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ARTIFICIAL INTELLIGENCE AND PERFORMANCE OF HOSPITALS IN PORT HARCOURT

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ABSTRACT

Artificial Intelligence (AI) is evolving rapidly in healthcare, and various AI applications have been developed to solve some of the most pressing problems that health organizations currently face. This study reviewed related literature in Artificial Intelligence, the importance and relevance of AI technologies especially machine learning and natural language processing in healthcare and how crucial it is for healthcare providers and organizations to understand these technologies and the ways it can be applied to improve the efficiency, safety, and access of health services to ultimately achieve value-based care. The role of technology in operations was also highlighted as well as the various performance indicators in the healthcare sector. Furthermore, practical recommendations to help healthcare organizations develop an AI culture and strategy that can support their digital healthcare transformation were listed in the conclusion.

Keywords: Artificial Intelligence, Machine Learning, Natural Language Processing, Performance, Healthcare.

1.0 INTRODUCTION

Artificial intelligence has evolved through the years to usher in the next wave of digital disruption; where "machines now exhibit human-like cognition". According to Robinson (2020), it is one of the most revolutionary technological advancements to have emerged, having the propensity of making impossibilities possible, and in so doing remodeling the world as we know it. Dhamija & Bag, (2020) added that in these modern climes, the application of Artificial Intelligence in the present day's organization setup is crucial to achieving operational transformations. Today, AI also known as machine intelligence has played an important role in every aspect of human endeavor, from the perception, processing, and interpretation of data. With the advent of AI, machines now interpret, analyze and process complex data systems in a variety of applications, including web search, self-driving vehicles, 3D, and most especially in healthcare (Robinson, 2020).

The aspects of AI technologies currently in use because of their accessibility and distinctive significance to all sectors which have made them popular topics for renowned researchers and investors alike are Machine Learning and Natural Language Processing. (McKinsey & Company, 2017). Recent trends in the technology space have made it clear that imbibing

these digital transformations has the potential to unlock the power of big data, gain insight into supportive evidence-based clinical decision-making, and aid in the accomplishment of value-based care in the healthcare sector.

In recent years, performance has become a well-known term in the health industry. As it connotes, maintaining the well-being of patients while achieving industry goals. According to Loan et al., (2012) performance represents the extent to which set objectives are accomplished. Therefore the concept of performance in healthcare signifies an instrument that quality, efficiency, and efficacy together. As Bellini et al, (2020) opined, there is now an increased demand for easily accessible and quality healthcare. This has ultimately prompted healthcare systems to spend more time looking for ways to deliver on their mandate. Moreover, as Loan et al., (2012) earlier affirmed, the mission of any hospital is to provide specific health services, which can solve the patients' health problems (efficacy) in the best manner (quality) and in the most economic way possible (efficiency).

The combination of AI and performance in healthcare as Rigby (2019) elucidates entails understanding AI technologies and how they can be used to improve the delivery of health services efficiently, taking into cognizance the aforementioned indicators of performance. Thus, Jiang et al. (2017) supported that the rapid advancement of technology has made it possible for AI to be successfully adopted in healthcare. Long et al. (2017) avers that the field of medicine is one of the most practical application areas of AI, as current medical leanings show that artificially intelligent computer programs have advanced to the domain of human professionals such as it is in medical diagnostics, even as industry experts have identified that there exist a synergy between AI and human doctors (Topol, 2019). Jiang, et al., (2017) concurred by asserting that in certain areas of healthcare, AI can unequivocally help physicians make better clinical decisions, and in some cases even replace human judgment. Moreover, the United Nations (UN) have reported that when the human diagnosis is combined with AI, the error rate drops to 0.5% compared to 3.5% for human doctors (Begovic, Oprunenco, & Sadiku, 2018). This is also supported by He et al. (2019) in their claims that the combination of human clinicians and AI produces better results than when the processes are done alone. Consequently, the use of predictive and cognitive analytics in medicine is predicted to enhance precision in generating individualized treatments (Vuong et al., 2019). In view of this, Chen & Decary, (2020) asserted that AI is practically touching every aspect of healthcare, and it is continuing to spread into new areas of medicine, such as clinical decision support at points of care, patient self-management of chronic illnesses at home, and real-world drug development.

