ekman, "Study protocol: Effects, costs and distributional impact of digital primary care for infectious diseases - An observational, registry-based study in Sweden," BMJ Open, 2020, doi: 10.1136/bmjopen-2020-038618.

[9] H. Demo, M. Garzetti, G. Santi, and G. Tarini, "Learning mathematics in an inclusive and open environment: An interdisciplinary approach," Educ. Sci., 2021, doi: 10.3390/educsci11050199.

[10] [J. Brozovsky, A. Gustavsen, and N. Gaitani, "Zero emission neighbourhoods and positive energy districts – A state-of-the-art review," Sustainable Cities and Society. 2021. doi: 10.1016/j.scs.2021.103013.

[11] A. Solly, E. Berisha, G. Cotella, and U. J. Rivolin, "How sustainable are land use tools? A Europe-Wide typological investigation," Sustain., 2020, doi: 10.3390/su12031257.

[12] V. Braun and V. Clarke, "Can I use TA? Should I use TA? Should I not use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches," Couns. Psychother. Res., 2021, doi: 10.1002/capr.12360.

[13] V. Zerjav, "Why Do Business Organizations Participate in Projects? Toward a Typology of Project Value Domains," Proj. Manag. J., 2021, doi: 10.1177/87569728211001663.