ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)
Volume 13 Issue 04 April 2026

Augmented Intelligence and Service Quality in the Workplace: Literature Review

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Abstract*— The paper examined the relationship between augmented intelligence and service quality in the workplace using dimensions such as: big data analytics, internet of things, cyber-physical system and how it influence service quality in the workplace. The paper reviewed theoretical, conceptual, and the empirical literature of the predictor variables: augmented intelligence with the dimension and the criterion variable: service quality. The paper highlighted and extensively discussed issues related to big data analytics, internet of things, cyber-physical system; the critiques of the existing literature relevant to the predictor and criterion variables and the gaps in literature were also reviewed. The literature reviewed finds out that augmented intelligence have several dimensions which are overlapping and were re-categorized based on their objectives and characteristics. The literature revealed that augmented intelligence dimensions identified in the literature has potential influence on service quality in the workplace. It is concludes that augmented intelligence improves workplace reliability for millions of clients and employees by providing number of transfer of service checking, system failure prediction, emergency alarm systems, fraud detection, phishing website detection, risk assessment, employees loyalty evaluation and intelligence systems by reducing the employee workload. The paper concludes that augmented intelligence is statistically relevant to service quality: tangibility, assurance, reliability, and responsiveness. The research findings revealed that the demand for augmented intelligence in the workplace is equally essential for the staff; thus, it recommended that there should be an optimal balance between virtual and human agents based on the staff requirements and preferences. The study recommends that further empirical research on augmented intelligence and service quality should be conducted in the Rivers State Police Command, Nigeria for the purpose of data collection and analysis in order to test the hypotheses developed in this study.

***Index Terms*— Augmented Intelligence, Workplace, Globalization**

I. INTRODUCTION

Globalization creates a borderless world with increased used of information technology (IT). It opens up for new market, customer and employee in the workplace. With the increase use of technology, making people become more knowledgeable and aware about their right and having more choice to choose. This has lead to fast rapid changes in business in the workplace and increased the competition land scale. Owning to that, service quality is considered as a critical dimension to gain competitive advantages in this highly competitive environment (Shahin & Samea, 2020). Hence, providing excellent service quality grows to be a major area of attention to practitioners and managers in the various kinds of public and private sectors; in manufacturing and service industries (Yogesh & Satyanarayana, 2023) and in profit and non-profit organization (Serra *et al.*, 2021). Service quality is an important issue in sectors of public, private, service, industries and businesses (Yusoff*et al.*, 2018). Today competition to improve service quality is known as a key strategic issue for organizations that are active in the service sector. Organizations that have a higher level of service quality thus will have a higher level of clients' satisfaction as a prelude to achieving sustainable workforce data and information (Guo, Duff, & Hair, 2018).

Services quality is defined as a measure to meet clients and customer needs and expectations by the service. Therefore, services quality can be defined difference between client and customers' expectations of service and services received. In addition, services quality has been defined as an attitude or general judgment of customers in relation to supremacy of a service (Koozehchian2021). Services quality in organizational theory literature is defined as: overall assessment of clients from organization services. The concept of service quality includes service delivery process and also the results offered services (Ismail, 2024) highlighted five important measures of service quality: tangible, responsiveness, empathy, assurance and reliability. Thus, tangible is often described as being where a particular service provider provides good facilities, equipment, personnel and communication materials when delivering services; responsiveness is often defined as the willingness of a service provider to provide the service quickly and accurately; empathy is related to caring, attention and understanding the client needs when providing services; assurance refers to credibility, competence and security in delivering services while reliability is frequently seen as the ability of the service provider to implement a promised service dependably and accurate process.

Engelbart in Nissi-Amadi (2020) opined that augmenting human intellect is increasing the capability of any employee in approaching complex problems and enhancing skills that suits the specific needs for deriving solutions to problems. Organizations have shows a massive interest in the potentials

of artificial intelligence to improve their client and customer service delivery via better network performance and reliability. However, organizations must be adaptive to change in today's world of work, if they must remain resilient in improving quality service. Resilience can be nurtured and it is expedient that every employee in any organization is groomed to see positivity in every difficulty; work out a mechanism to recuperate after a setback in such a manner like an issue never occurred. Organizations are to develop resilience in employees through the provision of enabling factors of which technology is considered for building employee capacity. Technology has overtime changed organizations, people, process and practices. Organizations have upgraded operations to create a balance between machine intelligence and unique abilities of workforce (Olomi & Ordu, 2020). The advancement of technology and its applications are important components in the organization; employees must focus strongly on technological development for global relevance. Developments in technology induce organizations to hook up with new realities of economic and social experiences that transcends into expansion, productivity and profit.

The world is moving towards artificial intelligence as systems become more digitalized and complex. Artificial intelligence plays an assistive role to human intelligence, highlighting the fact that cognitive technology is programmed to enhance human intelligence and not replace it, hence, the concept of augmented intelligence (Nissi-Amadi*et al.*, 2020).The human resources in organizations are geared towards insights for a better career that is technologically driven; employees are leveraging on artificial intelligence as a force for building a cohesive organization for enhance service quality. The world is not waiting as it is the 4th industrial revolution with digitalized economy. The traditional work environment has a perceived boundary between digital and physical world. Organizations seek to re-evaluate jobs and skills that are digital based for operations and determine alternative ways of actualizing desired outcomes. The automation has become a main pillar through which organizations achieve better outcomes with speed and accuracy. Digitalization and automation are also elements of augmented intelligence (Nissi-Amadi, 2020). The concept augmented intelligence which is a blend of human and artificial intelligence, is considered an important predictor of service reliability and responsiveness. Technology augments and empowers human capacities disrupting analogue human activities. Artificial intelligence offers employees information and connectivity, unimagined opportunities as well as unprecedented threats if not fully comprehended and managed. Artificial intelligence will amplify human effectiveness but also has the capacity to threaten human autonomy hence the need for perfect augmentation. Augmented intelligence creates greater surveillance, more interactions and high economic equalities.