Presently, healthcare facilities are facing enormous challenges and pressure due to increased numbers of patients in the hospitals per time and the quality of service rendered. Consequently, the deployment of AI technology will greatly impact the operational performance of the hospital facilities to produce a more efficient results. Therefore, it has become pertinent to evaluate Artificial Intelligence and its impact on the performance of hospitals in Port Harcourt. The next chapter shall review relevant literature in AI and performance. We shall also look at the role of technology in operational performance and how its adoption has brought about profound and disruptive changes in healthcare. Chapter three will discuss the methodology and the final chapter shall conclude this article.

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2.0 LITERATURE REVIEW

2.1 Artificial Intelligence: Definitions and Theories

Several definitions have been offered to explain the understanding of what Artificial Intelligence is all about. Krizhevsky & Hinton (2012) notes that although much progress has been made in the past in terms of the definition of AI, it has however suffered from inconsistencies as to what exactly constitutes 'real AI'. Nonetheless, Vuong et al., (2019) broadly defined AI as "an inter-disciplinary approach using principles and devices from computation, mathematics, logic, mechanics, and even biology to solve the problem of understanding, modeling, and replicating the intelligence and cognitive processes". Russell & Norvig (2010) also defined Artificial Intelligence as "a branch of computer science that attempts to both understand and build intelligent entities, often known as software programs". Similarly, Chen & Decary (2020) also stated that AI is not a single technology but a range of intelligent processes and behaviors generated by computational models and algorithms which makes the computer a system that simulates or exhibit specific aspect of human intelligence or intelligent behavior, such as learning, reasoning and problem-solving. Accordingly, a report from the University of Pretoria's Access Partnership has described AI as enabling machines that sense their environment, think, learn, act in response to their environment and circumstances underpinning it by defining Artificial Intelligence as a; "constellation of technologies that enable machines to act with higher levels of intelligence and emulate human capabilities to sense, comprehend, and act. These human capabilities are augmented by the ability to learn from experience and adapt over time."One inference that can be drawn from all the definitions is that AI represents a computational approach to developing intelligent software and systems that can solve complex problems by adopting human intelligence while working in the ways of the human mind.

The idea of AI dates back to the 1950swhere the term was used for the first time and it recently re-emerged with various technological breakthroughs (Yu, Beam, & Kohane, 2018). Furthermore, fueled by the abundance of data, algorithmic advances, and the usage of high-performance hardware for parallel processing, established IT giants in the last few years began bridging the gap between science and business applications (McKinsey & Company, 2017). The quest for a cohesive theory of AI has been widely considered as pointless as there have been many debates on the nature or objective of the field (Simon, 1990); (Kirsh, 1991). Contrary to the fields of science, engineering, and management which are guided and identified by corresponding theories, the field of Artificial Intelligence seems to be an exception in this regard. According to McCarthy et al., (1955), the historical reason behind this situation is that the field of AI started from the realization that computers, though initially designed for the purposes of calculating numerical problems, can be made to carry out other mental intellectually hard activities, such as proving theorem and game playing which are already considered as demanding "intelligence". They supported the lack of a common theory; maintaining that "Intelligence" is our middle name as our minds already contain processes that enable us to solve difficult problems. They further posit that a "theory of AI" is impossible to achieve since we cannot have a theory for "processes we do not understand".

However, some AI researchers believe that a theory will be useful and possible to achieve. This view is supported by Newell (1990) who argued for the necessity of a unified theory and

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further proposed a theory that attempts to cover Artificial and Human Intelligence. Based on the foregoing, Wang (2012) attempted to clarify the conflicting decisions by proposing that for AI to be theory-based, it needs to have both descriptive and normative features as obtainable in science or engineering fields as it studies the similarity and differences between "the computer and the human brain". Von Neumann (1958) further explained that computer systems can take over human mental labor in many situations and often do a better job. Wang (2012) further postulates that an AI theory should be descriptive with respect to the basic principles, functions, and mechanisms of human intelligence, and at the same time, be normative to computer intelligence, given that human intelligence is an existing phenomenon, while computer intelligence is something to be built, for which an accurate description does not exist at this moment.

2.2 Dimensions of Artificial Intelligence

The basic objectives of AI (heuristic programming, machine intelligence, or simulation of cognitive behavior) enable computers to perform intellectual tasks which Copeland (2000) identified as: learning, reasoning, problem-solving, perception, and language understanding. Joshi (2019), classified AI into the following, based on their ability to "think" and "feel" like humans; reactive machines, limited memory machines, theory of mind, and self-aware AI. He further stated that the classification currently expanded to include; artificial narrow intelligence, artificial general intelligence, and artificial superintelligence.

