

EFFECT OF ARTIFICIAL INTELLIGENCE ON OPERATIONAL PERFORMANCE OF NIGERIA HEALTH INSURANCE AUTHORITY

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ABSTRACT

The application of artificial intelligence to insurance companies' core business operations has garnered increasing interest. Nevertheless, research and practice have struggled to fully grasp the dynamics of this application. For this reason, this study evaluated the effect of AI on insurance underwriting, customer service delivery, insurance claim provision, and insurance marketing. We gathered respondents' information using a well-designed questionnaire. With a population of 4109, the Taro Yamane sample size formula for limited populations was used to produce a sample size of 310. The data was presented using both inferential and descriptive statistics, and the developed hypothesis was tested using a multiple regression model. According to the study, artificial intelligence contributes to improving insurance risk underwritten, customer service delivery but has a negative impact on insurance claims processing. This study concludes that the introduction of artificial intelligence has not only improved the performance of NHIS but the Nigerian healthcare delivery system. The study recommends that; NHIS should enlist more standard hospitals, review customer service delivery in all accredited hospitals and the government may diversify their investments in insurance claims, handling, and service delivery within the within the Nigerian insurance sector.

Keywords: *Artificial Intelligence, Insurance, Marketing, Claims, Underwriting, Customer Service*

INTRODUCTION

The healthcare remains a major sector advancing changes not just in human life's but also a medium of driving economic growth and development globally. The advent of technology has changed the way things are done now and the advent of artificial intelligence has further changed things especially in the healthcare sector (Martin et al., 2021) thereby, opening up unused roads for more exact conclusions, individualized treatment plans, and way better by and large wellbeing (Gergo & Gergely, 2021).

This work advances a new perspective especially as it relates with the healthcare

sector in Nigeria through an analysis of artificial intelligence on healthcare in Nigeria, as well as the conceivable dangers and troubles which will emerge from its utilisation and how well the existing lawful framework is suited to bargain with them. There has been much discourse about artificial intelligence (AI) and its incalculable applications within the 21st century, including keeping money, hazard insurability, healthcare benefit conveyance, building, and trade writing (Ali et al., 2019; Qashqai et al., 2019; Jakši & Marin 2019).

Artificial intelligence (AI) in the realm of services typically refers to automated and robotic systems designed to assist customers

in their purchasing and usage processes. These technologies display an eagerness and capacity to aid people and businesses, enhancing service delivery and efficiency (Gursoy, 2018; Lu et al., 2019). Conversely, insurance operates as a form of commercial intermediation by distributing risks among all participants in a particular group, effectively mitigating potential losses (Denenberg et al., 2014). The political and social preferences of the general population significantly influence the functionality of the insurance sector within any community.

Insurance has historically been recognized for its role in ensuring that the resources necessary for claim payouts are available when needed, providing a critical protective barrier (Yusuf et al., 2017). This becomes even more crucial in the context of life insurance policies, which serve as a continuous support mechanism. The insurance industry contributes to the economy through savings and investments in various financial and real estate assets. The returns on these investments represent a vital source of revenue for insurance companies. By reinvesting portions or the entirety of their annual income, insurance companies can increase the size of their assets.

The NHIS appears similar to other global government-funded schemes, but the HMOs seem less effective than expected, primarily due to inadequate implementation of (AI). Many HMOs on duty often deliberately avoid work, largely because of their perception of AI activities in the sector. Those who do attend to patients frequently exhibit reluctance, affecting problem-solving efforts in hospitals. This attitude among healthcare staff contributes to user dissatisfaction with the NHIS.

Researchers have also discovered that many enrollees consistently complain about health service providers denying them their full entitlements and sometimes charging additional fees (Tynkkynen, 2013; Liran, 2017). This underscores the need to enhance the application of AI for problem-solving

within the sector. Additionally, some HMOs have cited issues such as a lack of medications, poor enrollment services, inefficient referral systems, and delayed services as justifications for needing improved decision-making applications.

The researchers, hence, inspected particularly, the operational execution of HMOs in FCT, Abuja. Consequently, three objectives are formulated bellow to guild the study to:

- i. examine the impact of perception application of artificial intelligence on insurance risk underwriting;
- ii. assess the impact of problem-solving application of artificial intelligence on customers service delivery; and
- iii. explore the effect of decision-making application of artificial intelligence on protection claims processing

The underlisted hypotheses were formulated in line with the objectives of the study:

- H₁:** Perception application of artificial intelligence has no impact on customer's service delivery
- H₂:** Problem solving application of artificial intelligence has no impact on customer's service delivery
- H₃:** Decision -making application of artificial has no effect on protection claims claim processing.