Augmented intelligence, also known as intelligence augmentation or cognitive augmentation is next level artificial intelligence. Augmented intelligence refers to the synergistic technology of humans and computers. Augmented intelligence is a form of artificial intelligence designed to augment human intelligence rather than replace it. It uses machine learning and predictive analytics to improve human decisions and the actions taken in response to those decisions. This technology is called artificial intelligence or cognitive augmentation. The concept of augmented intelligence is not new. It has been integrated into our lives for many years. Early examples of this were servers and servers, which enabled faster data processing and better decision-making based on that data. As technology advances, especially the Internet of Things (IoT) and the connectivity of smart objects, mindfulness becomes part of our daily lives. Augmented intelligence systems can use advanced algorithms and large data sets to provide insights and recommendations that humans cannot access. This landmark link between human intelligence and machine precision aims to/ improve many aspects of life, from personal productivity to solving complex problems in professional settings (Olomi & Ordu, 2020). The future of artificial intelligence will be more integrated into our daily lives, providing analytical tools and intelligent systems to support human activities, potentially changing industries such as healthcare, finance and education. Augmented intelligence technologies do not seek to replace human intelligence, but instead seeks to assist humans with their work. Artificial intelligence targets to create systems that can run without humans whereas augmented intelligence creates system that make humans better. Managers in organizations are to determine what tasks needs total automation, what tasks needs augmentation, and what tasks to leave to employees.

According to Munday (2019), seventy-two percent of employees are worried about the future, it is believed that artificial intelligence will perform human tasks and subsequently replace the human worker beginning with low-income workers e.g. picking robots are replacing field workers, driverless cars will replace taxi drivers and so on. Olomi and Ordu (2020) studied augmented intelligence and corporate adaptability of tertiary institutions in Rivers State and concludes that augmented intelligence, manifested as human intelligence and artificial intelligence, significantly enhances corporate adaptability of tertiary institutions in Rivers State; that desire improved corporate adaptability should adopt augmented intelligence by automating tasks that are better performed by machines and using human skills in tasks that require human intelligence; and also provide trainings and empowerment programmes that gives employees the skills needed to adapt to changing work environment. Mohamad (2021) studied big data analytics capabilities and firm performance concludes that big data analytics increase supply chain resilience as a mediator by enhancing innovative capabilities and information quality, ultimately leading to improved firm performance. Andrese

ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Volume 13 Issue 04 April 2026

and Gronau (2015) conclude that organizational intelligence has positive effects on organizational resilience and position that the positive adjustment under challenging conditions fosters strength and survival of organizations (Vogus & Sutcliffe, 2017).It is important that organizations get more optimistic and evaluate how artificial intelligence will drastically affect job roles. The truth is the employees' fears are real; artificial intelligence is actually designed to relegate human intelligence but augmented intelligence promotes human intelligence and aids employees in working faster and smarter. The paper examined the relationship between augmented intelligence and service quality.

To undertake the exercise, we developed a conceptual framework shown in Figure 1.The figure shows the relationship between augmented intelligence and service quality having the predictor variables with dimensions and criterion variable with measures and with institutional culture as a moderating variable.

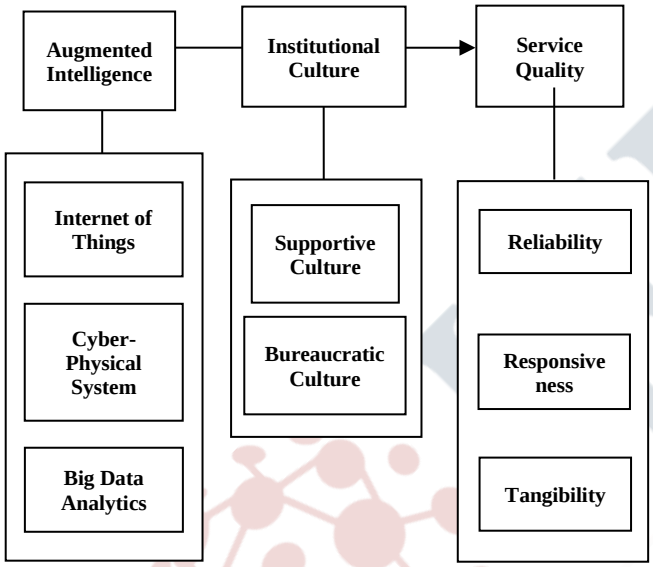


Figure 1: Conceptual framework showing the relationship between augmented intelligence, and service quality in the workplace under the moderating influence of institutional culture.

Source: Desk Research. The dimensions of augmented intelligence were adapted from the works of Nissi-Amadi*et al.* (2020), Griffor(2017), and Davenport (2022). The measures of service quality in the workplace were adapted from the works of He and Li (2021), Kumar and Charles(2020), and Ananth (2021). The moderating variable was adapted from the work of Rehman *et al.* (2019).

II. THEORETICAL REVIEW

The baseline theories that underpin this paper are the system theory (Bertalanffy, 1940), the activity theory (Havighurst, 2021) and the knowledge based view theory (March, 2021) and Spender (2022), thus, this section explains the above theories.

2.1 Systems Theory

The system theory was originated from the work of the biologist (von-Bertalanffy,1940) who initially sought to find a new approach to the study of life or living systems. More so, von-Bertalanffy(1968) further envisioned general system theory as a way to address the increasing complexity of the world's problems. The theory offers explanation for the functionality of the organization by drawing from the features of its various parts. This is as an organization can be described as an integrated system of interdependent structures and functions constituted of groups, and a group consists of persons who must work in harmony. Each person must know what the others are doing. Each one must be capable of receiving messages and must be sufficiently disciplined to obey (Rummler, 2019). Organization can also be conceived as living systems comprising of elements in mutual dynamic interaction, and operating within the laws that govern the pattern of parts and process of the whole-non-summative wholeness, control, self-regulation, equifinality, and self-organization. A system is a whole, made up of parts. Each part can affect the way other parts work and the way all parts work together will determine how well the system works. This is a fundamental challenge to traditional management thinking which always causes sub-optimization; parts achieve their goals at the expense of the whole. Only changing the system solves the problem (Murray, 2017).