In the light of the above, Jiang et al.(2017) viewed Artificial Intelligence in two broad categories which they asserted are responsible for most of the recent advances in the field of medicine; Machine Learning (ML), which analyses structured data such as imaging, genetic, and electrophysiological (EP) data, and Natural Language Processing (NLP), which extracts information from unstructured data such as clinical notes and medical journals to supplement and enrich structured medical data. These two critical dimensions will be used in measuring the performance of AI in health care operations in the next paragraph.

2.2.1 Machine Learning

Machines are by nature not intelligent, as they were originally designed to perform specific tasks. Mohammed, Khan, and Bashier (2017) assert that the fundamental difference between humans and machines in performing their work is intelligence, considering that the human brain receives data gathered by the five senses and is sent to the brain via the neural system for perception and action. On the other hand, a machine cannot deal with gathered data in an intelligent way, because it does not have the ability to analyze data for classification or from previous experience. Also, Nilsson (1998) observed that a machine can learn whenever it changes its structure, program or data in such a manner that its expected future performance improves. He further explained that these changes as tasks associated with AI which involve, recognition, diagnosis, planning, robot control, and prediction. It is for this reason, that the British Mathematician, Alan Turing proposed a test, to measure the performance of machines in terms of intelligence, hence the beginning of machine learning, a dimension of Artificial Intelligence.

Consequently, Mohammed, Khan, and Bashier (2017) defined Machine learning (ML)as a branch of Artificial Intelligence that aims at enabling machines to perform their jobs

skillfully by using intelligent software. Jiang et al. (2017) view it as a set of subfields that allow computers to make predictions based on underlying data patterns making it the most common AI application in the medical field. Evidence suggests that combining medical personnel with ML algorithms improves decision-making by lowering the error rate (Andras, et al., 2019). For instance, when compared to a strategy based simply on clinical criteria, an ML approach incorporating diagnostic and treatment information was able to improve lung cancer staging accuracy by 93% for ML vs. 72% for the clinical approach (Andras, et al., 2019). Therefore Chen & Decary (2020) insists that understanding the potential and limitations of machine learning is critical for its use in hospitals even as they asserted that supervised learning, unsupervised learning, reinforced learning, and deep learning are the most common machine learning algorithms currently in use.

2.2.2 Natural language processing

The Webster's Dictionary describes language as a method of communication with which we can speak, read and write. But the question that confronts us is can we communicate in a similar manner with computers? In other words, can humans communicate with computers in their natural language? This poses a challenge because computers need structured data whereas human speech is unstructured and often ambiguous, hence the advent of NLP. From the foregoing, Chen & Decary (2020) defined Natural language processing (NLP) as a technique for automatically analyzing and representing human languages, primarily in text format, using computational methods. Similarly, Tutorialspoint elucidated that as a sub-field of AI, it is concerned about enabling computers to understand and process human language. In the medical field, it has been observed that Natural language processing methods can help enhance diagnoses, therapy recommendations, and treatments by extracting a huge volume of crucial information albeit unstructured textual and descriptive data about patients from doctor's notes, test findings, lab reports, medicine orders, and discharge instructions (Jiang, et al., 2017). Above all, through ML and NLP, computers will be able to quickly absorb large volumes of images and textual data, allowing clinicians to make prompt diagnosis and treatment decisions, which will have a significant impact on health service delivery, particularly in terms of how patients are treated.

2.3 The role of Technology in Performance

Technology plays a pivotal role in creating new products and improving processes. The development and innovative use of technology give an organization a distinctive competence and competitive edge over other organizations (Sonnentag & Frese, 2002). Thus technology takes many forms, beginning with ideas, knowledge, and experience and then utilizing them to create new and better ways of doing things. Therefore, Ellitan (2002) identified technology as the hardware and software employed to solve operational problems effectively in an organization. Krajewski & Ritzman (1999) in their study identified product technology, process technology, and information technology as three principal areas of technology in an organization. The emphasis however is on process technology for the purposes of this study. Therefore, Ellitan (2002) described process technology as the machine, equipment, and devices employed in operations to transform materials into finished products in other to fulfill organizational strategic objectives.