LITERATURE REVIEW AND THEORETICAL FOUNDATION

Artificial intelligence (AI) includes all intelligent machines that can learn, adapt, and function in various risky situations (computer systems) without needing

external help (Miaillhe, 2018). With each new data file, intelligent systems use complex algorithms to learn from previous performance and continually modify and improve their predictions (Hehner et al., 2017). Furthermore, machines mimic human cognitive abilities such as perception, learning, reasoning, and problem solving (Balasubramanian et al., 2018). According to OECD (2020), the results can be displayed in products, social media posts, and search engine results, and the information is expected to be honest. However, when artificial intelligence (AI) and machine learning are used for commercial purposes such as online retail and recommendation systems, it does not come without raising ethical questions and criticisms.

Unlike natural intelligence, computers can only become more intelligent in limited areas. More generally, natural intelligence is highly adaptive, and such high levels of intelligence (often called general intelligence) cannot be transferred to machines. Artificial intelligence is described by Elaine Rich et al. (2008) as "the study of how computers do things better than they can currently do." "The science and development of intelligent machines, especially intelligent computer programs" is McCarthy's (2020) definition of artificial intelligence. According to McKinsey (2017), the general definition of artificial intelligence is the ability of a computer to manage and perform specific tasks quickly, effectively, and intelligently.

Artificial intelligence is also related to machine learning, since in machine learning, humans input data into a computer and the machine is assumed to be able to learn on its own (Nedelkoska and Quintini, 2018). In the field of machine learning known as "deep learning," algorithms aim to obtain a high level of abstraction of the data. Artificial intelligence is a broad field of computer science. The goal of artificial intelligence is to create intelligent autonomous systems that do not require human intervention, as

exemplified by blockchain technology (Alli, Ganiyu, Aina, 2020).

Operational Performance

The efficacy and efficiency with which organisations use their resources to accomplish their goals is referred to as operational performance. It includes a range of elements, including flexibility, speed, quality, and productivity, all of which are essential for preserving a competitive edge in the market (Slack et al., 2020).

Productivity, a crucial component of operational performance, gauges how successfully an organisation uses resources to produce products and services by comparing the output produced to the input consumed (Hitt, Xu, & Carnes, 2016). Elevated levels of productivity signify proficient operations and facilitate reduction of expenses and enhancement of earnings. Another important factor is quality, this refers to the degree to which a product or service meets and fulfills the needs and expectations of the user. Excellent quality increases client happiness and loyalty, which encourages recurring business and favourable word-of-mouth (Garvin, 1987).

In the fast-paced commercial world of today, speed—that is, an organization's ability to offer goods or services quickly—is crucial. In businesses where prompt delivery is crucial, faster delivery times can boost customer satisfaction and give a major competitive advantage (Christopher, 2016). Organisations may respond quickly to consumer requirements and market possibilities by being flexible, which allows them to adjust to changes in demand or market conditions. This ensures continued competitiveness (Upton, 1995).

Additionally, elements like innovation and continual improvement have an impact on operational success. While continuous improvement techniques like lean management and Six Sigma systematically improve operational capabilities, process,

product, and service innovation may result in significant increases in efficiency and effectiveness (Davenport, 2013; Antony, 2014).

For these businesses to succeed, managing client connections and providing services seamlessly are critical components of their business operations. By encouraging a cooperative and productive work environment, the integration of human relation competencies—such as effective communication, trust-building, and conflict resolution—plays a critical role in improving operational performance (Gara & La Porte, 2020; Umar et al., 2024). Operational performance is a broad term that describes how successfully an organisation uses its resources to accomplish its objectives. It is a critical factor in determining long-term profitability and competitive advantage, especially in fast-paced, customer-focused sectors like service marketing.

Operations of Insurance Firms

The insurance company's guiding principles have gained credibility as its capacity for business has grown. Therefore, it should go without saying that the sales role is essential. However, in the insurance business, sales volume ensures profitability and may not necessarily align with the goals of the insurance company's underwriting department (Ajemunigbohun et al., 2018). Subscribers play a vital role in the marketing department, particularly because sales agents and intermediaries occasionally do not adhere to the company's underwriting policies. Nevertheless, when the underwriting department adopts an excessively restrictive approach in accepting and classifying risks, the company loses valuable expertise (Denenberg et al., 2014).