In essence, the systems perspective emphasizes that everything is connected to everything else and that it's often worthwhile to model businesses and processes in terms of flows and feedback loops. Systems thinking stress linkages and relationships and flows. It emphasizes that any given employee or unit or activity is part of a larger entity and that those entities, working together, are justified by the results they produce. To effectively dexterously and proactively adapt to the demands of a rapidly changing environment, all system components inputs, processes, outputs, and feedback must be managed and interact to survive. In other words, the ability of organizations to attain excellence in their behaviour and actions can be considered as resulting from the optimality of their processes and the effectiveness of each department or unit. General system theory emerged as an alternative to the dominant form of inquiry and way of thinking, reductionist analysis, which was criticized for being unable to address wholes, interdependence, and complexity. The systems theory offers a conceptualization of organization as a systems compose of units or parts which are considered as necessary in their functionality and structuring for the wellbeing of the whole. The implications are such that the failure or poor application or contributions from any singular feature or aspect of the organization would have negative impact on the overall outcome of technological integration in an organization.

2.2 Activity Theory

The activity theory was developed by Havighurst (2021) and expanded by Vygossky (2025) and Leontiev (2022). The activity theory originated from the socio-cultural tradition of the Russia Psychology which focuses on individual activity in maintaining social interactions. Activity theory begins with the notion of activity. An activity is seen as a system of human "doing" whereby a subject works on an object in order to obtain a desired outcome. In order to do this, the subject employs tools which may be external. It is understood to be purposeful, transformative and develops interactions between actors: Social strata, hierarchical structure of activity and division of activities as actors in the system. Activity theory helps explain how social artifacts and social organization mediate social action. Proponents of the activity theory sought to explain human activities as systemic and socially situated phenomena that go beyond the paradigms of reflexology (interpretation of behavior in terms of reflex actions). According to Bedny and Karwowski (2017), activity theory is designed to enhance human and computer interactions in carrying out definite tasks: Application to human performance and work design giving room for learning. Thus, activity theory is fundamental to information systems management and for developing data models (Nardi, 2025).

Activity theory is an approach to understanding human behavior by examining the social context of the behavior and the motivations of social pressures on people as they engage in activities (Vygotsky, 2022). Outcomes leading to development of tools is achieved employees interact with each other and their environment; tools in line with constructing a computer or designing a system. The activities people are engaged in, is influenced by the roles as the case maybe; it a theory that views beyond internal drives to external motivation. According to Bedny and Karwowski (2017) activity theory is designed to enhance human and computer interactions in carrying out definite task: application to human performance and work design giving room for learning. Activity theory is also seen as a theoretical foundation for information system management and for developing data models (Nardi, 2025). Activity theory recognizes the internalization and externalization of cognitive processes involved in the use of tools, as well as the transformation or development that results from the interaction (Vyotsky, 2022). Theoretical concepts in activity theory makes it possible to align it to the human intelligence and the artificial intelligence into a more holistic research approach which is referred to as augmented intelligence in the present study.

III. CONCEPTUAL REVIEW

3.1 Augmented Intelligence

The idea of intelligent organization can be seen from different perspectives including organizational learning and knowledge management. Smart organizations have a huge intellectual capacity base that is embedded into learning as a culture. Yolles (2024) saw learning culture in line with a system of belief, attitudes, values, behavioral norms and meanings and the maintenance of learning structures that are responsive to learners, motivates the knowledge creation processes and provides opportunities for the application of new knowledge. The learning organization is capable of responding to variation that is adaptive and thus responding to the perception of a changing environment, or being proactive and responding to a perception of need for organizational improvement. We operate an intelligent organization where knowledgeable workers are pivotal to innovation and development for growth. The technological advancement and information systems birthed artificial intelligence in organizations as a new breed of knowledge; this breed had no plans of retaining humans at the workplace in the future. The needs of connecting artificial intelligence's full potential started with the explorations of organization's opportunities and make them artificial intelligent-fueled organization.

Davenport (2017) describes three path journey organizations are taking to achieve the utilization of artificial intelligence which are assisted intelligence organizations make decisions from large scale data programs (the power of the cloud and science-based approaches), augmented intelligence which is becoming today's reality, machine learning capabilities are layered on existing information management systems work to augment human analytical competences and autonomous intelligence. According to Davenport (2017) in the coming years, more organizations will progress toward autonomous intelligence in which processes are digitized and automated to a degree whereby machines, bots, and system can directly act upon intelligence derived from them.Duncan (2010) viewed intelligence as a concept that clarifies individual differences and ability to decipher multifarious ideas in order to adapt effectively into a society or an environment where one leans from experiences to engage some level of cognitive activities. The world today is in transit of implementing intelligence that is higher, bigger and better; an intelligence that conglomerates human and systems thinking: creating an environment where humans and systems act upon one another in ways that are mutually transforming. Emerging technologies are becoming quite complex, it has become imperative to integrate the intelligence of humans and that of artificial.