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It has been observed from research that technology has brought about changes in the area of healthcare, as a result, patients now have access to the best diagnostics and surgical tools for cutting-edge treatments. Accordingly, Jones (2018) affirmed that the introduction of new AI technologies in the areas of health records, remote consultations, diagnostics and predictions, and patient care has led to better treatments and enhanced the quality of life of patients generally. Notably, the field of Medicine has long been identified as one of AI's most promising areas of application as many clinical decision support systems have been suggested and implemented as a result rule-based techniques were shown to interpret ECGs, diagnose diseases, choose appropriate medications, provide clinical reasoning interpretations, and support physicians in creating diagnostic hypotheses in complex cases (Yu, Beam, and Kohane, 2018). In essence, the purpose of computer-aided programs in medicine is to essentially imitate expert human reasoning, hence improving the clinical diagnosis and treatment process (High, 2012). For instance, IBM Watson's pioneer cognitive program, an aid in individualized oncology diagnosis and treatment is seen as a prominent example of digital computing strengths

2.4 Performance

Performance is probably the most widely used dependent variable in research today, yet it remains the vaguest. According to Jahanshahi (2012), it comprises the actual results or output of an organization as measured against its intended results or output. Loan et al., (2012) opined that performance represents the extent to which set objectives are accomplished. Where Purbey et al. (2007) proposed that operational performance be measured via the sub-indicators of cost reduction and resource utilization, Davies et al.(2013) considered efficiency a critical element when evaluating operational performance. Gomes et al. (2010) further advocated that operational performance should be measured using three indicators; availability, quality, and efficiency. Capkun et al. (2012) summarized that operational performance determines the viability of an organization. While many studies have tried to measure operational performance in the healthcare sector, Li & Benton (1996) have characterized the performance of the healthcare sector into; internal measures and external measures which they further sub-divided into; financial status and quality performance. Similarly, Elg et al., (2013) identified three distinguishing approaches to measure performance for healthcare organizations that comprises; management accounting, operational performance, and strategic control. Furthermore, Nerminathan et al(2014); Elg et al. (2013); Capkun et al (2012) each specifically analyzed operational performance in healthcare using average length of stay (ALOS) or length of stay (LOS) to calculate the number of days a patient stays in the hospital. Pillay et al.(2011) further recognized some causal factors which include; heavy workload, poor facilities, and poor management supervision as reasons for long waiting times in most healthcare establishments. Chen (2013) argues the inappropriateness of this measure as a healthcare output, rather he proposed; that service delivery, cost reduction, and quality should be the measure of efficiency in the healthcare operations. Accordingly, Anuar, Saad &Yusoff (2018) have asserted that Healthcare Operational Effectiveness should be used systematically by operational managers and healthcare administrators to monitor operational performance as well as make improvements. Thus, Loan et al., (2012) and Carini et al., (2020) both advocated that indicators of hospital performance can be classified into the following:

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2.4.1 Efficiency: According to Carini et al., (2020), efficiency in healthcare can be defined as the optimal deployment of available healthcare resources to maximize health outcomes for society. Similarly, Veillard et al. (2005) define efficiency as the hospital's optimal use of inputs to produce maximum outputs given available resources. Gandjour et al., (2002) look at efficiency in terms of procedure (as it relates to specific clinical situations) and structure. Veillard et al., (2005) additionally offer a sub-category of the dimension, describing efficiency in terms of service appropriateness, productivity, and capacity utilization. Loan et al., (2012) find that the dimensions' substance includes resources, a financial component (finance systems, continuity, extra resources), more high-skilled individuals, and the availability of cutting-edge medical technology and equipment.

2.4.2 Clinical Effectiveness: Clinical effectiveness, according to Veillard et al., (2005), is the appropriateness and competence that permits clinical treatment and services to be delivered with the greatest benefit to all patients. This research divides this dimension into three categories: appropriateness of care, conformance of care procedures, and outcomes of care and safety processes. Simou et al., (2014) consider mortality, readmissions, and survival rates. The content of the dimensions, according to Loan et al (2012), includes technical quality, evidence-based practice and organization, health improvement, and outcomes (both individual and related to patients).

2.4.3 Patient-Centeredness: According to Veillard et al., (2005), this dimension refers to a set of indicators that take into account the patients' and families' perspectives. The primary goal is to see if patients are in the center of care and service delivery. In terms of patient input, Simou et al., (2014) present patient-centeredness metrics. The dimension content, according to Loan et al., (2012), includes availability towards patients: focusing on the client (quick attention, access to social aid, politeness, and service provider selection), patient satisfaction, and patient experience (dignity, confidentiality, autonomy, communication)

2.4.4 Safety: Veillard et al., (2005), propose that this relates to the ability of both patients and experts to avoid, prevent, and limit harmful interventions or dangers for themselves and the environment. According to Loan et al., (2012) the dimensions indicate that patients are satisfied with the medical services, suppliers are aware of the value of keeping a relationship with a hospital, and the organizational structure is functioning.