Yusuf et al. (2017) state that this department is primarily in charge of the company's reputation and actively interacts with the public. In both cases, the producer serves as a go-between for the policyholder and the

firm when it comes to paying the premium and making claims. Two different departments need to be coordinated with (Ajemunigbohun et al., 2018).

According to Yusuf, Ajemunigbohun, and Alli (2017), claims processing and administration are among the most significant and intricate aspects of insurance as many insurers may significantly enhance their business model by restructuring the claims process. All stages of the claim process are covered, including claim triage, review, fraud investigation, adjustment if required, and acceptance or dismissal, from the time of contact until the matter is settled. The claims process can be accelerated and automated with artificial intelligence (AI). Artificial intelligence (AI) technologies such as chatbots, such as Watson Assistant, have the potential to enhance client interactions with insurance firms.

For instance, when paired with the visual categorization of the AI image and machine learning for the cost and impact of the claim, a completely automated artificial intelligence (AI) judgement may be generated so that claims are paid for hours or days rather than weeks.

Artificial intelligence enhances the ability to identify unfounded claims (Eling and Lehmann 2018; Gruhn 2018). For example, insurers may accurately detect insurance fraud through the use of picture recognition and non-traditional methods, such as data from external databases (Gruhn 2018). Additionally, prior claims and suspicious trends, together with the behaviour of insured persons, those in their networks, and other parties affected by the alleged harm, may be considered by automated claims evaluation systems (Ravi and Kamaruddin 2017). According to Sam, Becky, and Mark (2019), low-impact cases are likely to be the only ones where this type of claims acceleration system works well. However, the use of artificial intelligence (A.I.) in the automated system or the influence of mechanising the claims procedure may

result in the reinforcement of more complex claims that are driven by processes and manual labour when A.I. is used to manage these claim categories.

Linking Artificial Intelligence to Insurance Firms Operations

Artificial intelligence in insurance, according to Nedelkoska and Quintini (2018), makes it possible to use technology for system auditing, damage recovery, claim reporting, and client communication—all of which enhance the claims process (Ramnath, Ari and Doug, 2021; Geneva Association, 2018; OECD, 2017). Furthermore, machine learning makes it easier to commit fraud and significantly reduces processing times, which helps insurers make better use of artificial intelligence.

Because automated methods have been demonstrated to increase coherence and efficiency in claims and underwriting, several insurance firms have used them. It consistently moves closer to virtual assistants on the client side in order to achieve intelligent back-office automation (Priti, 2021; Ramnath, Ari, and Doug, 2021). Artificial intelligence has led to advancements in voice command and touch screen technologies, which are becoming more intuitive and intelligent. This facilitates simpler and more natural contact between users. A rising number of insurers are employing smart part virtual help, which spans from high-tech startups to well-established organisations, to offer clients quick, customised support (OECD, 2017).

Insurance companies may use marketing as an active strategy to broaden their client base and improve customer acquisition. As a vital part of the competitive market, insurers must thus expand on the fundamental marketing strategy and go much beyond the traditional cold calling technique. Zekaj (2016) asserts that because insurance goods are unbreakable and only exist as promises,

insurance marketing is essential to meeting supply and demand. As a result, the services' customer will understand that confidence is needed to sell a promise in the event of an accident. The importance of artificial intelligence is currently growing due to factors including stronger sales, cheaper computing costs, easier access to huge data, and improvements in machine learning models and algorithms (Ming-Hui & Roland, 2020). Through artificial intelligence, an agent in the insurance industry may obtain the whole customer profile and prospects.

Companies may use further analysis on this data to gain a more nuanced understanding of consumer preferences, precise product or offer recommendations, and more. Soon, there will be advancements in sales and marketing from "finding consumers for product lines" to "assisting in customer creation." Bernado (2021) asserts that the core components of every organisation are its customers. Goods and services are provided to certain groups of individuals or businesses. The customer is the one who is willing to pay for the company's goods and services. It is crucial to understand the kinds of goods and services that may be created and provided during a company's life cycle.