Nissi-Amadi *et al.* (2020) defined augmentation as the act of making larger and intelligence as the totality of the mind to reason or fathom, comprehend and apply. It is also the ability of an entity to express such capacity as the human mind (Bhatia, 2022). Hence, augmented intelligence is the enlargement of the human capacity of reasoning and blending it with the designed thinking of technology (Bhatia, 2022). Toivonen (2019) defined augmented intelligence as human-centered, it a partnership model that accommodates people

and technological systems in a co-working space together to improve cognitive performance which includes learning, decision making that results to new experiences. He further stated that augmented intelligence is about employees benefiting from artificial intelligence. Toivonen (2019) posit that technology evolves and that the combination of human and artificial capabilities in augmentation will lead to greater benefits in the future. Augmented intelligence is an enabler to organizations in increasing productivity and efficiency service delivery in general operations. Gil (2019) also added that augmented intelligence is an alternative conceptualization of artificial intelligence that focuses on augmented intelligence assistive role, emphasizing the fact that cognitive technology is designed to enhance human intelligence rather than replace it.

Gil (2019) concluded that rather than view artificial intelligence as systems with the aim of replicating and surpassing human intelligence, it should be considered an aid. Technological experts have started viewing artificial intelligence as a system to enhance and augment human capabilities in all facet of the economy. Bhatia (2022) added that augmented intelligence is the human side of the artificial intelligence. Davenport (2017) added that augmented intelligence is human interaction with technology and information systems via a potentially disruptive innovation that represents a great technological transformation. This transformation explores array of other interfaces for organization's future preparedness (Davenport, 2017). Today, organizations are exploring augmented intelligent opportunity to allay the fears of employees as they peep into the future: integrating intelligent interfaces into their operations and helping the workforce adapt to new modes of human and machine interaction and see how mechanical augmentation can help them work more efficiency. Augmented intelligence however, seeks to leverage the advantages of artificial intelligences and human intelligence in order to create better, smarter organizations that create greater surveillance, more interactions and high economic equalities. In essence, augmented intelligence creates systems that make humans work better by providing machine assistance that enhance human performance.

Artificial intelligence is the zenith of human intelligence displayed: It is the ultimate augmentation of human thinking converted into a technological platform. Artificial intelligence finds its definition from the progress in human innovation. Artificial intelligence is seen in many industries/section in the world of business; transforming the way humans use technology to communicate and transact (financially, socially and otherwise), and to retrieve information. Artificial intelligence is a mechanism for creative disruption (Carroll, 2020). Artificial intelligence which is also referred to as machine intelligence is intelligence demonstrated by machines compared to the natural intelligence depicted by humans. Artificial intelligence is a term used to describe machines or computer related technology that mimics cognitive functions associated with the human mind for learning, retaining and problem solving (Carroll, 2020). Artificial intelligence is the ability of a computer system or machine technology to think, learn and retain, artificial intelligence is geared towards making machines smart (Carroll, 2020). Artificial intelligence is an old concept that finds metamorphically reinventions of itself. The implementation of augmented intelligence in an organization requires managers to determine tasks that need total automation; tasks that need human performance and tasks that need augmentation. This study thus views internet of things, big data analytics and cyber physical systems as dimensions of augmented intelligence.

3.1.1 Dimensions of Augmented Intelligence

3.1.1.1 Internet of Things

Internet of things today is a concept that has been generally accepted and appreciated at the workplace: it is a key driver of improved performance in the organization through sensitive-digital electronic network measures and provides useful quantified data for analysis in the organization. Technology and innovation is rapidly on the increase causing a paradigm shift of the organization to technological centered (tech-centric) (Nissi-Amadi *et al.*, 2020). The Internet of Things refers to networks and sensors that help monitor and control various devices and have a substantial impact on the workplace. In other words internet of things can be defined as an intellectual environment where information is exchanged and interacted between human and object or between objects in connection with wire/wireless network on all the things around people based on ICT. Ashton (2025) sees internet of things as an open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting in face of situations and changes in the environment. The internet of things can also be considers a worldwide network which allows the communication between human –to –human, human-to-things and things-to-things, which is anything in the world by providing unique identity to each and every object (Bi, Xu & Wang, 2024).

Internet of things can be connected and communicated in an intelligent fashion; with individuals connected through electronic devices such as servers, computers, tablets, telephones and smart phones. According to Ling-yuan (2022), internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics. Harald (2020) sees internet of things as the collaboration of interconnected objects, services, humans and devices that can communicate, share data and information to achieve a common goal in different areas and applications within an organization. The internet of things is known as the internet of everything or the industrial internet; this new technological paradigm is intended to view the network of machine devices and its interaction with elements. Furthermore, Internet of Things saves collected big data in

the cloud utilizing artificial intelligence for the analysis. Therefore, it is now in a limelight as a core technology in the fourth industrial revolution and also as a pivotal technology to realize how people become eligible to enter smart world. Internet of Things develops Human Resources, manages Digital Human Resources and its process, and analyzes data (Fortino, & Pathan, 2022).

3.1.1.2 Cyber-Physical System

Cyber physical system can be defined as systems that encompass physical, control, and cyber components to control and monitor the physical environment (Griffor, 2017). These components operate to form a control loop, in which sensors collect measurement data about the state of the physical system and transfer them to the control components. The control components process the data received and return action commands to the actuators to regulate the physical system. Communication among these components is enabled by cyber components, including hardware and software, which form the communication network. While most processes in cyber physical system are automated, operators and engineers use human interfaces to configure, monitor, and control the right functioning of the cyber physical system.Physical components form the physical controlled system. For example, power grids consist of the buses, lines, switches, transformers, and so forth, which communicate with the control system; medical devices comprise physical implanted or wearable devices equipped with wireless capabilities to communicate with other devices for their reconfiguration; smart cars are equipped with electronic units for monitoring and controlling functions such as engine emission, brake, and entertainment (Humayed, 2017).