2.4.5 Responsive governance: Veillard et al., (2005) define responsive governance as the "degree of responsiveness to community needs, to ensure care continuity and coordination, to promote health and provide care to all citizens" and they divided the related indicators into system integration and continuity and public health orientation. According to Loan et al (2012), the dimension content includes social accountability and reactivity, community orientation (reaction to needs and requirements), access to resources, continuity, health promotion, equity, and the ability to adapt to changing population demands (strategically)

2.4.6 Staff Orientation: Veillard et al., (2005) analyze this dimension in terms of individual needs awareness, health promotion and safety activities, and behavioral reactions. Simou et al., (2004) look at absenteeism, job satisfaction, overtime work, burnout, and continuing education as ways to address the problem. According to Loan et al., (2012), dimension content includes meeting human resource needs, developing motivational systems

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to prevent specialized human resource (physicians and nurses) migration, ensuring proper conditions to keep hospital personnel's health safe and improving it, and ensuring fair opportunities for continuing medical education.

2.4.7 Timeliness: Simou et al. (2004) evaluated it in terms of indicators, and it refers to the time needed to address specific therapies.

In line with the above, Nikjoo et al., (2013) opined that hospital performance indicators help with monitoring, evaluation, and decision making, hence they provide health stakeholders the opportunity to identify critical and problematic points to take corrective action.

2.5 AI and Healthcare Performance in Africa

In a study released in 2018, the World Health Organization, the Organization for Economic Cooperation and Development, and the World Bank reiterated their global commitment to achieve universal health coverage by 2030. In which the stipulated that people and communities all over the world should be able to afford high-quality health care, whether they are preventive, curative, rehabilitative, or palliative. Despite this, given the challenges most hospitals face, such as shortages of qualified professionals or supplies, rural accessibility barriers leading to a lack of awareness of health issues, diagnosis, and detection, it is likely that Africa's healthcare framework is grossly underperforming when it comes to delivering on the set mandate (Accenture, 2017). These difficulties, according to an Accenture analysis, these issues can be mitigated by using AI programs, which are available in industrialized countries.

Furthermore, according to a study conducted by Accenture, AI is expected to promote global economic growth by 2035 and has the ability to double any country's GDP growth rate if embraced. As a result, the African region's ability to capture a portion of this benefit will be a tremendous instrument for developing fundamental areas such as agriculture, healthcare, and public and financial services (Accenture, 2017). As a result, Access Partnership backed the adoption of AI in their study, claiming that it will bring about innovative and productivity-boosting technology that will fuel Africa's progress. Nonetheless, Gadzala (2018) stated that just a few African countries, like Kenya, South Africa, Nigeria, and Ghana, have embraced the use of Artificial Intelligence. He believes that many African countries are lacking in data gathering and privacy, infrastructure, education, and governance, all of which he believes are crucial for the successful use of AI technology for long-term progress. According to Chen and Decary (2020), other challenges include: (1) a large capital outlay for implementation; (2) an understanding of the type of AI technology to be used; (3) knowledge and strategies for integration; (4) identifying trained personnel for implementation; (5) incompatibility of the technologies with legacy infrastructure; and (6) access to diverse medical data for training and implementation. Moreover, Edet et al.(2017) found that users of technology applications are consistent with the following: infrastructure and logistics, data management, wages and remuneration, and human resources and healthcare system, in their report on exploring the use of technology for routine health data collection in Rivers State in general and Port Harcourt in particular.

The following according to Sallstrom et al. (2019) were identified as key measures to be considered when looking at the adoption of AI in hospitals:

Flexibility: Physician shortages affect remote areas in some communities, with patients frequently unable to access high-demand doctors, resulting in high death rates in those places. Tech-enthusiasts believe AI technologies will make progress in solving such issues. In other words, AI-based telemedicine technology can help people across boundaries, overcome language obstacles, and overcome financial restraints. For instance, DokLink, a Nigerian health-tech company, assists patients in scheduling visits and collaborating on medical information exchange. (Technopreneur, the Business Minded Techie, 2018).