The way a business interacts with its customers can be completely transformed by artificial intelligence (A.I.) (McLean & Osei-Frimpong, 2019). Therefore, in order to significantly impact this shift, insurance managers must be aware of the new technologies and how artificial intelligence can help businesses create innovative products, gather insightful data from unorthodox sources, streamline operations, and enhance customer satisfaction (Martin, David & Julian, 2021).

First, the way insurance interacts with customers (via sales and customer service, for example) is changing. Due to a lack of other options, customer service has historically needed direct communication between the client and an agent, broker, or

bank for issues pertaining to product features and complaints; however, the availability of information online and through chatbots has significantly increased. Even certain things may be bought online without a human being involved by using chatbots. Insurance firms will use human sales and customer care representatives more efficiently as chatbots begin to assume some of their duties. The availability and quicker delivery of customer service and product information benefits the policyholders as a consequence (Martin, David & Julian, 2021).

To maintain a competitive edge, businesses should continuously create and transform knowledge (Kogut and Zander 1992). Customer service acumen and inventiveness have emerged as critical sources of competitive advantage in the age of service-dominant thinking (Gidhagen et al., 2011). Robotics and AI advancements are continually pushing businesses to provide clients with new levels of service value. In contrast to traditional customer service, which consists of a series of interactions and activities between people (workers and customers) (Ray et al., 2005; Setia et al., 2013), service in the context of service robots entails combined human and robot communication. Customers give varying degrees of importance to different factors of service excellence. For instance, although some clients prioritise promptness and accuracy in services, others prioritise friendliness and individualised attention.

Customers' expectations for the kind and calibre of services have changed with the advent of service robots (Edvardsson et al. 2018; Lee & Lee 2019). Therefore, the quality of service rendered by intelligent machines and its importance to the consumer are determined by both the technical prowess of the machines and the goals of the consumer. Therefore, organisations must ascertain what customers want and anticipate in terms of the quality of services rendered by intelligent machines before deploying them for services. Therefore, it may increase a company's profitability by

offering customer service that is quicker and more effective, which will increase customer satisfaction and loyalty. Nigeria's use of AI in healthcare is still in its infancy and is developing. Nonetheless, there is no question that the use of AI in the healthcare sector would significantly improve the standard of healthcare services provided in Nigeria.

Theoretical Framework

Developed by Tornatzky and Fleischer in 1990, the Technology-Organization-Environment (TOE) model offers a complete framework for comprehending the elements influencing the adoption of technological breakthroughs inside organisations. According to the TOE model, acceptance and implementation of new technologies are determined by three key contexts: the environment, the organisation, and technology. The technical context evaluates new technologies' advantages, drawbacks, and suitability for usage with the company's current systems. It also includes the technologies now in use. This aspect is essential to comprehending the possible effects and viability of implementing advances such as artificial intelligence (AI) in health insurance companies.

The traits and assets of the organisation itself are referred to as the organisational context. This covers the firm's personnel resources, managerial structure, size, and scope. An organization's preparedness to accept new technology is largely dependent on factors including organisational culture, financial resources, and personnel competence. This setting assesses whether Nigerian health insurance companies have the people, infrastructure, and supporting leadership required to successfully integrate AI technology.

The external elements that might affect the adoption of technology, such as market structure, industry features, regulatory frameworks, and competitive pressures, are included in the environmental context. This

dimension will take into account the amount of industry rivalry, the legal environment controlling the use of AI, and the general state of technical innovation in the Nigerian health insurance market. Using the TOE framework, this study can methodically examine how these three contexts impact health insurance companies' operational performance when integrating AI technologies, offering a comprehensive understanding of the adoption process and its possible effects on the efficacy and efficiency of organisations.

Empirical Review

In Enugu, Southeast Nigeria, Obikeze and Onwujekwe (2020) investigated the functions of health maintenance organisations in the introduction of a social health insurance programme: In the study, a somewhat mixed sequential dominant status design was used. The study's population included 613 federal government employees, of which 28 were selected as a sample. Based on the themes that were generated and examined, the qualitative data analysis revealed that the majority of respondents were dissatisfied with the responsibilities that HMOs played in the federal government.