Control components form the intelligence layer of the CPS, often referred to as ICSs or Supervisory Control and Data Acquisition (SCADA) system (Humayed, 2017). ICSs or SCADA systems are used to centrally control dispersed assets. These assets are locally monitored using widespread sensors, which produce measurement data that are representative of some physical property of the system, for example, speed, temperature, power, voltage, current, and so forth. These data are then transmitted to field connection controllers (remote terminal units [RTUs], programmable logic controllers [PLCs], and intelligent electronic devices [IEDs]), and subsequently to the control center. These controllers differ in terms of the complexity of the commands that they can process and the level of autonomy in processing them. The control center includes a data historian to collect time-series data and support data analysis; a human machine interface (HMI) for human operators to monitor and control the system by changing set points and manually overriding automatic control operations; a master terminal unit (MTU) or control server for the control software to gather, process, and communicate data and information; and an engineering workstation to program the field connection devices. Cyber components form the communication network, including network connectivity devices (NCDs) such as routers, firewalls, and modems, communication channels such as LAN, WAN, and the Internet, and communication protocols such as Modbus, Fieldbus, DNP3, and IEC 61850 (the last two are applied in power systems). While the components of the control center are all connected by a LAN, field connection controllers communicates with the control center through WAN or dial-up modem based on topologies, including point-to-point, series, and series–star configurations (Stouffer, 2021).

3.1.1.3 Big-Data Analytics

Organizations make decisions out of staled information; real time data are necessary for valid decision making. Organizations are beginning to understand that they need to gather real time data and stream such data into their operations; they can apply analytics and get significant value for decisions. Big data analytics as a concept brings speed and efficient. The rate at which data is generated today is faster, the analysis of data has migrated from databases to big data analytics. The term big data refer to the extremely large and varied datasets that may be analyzed to reveal patterns, trends, and associations; they are often too large to store in traditional database sets, process and analyse with traditional storage and computing methods (Davenport, 2022). Big data analytics is a complex process of examining large and varied data sets in order to uncover information; hidden pattern, unknown correlations, market trends and client preferences, organizational profit analysis (Gartner, 2018). Big-data analytics is concerned with investigating what has happened in the organization, how it happened and reports the result(s) or output to predictive analytics for further analysis (Riahi & Riahi, 2018). As a real time analytical tool, it is capable of exploiting hidden pattern that exists in the firms and other information about the customers based on existing records.

Big-data analytic develop memory to store various activities that have taken place in the firm, evaluates these activities and present the results to predictive and prescriptive analytics for better decision-making (Klaas, 2016). Why things happened is the question that is tried to be answered by diagnostic analytics (Gartner, 2023). This type of analytics does provide deep insights into a certain problem. Ruohonem (2025) stated that the main characteristics of diagnostic analytics are; enablement of the discovery of unpredictable relationships between historical and current patterns, explain effect relation, causes and correlation and visualization format; dashboards on data discovery which focuses on visualizing complex dimensions, measures and relationships simultaneously. Big-data analytics enable the analyst to understand what has happened, what is happening and how they happen in the organization, such as the behavior of customers, what is responsible for poor performance (Zhou, 2025). Big-data analytic identifies the reasons for any occurrence for predictive and prescriptive actions (Spacey, 2017). It aids in error correction, detect fraud, and verify processes, find out what trigger an event and reports to predictive and prescriptive analytics for further analytical

insight (Sharma, & Wang, 2017).

Big data helps organizations make informed decisions. Data analytics technologies and techniques provide a means to analyze data sets to help humans draw make decision and conclusions about organizations. Big data analytics builds an intelligent organizations/0µç

3.2 Service Quality

Service quality is generally defined as customer perceived quality which stresses the individual's assessment of the value of the total service offering (Gummesson, 2022). Practically, Gronroos (2025) described perceived service quality as the difference between expected service quality and experienced service quality. This has a link to the gap model suggested by Parasuraman et al. (2025). On the other hand, Berry (2025) have divided service quality into two types; regular services, and handling of exceptions or problems to ensure that appropriate procedures are taken to deal with probable failures. As regards to service quality, the individual's experience of a service forms the basis of an assessment of its quality. It is great to listen to customers and study their reactions of what they perceived. When purchasing services, customers' attention is often limited to a small number of tangible inputs (Zeithaml, 2024) for example when customer walk in to a bank, the customer focus more on the service provided instead of examining on how well the ATM machines are located.

Physical environment include buildings, offices and interior design affects customer beliefs, attitudes and satisfaction (Zeithaml & Bitner, 2010), and provides an opportunity to tell the correct story about a given service (Berry et al, 2019). Matters such as how well one's dress up, articulates, writes, designs and presents proposals seems like no meaning because they are intangibles (Levitt, 2021). As tangible input, the service personnel, the organization and the marketers, represents the service in the customers eye (Zeithmal& Bitner, 2025). The management of quality for a service personnel includes such things as motivating, managing information, training, career planning and recruiting and retaining of right people (Normann, 2021).It is true that service business is personnel intensive, meaning that quality supplied to the customer is essentially a result from the way personnel perform (Normann, 2021). Schneider (2020) showed that both employees and customers will experience more positive outcomes when the organization operates with a customer service orientation and management supports. This may be linked to the external service value within the service profit chain suggest by Heskett *et al*.(2024), which described employee satisfaction as the underlying factor in the formation of customer perceived quality. The other important element is service culture, which means in an organization, all employees are embedded with the culture of being customer focus and customer oriented. This can be achieved by participating in the production process, gaining customers influence and determined service culture before providing the service (Lethtinen, 2025).

Service quality is known to be based on multiple dimensions; there is no general agreement as to the nature or content of the dimensions (Brady & Cronin, 2011). However, a review of the service quality studies to date explicitly shows that European scholars have made a great influence on the study of service quality dimensions. That is, the contemporary discussions on the dimensions of service quality have been initiated by European scholars. Lehtinen and Lehtinen (2022) defined service quality in terms of physical quality, interactive quality and corporate quality. Physical quality relates to the tangible aspects of the service. Interactive quality involves the interactive nature of services and refers to the two-way flow that occurs between the customer and the service provider, or the company representative, including both automated and animated interactions. Corporate quality refers to the image attributed to a service provider by its current and potential customers, as well as other publics. They also suggest that when compared with the other two quality dimensions, corporate quality tended to be more stable overtime.