Quality: AI is becoming increasingly important in the early detection of diseases, allowing for more precise diagnosis and lowering the risk of misdiagnosis, as well as the health and financial burden on patients. Medical process automation, such as chart cataloging, prescription filling, and transcribing services, can relieve medical practitioners' workload while also providing positive externalities for patients. Furthermore, this will aid primary care by speeding up a patient diagnosis (Technopreneur, the Business Minded Techie, 2018). All of which will translate to the quality of service rendered.

Cost Reduction: Many public healthcare systems around the world are still financially unable to address issues pertaining to affordability according to Deloitte's 2019 Global Healthcare Outlook report. They also proposed that global spending will grow at a rate of 5.4% yearly until 2022, a noticeable 2.9% across the last five years. In West Africa, government healthcare spending is predicted to rise at a rate of 4.9% on average (The Economic Intelligence Unit, 2018). As a result, they argue that incorporating AI into the healthcare sector can assist to control rising medical diagnosis costs while also making treatments more inexpensive. Accordingly, Ahmed et al., (2020) opined that the implementation of artificial intelligence in healthcare has potential that can lead to significant improvements in providing real-time, better personalized, and population medicine at lower costs. In Nigeria, for instance, a system called Apmis has been developed that provides for easy, transparent, secure, and low-cost data sharing. It was created to make communication easy for hospital owners, healthcare practitioners, and other stakeholders to exchange healthcare data (Apmis: All Purpose Medical Information System, 2018). It is against this backdrop that Accenture advocates that by 2026, AI-assisted technology will save the global healthcare business $150 billion every year (Accenture, 2017).

3.0 CONCLUSIONS, RECOMMENDATIONS, AND AREAS FOR FUTURE STUDY

From the foregoing literature, we are inclined to believe that Artificial Intelligence has the potential to enhance productivity and growth by expanding opportunities in key sectors for development, including agriculture, healthcare, financial services, and government services. By empowering organizations with access to high-quality digital tools, AI will equip workers, entrepreneurs, and businesses to compete at a global level and be at the forefront of economic transformation. Therefore, in a critical area like the health sector, Artificial Intelligence should be viewed as a powerful tool and partner that can enhance, extend and expand human capabilities in delivering quality, safe, and efficient care patients need. After all the WHO's most critical issue in the SDG is providing overarching and effective healthcare treatment options that improve standards of living. A review of related literature shows that AI innovations have been better adopted and harnessed more efficiently for improved patient care in the healthcare fields in the developed and more industrialized nations, whereas

research reveals that healthcare providers and organizations in the less developed countries are slow to adopt these tools of technology although some of the developing nations like South Africa, Kenya, and Nigeria are quickly catching up.

The performance variable represents the extent to which set objectives are accomplished is a key aspect of the management process of any organization. Suffice it to say that it is what determines the viability of an organization. Thus, in the healthcare sector, research studies indices for measuring healthcare performance as was earlier mentioned in the literature and these indicators help in the evaluation of the hospital's operations. Accordingly, the World Bank Organization emphasized the importance of constantly monitoring and evaluating the performance of hospitals seeing that the sector consumes about 50 to 80% of the allocated budget for health sectors (Nikjoo et al., 2013).

Below are some considerations for the successful development, deployment, and integration of AI in healthcare that will bring about an easy workflow process for optimum performance:

1. Embed AI features into workflows to support clinical decision-making
2. Know and select the key platforms, products, and services for developing AI in healthcare
3. Customize a robust data strategy for data access and storage
4. Make adequate provision for human capital development and training
5. Determine the context and protocol for the safe use of AI technology
6. Establish performance standards to measure AI success
7. Develop and support state and regional AI-powered digital healthcare ecosystems

The foremost implication of these findings is the need for healthcare providers and hospitals in Port Harcourt to be abreast with global trends in AI in other to adopt the vast untapped potential and make concerted efforts in the investment required to streamline the processes required in implementation for lowered costs of operations, increased efficiency and most importantly save lives.

Finally, this study is fraught with some limitations that may serve as an area for future studies. First, there was very limited data about AI and its performance in private hospitals in Port Harcourt, consequently, future studies could empirically examine Artificial Intelligence and the operational performance of private hospitals in Port Harcourt. Other areas of future research interest might be in terms of exploring aspects of disruptive technology like robotics and the internet of things (IoT) and how they can impact performance in healthcare.

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