Siddiqui and Sharma (2020) stated that nowadays the consumer is demanding services with higher standards and also becoming more and more aware of higher expectations. They further added that it is difficult for service providers to manage their services effectively, because the advancement of technology, especially in information and ICT, enables the consumer to make accurate and quick comparisons on the Internet. They concluded that this in turn leads to the fact that customer expectations and perceptions are continually changing and evolving. Furthermore, customer service is more pertinent in service business as compared to manufacturing companies, since service characteristics are often inseparable and intangible. Due to improved technologies, growing customer sophistication, and increased private player competition, recent years had witnessed greater thrust on achieving greater levels of efficient customer service. It can be observed that customers are becoming more and more advanced in their requirements and expectations, which in turn demands higher and higher standards of service (Verma, 2014). For the consumer, the term service can entail many meanings and go under different names, some of which include customer relationship, customer satisfaction, service delivery and customer delight. Because of this, there is increasing interest in improving service via customer service, which means that objectives of the business must be aligned closely with the customer service elements. Meanwhile, according to Payne (2025), initiatives related to quality improvement go hand in hand with customer service initiatives. Previous research had reported that the concepts of marketing, customer service, and quality have been integrated to form a new perspective on the old concept (Christopher & Ballantyne, 2021). Thus, marketers now are of the opinion that achieving quality has become a pivotal concern. Therefore, in order for service providers to attain better positions in the market place, a vital key is consistent

ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Volume 13 Issue 04 April 2026

superior service delivery (Brown & Swartz, 2019).

3.2.1 Measures of Service Quality

3.2.1.1 Reliability

Reliability refers to the timeliness and precision of handling client issues and fulfilling their promises to the customers (He & Li, 2021). It can immensely affect the service quality perception of customers. Early research suggested reliability as one of the significant attributes on which customers form their expectations of service quality (Dabholkar 2025). Moreover, reliability as described by Parasuraman *et al.* (2025) is a key driver for overall service quality which relates to an organisation's capability to execute the service as promised, in an accurate and dependable manner. Furthermore, reliability connotes handling customers' service problems, performing services right for the first time, provide services at the promise time and maintaining error free record. Reliability also consists of accurate order, fulfillment, accurate record, accurate on billing, accurate calculation of premium and commission and keeping services promise. All these reliability attributes make customers recognize the consistency and creditability of employees which leads to service quality and overall performance to the organization.

Redwell-Emotongha *et al.* (2021) posited that delivery reliability is the ability of the firm to effectively and rapidly respond to customer requirements on time, support and quality service to satisfy the needs and wants (Zhang 2012). Furthermore, delivery process takes care of a fluent material flow through manufacturing and a rapidly delivery to the customers. As levels of supply chain integration increased and inventory levels have been reduced, reliable, on-time deliveries have become increasingly critical for success. Large inventories and production capacities were traditionally required to ensure on-time delivery. However, with advanced information systems, deregulation, agile manufacturing organizations with flexible equipment and tooling, and sophisticated delivery systems, integrated supply chains no longer need large, costly inventory buffers to respond to unexpected events and variations in demand.

The measurement of delivery time flexibility is essential to estimate the responsiveness of a supply chain. Delivery flexibility deals with delivering products which are desired by the customer to the market as quickly as possible to outsmart their rivals competitors in the industry. The higher the flexibility, the better is the responsiveness of a competitive action is effective. More so, if the delivery process is highly flexible, it would continually meet the changing needs of customers and help customers to view the supply chain favorably (Beamon, 2024; Gunasekaran et al., 2011). The construct of delivery flexibility is operationalized in terms of ability of supply chain to change or deliver orders according to fluctuations in demands of customers (Das & Abdel-Malek, 2013; Neely *et al.*,2025; Sanchez & Perez, 2015; Kumar*et al.*, 2017).According to Joseph and Stone (2013); Emotongha (2020) delivery flexibility is seen as reliable delivery system which is important and has a great influence on customer satisfaction, improving sales and market share. Manufacturing company is at a stage where customer perceptions and preferences have a very important impact on a firm's competitiveness. Customer satisfaction is a measure of how products and services supplied by a company meet or surpass customer expectation over its competitors in the industry. The integration of world economies has opened an array of business opportunities as well as challenges for competitive firms. Blanchard (2018) stated that reliable supply system is frequently considered as a physical system. A physical system is one that is "made up of real components occupying space. He also defined it as a conceptual system. A conceptual system is an organization idea, a set of specifications and plans, and a series of abstract concepts.

3.2.1.2 Responsiveness

Responsiveness is the attainment of quality of service, this plays pivotal role in surpassing customer's expectation, it is the willingness and preparedness of employees to offer service by taking into consideration timeliness of services (Kumar & Charles, 2020). Responsiveness in this regard is that act of being ready and disposed to offer services in a timely manner to clients in a bid to meet or surpass their expectation by utilizing information obtained from the market. It is facilitated by a comprehension of customer's safety needs, social status, psychological disposition and individual attention given by employee as well as convenient operating hours. These are vital in satisfying customer's expectation; thus, responsiveness is important in creating a good impression in the minds of customers which will likely increase their tendency in prolonging their relationship with the organization.

Responsiveness to customer expectations is a crucial competitive factor in the current business environment of today's universal and volatile marketplace, with increasing product varieties, spontaneity in customers' tastes and preferences, shortening life cycles and more demanding competition (Danese, Romano &Formentini2023). The ability to consistently, offer the right product or services to its array of loyal and prospective clients at the right time at the right place and at the required quality is the main objective of any organization. In order to become more responsive, organization needs to be swifter and stretcher in their operations. However, in their bid to accomplish the objectives of developing desired competitive capabilities, many firms increase their investments in acquiring advanced operational technology to deepen its operational effectiveness and efficiency. Farooq and O′Brien (2025), stated that firms, when making decisions regarding technology selection, should consider direct and indirect consequences on all partners in their value chain. Kim, Cavusgil, and Cavusgil (2023), had espoused that, in the present hypercompetitive market, a firm's individual capabilities and efforts, by

themselves, are not sufficient, but rather the firm must rely on its supply chain partners to create responsiveness to customers and generate added value for them.

Responsiveness is a market-driven behavior of the firm, it requires some kind of market maturity, as customers, competitors, and other relevant market actors need to be distinguished from one another. In corroborating previous works of scholars, Pehrsson (2024) advocated that organizations as key players should be able to postulate an appropriate level of responsive actions towards accomplishing customer needs, such as product customization and building customer relationships. Creating effective responsiveness therefore means that the firm tries to achieve responsiveness based on wide-ranging knowledge of its customers and competitors; this necessitates a well-designed system for engendering and circulating market information. This paper, however, progresses by reviewing literatures on three (3) measures of corporate responsiveness namely, adherence, promptness and market intelligence.

3.2.1.3 Tangibility

Ananth (2021) referred to tangibility in their study of private Banks as modern looking equipment, physical facility, employees are well dressed and materials are visually appealing. Tangibility is the extent to which physical resources, equipment, and appearance of staffs or personnel in adequate manner. Tangibility for digital services based on design of websites, contents of site, visualization etc. (Moon, 2023). The concept of tangibility towards internet of things seems unusual but interfacing and collaborating with such devices does not remain an uniqueness idea anymore (Kranz*et al.*, 2020). Mayer*et al.* (2024) suggested the permutation mechanism of semantic communication primitives to various IoT entity attributes that aims to support both web graphical user interface (GUI) and quantifiable interfaces, for example the tangible knobs.

According to Angelini (2018) the concept of tangibility in internet of things was introduced by Sarah Gallacher (ETIS, 2017) to stimulate the change in layout of physical interfaces with Internet of Things. Tangibility of IoT services with sensors technology and mobile phone app exemplified by various practical tools. *TANGERINE* was a system for maintaining cooperative interactions on tabletops where customers could transfer data to perform certain activities via client-centered constructed Internet of Things based tangible dice (Baraldi, 2018). The couple of articles introduced distinct such application setups: for collaborative traffic management (Lebrun *et al.*, 2025) and in food business for inferring recipes. The smooth interaction of IoT objects by considering the characteristics of tangibility of application like mobile app or website layout, design, aesthetic manner with device layout like device design, device aesthetic, visual appealing of system, gadget design synchronization with nature of provided service etc. affect the user satisfaction. Similarly, Moon (2023) explored that the tangibility of digital services boosts the client satisfaction and creates elicit positive expression of provided facilities.

3.3 Institutional Culture as a Moderating Variable

Institutional culture refers to the beliefs and behaviour a group of persons have developed overtime and shared in common within an organization (Rehman*et al.*, 2019). It is the shared goals, beliefs, norms, and practices followed by members of an organization which differentiate that organization from the others in similar industry (Ahmed, 2018). Ahmed (2018) strongly posited that organizational culture impacts on employees' behaviour, attitude, organization activities and performance. They opined that the culture of an organization develops or shapes the perception of its employees as they tend to behave accordingly. For the organization to be strategically fit, it must require the proper and strong culture. O'Reilly (2019) opined that organizational culture is an essential feature or factor in developing and maintaining the high level of organizational commitment among personnel within the organization.

The postulation that strong cultures enhance firm performance is premised on the instinctively powerful idea that organisations benefit from highly motivated employees committed to common or shared organisational goals. Abbas and Somaye (2022) asserts that the relationship between cultural strength and performance reliability is dependent on how strong firms learn from and respond to their own experiences and changes in their internal organisational mechanisms (processes, policies, values and norms) and the volatile environments. Louis (2023) asserts that organisational culture as a set of understandings or meanings shared by a group of people that are largely tacit among members and are clearly relevant and distinctive to the particular group which are also passed on to new members. This definition implies the culture's characteristic of being shared and learnt. Chatman and Eunyoung (2013) describe it as a system of shared assumptions, values, and beliefs which guide people to be aware of appropriate and inappropriate behaviour. Barney (2020) refers to organisational culture as the collective programming of the mind that distinguishes the members of one organisation from others.

IV. EMPIRICAL REVIEW

Olomi and Ordu (2020) investigated the relationship between augmented intelligence and corporate adaptability of tertiary institutions in Rivers State. The study was anchored on the activity theory. The study was conducted at the micro level with individual staff of the tertiary institutions serving as unit of analysis. A cross-sectional survey research design was adopted while a structured questionnaire was used to collect primary data. The final analysis of the study was based on data collected from 197 respondents. The Spearman's rank order correlation statistic was used to test the hypotheses formulated for the study. It was found that a significant relationship exist between augmented intelligence and corporate adaptability as all the dimensions of augmented

intelligence (human intelligence and artificial intelligence) covered in the study posted positive and statistically significant connection with corporate adaptability. The study concludes that augmented intelligence, manifested as human intelligence and artificial intelligence, significantly enhances corporate adaptability of tertiary institutions in Rivers State; and recommends that tertiary institutions in Rivers State that desire improved corporate adaptability should adopt augmented intelligence by automating tasks that are better performed by machines and using human skills in tasks that require human intelligence; and also provide trainings and empowerment programmes that gives employees the skills needed to adapt to changing work environment

Halawiand Haydar (2018) investigate the effects of training on employee performance: A Case Study of Bonjus and Khatib & Alami Companies. The study collected primary data from a sample of 303 respondents. The researcher visited a sample of respondents from their workstations to administer questionnaires. The findings, however, showed that the two companies from Lebanon design different training programs. The two companies design training programs that focuses on short-term skills and development programs for long-term abilities. Some of the programs include organizing programs outside the workplace, attending workshops, participating in department activities, and watching others. Consequently, training programs benefited employees as well as the two companies. Employees cited that they were able to develop inner satisfaction, received positive evaluation feedback, understood how to achieve a quality output, and developed career beyond class work.

Emeribe (2024) examined institutional culture and academic service delivery among lecturers in public tertiary institutions in, Nigeria. A correlational research design was adopted for this study. The population of this study comprised 3,431 lecturers in all public tertiary institutions in Cross River State. A stratified sampling technique was used to select 685 lecturers from the institutions as samples for the study. Pearson Product Moment correlation analysis and Multiple Regression analysis were used for data analysis. The results of the study indicated a strong significant positive relationship between institutional support culture and academic service delivery among lecturers in tertiary institutions in Cross River State. The study concluded that lecturers in public tertiary institutions will deliver their academic services effectively when the institutions are committed to improving the institutional culture variables examined in the study.

Odhon'g and Omolo (2025) sought to establish the effect of human capital investment on organizational performance of Pharmaceutical Companies in Kenya. The independent variables include: training, education, knowledge management and skills development. The main underpinning theories in this study include: human capital, skill acquisition and sustainable resource theory. 200 observations were used in the study. Study used questionnaires in data collection, descriptive and inferential statistics used in the analysis. The found a positive significant relationship between human capital investment and organizational performance. The study recommends provision of quality education, relevant training linked to industry requirement, the study suggest adoption of German Dual Vocational Education and Training system to facilitate and strengthen linkage between education sector and the industry. Promotion of knowledge management through teamwork, social networks and knowledge management systems; training on employability and transferability skills to enhance skills development. The enterprises to go beyond traditional apprenticeship, Soft skills assessment in schools, embrace technology and promote intrapreneurship. The study also suggest introduction of skill development fund to equip the communities and businesses with relevant skills required in the dynamic global market place

Brenya (2024) conducted a study on the effect of human capital development on employee commitment in the judicial service; a case study of western region of Ghana. The research design adopted was descriptive. Questionnaires were designed to collect data from the research population which comprised the registrars and staff of the Judicial Service in the Western Region of Ghana. Convenient sampling was used for selecting 100 staff and purposive sampling 50 management staff. Data was analyzed by the used of SPSS software. It was concluded that the level of human capital development in the Judicial Service was very low. The management commitment towards the human capital development was also on the lower side. The study showed a high level of affective commitment, but a very poor continuous organizational commitment and normative organizational commitment. Using the literature review, conceptual framework and the research questions as the backbone to the study, the following hypotheses were proposed for the study:

Mohamad (2021) examined the impact of big data analytics capabilities on firm performance through supply chain resilience in the presence of the risk management culture. The study adopted a cross-sectional approach to collect survey-based responses to examine the hypotheses. 167 responses were collected and analyzed using partial least squares in SmartPLS3. The respondents were generally senior IT executives with education and experience in data and business analytics. The results show that big data analytics capabilities increase supply chain resilience as a mediator by enhancing innovative capabilities and information quality, ultimately leading to improved firm performance. In addition, the relationship between supply chain resilience and firm performance is influenced by risk management culture as a moderator.

Dick(2023) examined big data analytics and performance of deposit money banks in Nigeria. The study adopted the cross-sectional survey design. Structured questionnaire was used to collect data from respondents while linear regression

analysis was used as the test statistic. The population of the study comprised of 21 deposit money banks in, Nigeria. A total of168 respondents were drawn from the study population using simple random sampling techniques. The study found that diagnostic big data analytics enhanced the performance of deposit money banks in terms of customer satisfaction and return-on-investment. Therefore, the study concluded that diagnostic big data analytics is essential to improve the performance of deposit money banks in Nigeria and recommended that deposit money banks that desire to enhance their performance in terms of customers' satisfaction and greater return on investment should integrate diagnostic big data analytics as a key data management tool.

V. CONCLUSION AND RECOMMENDATIONS

The paper examined the relationship between augmented intelligence and service quality in the workplace. The dimensions of the predictor variable are: big data analytics, internet of things, cyber-physical system. The paper highlighted and extensively discussed issues related to big data analytics, internet of things, cyber-physical system; the critiques of the existing literature relevant to the predictor and criterion variables and the gaps in literature were also reviewed. The literature reviewed finds out that augmented intelligence have several dimensions which are overlapping and were re-categorized based on their objectives and characteristics. The paper concludes that augmented intelligence has potential influence on service quality in the workplace. The paper concludes that augmented intelligence however, seeks to leverage the advantages of artificial intelligences and human intelligence in order to create better, smarter organizations that create greater surveillance, more interactions and high economic equalities. In essence, augmented intelligence creates systems that make humans work better by providing machine assistance that enhance human performance. The implementation of augmented intelligence in an organization requires managers to determine tasks that need total automation; tasks that need human performance and tasks that need augmentation. The paper concludes that service quality in the workplace largely depends on augmented intelligence or that augmented intelligence predicts service in the literature. The paper concludes that augmented intelligence is a tool for finding hidden meaning within data by uncovering patterns and correlations at a massive scale. Augmented intelligence can be applied in business, decision-making, healthcare, journalism, insurance underwriting, ID verification, logistics planning, remote assistance, manufacturing, finance, real estate, military, and legal profession. Intelligent machines (or computers) are efficient in numerical computation, information retrieval, statistical reasoning, and have almost unlimited storage.

i. The findings revealed that the demand for augmented intelligence in the workplace is equally essential for the staff; thus, it recommended that there should be an optimal balance between virtual and human agents based on the staff requirements and preferences.
ii. The Internet of Things (IoT) has enormous potential in the workplace. Therefore, if implemented correctly, it may yield the desired results and add value to workplace resources and services quality.
iii. The study recommends that further empirical research on augmented intelligence and service quality should be conducted in the Internal Security Agencies in South-South, Nigeria.

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