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In Wamba (2022), the mediating roles of organisational agility (ORGAG) and consumer agility (CUSTAG) are examined in relation to the influence of artificial intelligence (AI) assimilation on company performance. The research is a response to the increased interest in the economic value of AI and how it might improve organisational operations and strategic advantages. The research uses organisational and customer agility as mediators to examine how AI assimilation affects company performance using the dynamic capabilities view. An online survey was used to gather information from 205 supply chain executives in the USA in order to evaluate the suggested study approach.

METHODOLOGY

The study used a survey design to collect the necessary primary data. The study's participants included HMO enrollees, HMOs, and other hospital patients. The researcher gathered data from the target group via a questionnaire. The population of the study consisted of a total of 4109 people: 69 employees of the Abuja office, 40 HMOs that oversee these lives through primary healthcare providers dispersed throughout the Federal Capital Territory, and 4000 enrollees of the National Health Insurance Scheme at the University of Abuja Teaching Hospital, the sample size was determined using the Taro Yamane sample size determination technique (1967) modified by smith, which is:

$$n = \frac{N}{3 + N(e)^2}$$

Where; N= Population size, n= Sample size, e= Error of Margin (0.05)

$$n = \frac{4109}{3 + 4109(0.05)^2} = 310$$

Meanwhile, Israel (2013) suggested increasing the sample size by 10% to 30% to

accommodate incomplete questionnaire completion or non-response. The study increases the 310 sample size that was originally determined by 10% (1.20*310) to 372, and to guarantee that each respondent had an equal chance of being selected, the study used a straightforward sampling approach to distribute questionnaires to respondents. Out of the 372 questionnaires distributed, only 355 (or 95%) were returned and used for the research. The majority of the data was gathered from primary sources, such as questionnaires, interviews, and firsthand observations. The degree to which a research instrument yields consistent outcomes is conceptually known as reliability (Osuagwu, 2008).

Cronbach’s alpha was used to test the reliability of the instrument. Conceptually, validity implies the degree to which research instruments measure what it is designed to measure; Experts in management and psychology provide their approval to demonstrate the content validity of the instrument. Since co-efficient alpha values greater than 0.7 signify appropriate reliability, the instrument's sound

dependability is shown by the co-efficient alpha value of 7.89. The HMOs registered with UATH were chosen at random and completed the questionnaire administered in UATH, Federal Capital Territory, Abuja.

The three hypotheses posed in the study area were tested using multiple regression with the aid of the Statistical Package for Social Sciences (SPSS) and our model specification was formulated and used to test the three hypotheses posed in the study. The model is as follows:

$$OP = \beta + \beta_1 PA + \beta_2 PS + \beta_3 DM + \mu \text{-----} 1$$

PA= Perception application of artificial intelligence, PS= Problem solving application of artificial intelligence, DM= Decision making application of artificial intelligence as the co-efficiency of independent variables and OP=operational performance (IRU= insurance risk underwriting, TSQ=service quality, ICP= insurance claims processing) =the intercept, β_1 and β_2, β_3 . =Coefficient of operational performance, =Error term.

RESULT AND DISCUSSION

Table 1: Regression Result on artificial intelligence has an effect on operational performance

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.550	.163		9.535	.000
1 Perception application	.230	.061	.225	3.748	.000
Problem solving application	.218	.072	.167	3.031	.003
Decision making application	-.222	.058	-.222	-3.815	.000

a. Dependent Variable: Performance

R: .298^a R-square: .089; F(354), 11.377, p<0.05

The R-square, or coefficient of determination, is utilized to evaluate the goodness of fit for the estimated model. In

this context, the R-square value of 0.089 suggests that the model's predictive capability is relatively low. This value

indicates that artificial intelligence accounts for 8.9% of the variation in the operational performance of the NHIS. The remaining 92.1% of the variation is attributed to unexplained factors captured by the error term.

The F-statistic, another measure used to determine the overall significance of the regression model, indicates that the result is statistically significant at the 5% level. With a high F-statistic value of 11.377, the significance level is confirmed as the p-value (0.000) is less than 0.05, demonstrating the model's reliability in this analysis.

Test of Hypothesis

Test of Hypotheses One: Perception has no significant effect on insurance risk underwritten

The analysis revealed a calculated t-value of 3.748 for the perception application. According to the rule of thumb, the critical t-value at a 95%. Since the computed t-value exceeds this threshold ($3.748 > 1.96$), it falls within the rejection region. Consequently, we reject the first null hypothesis (H01) and conclude that the perception application of artificial intelligence significantly impacts the underwriting of insurance risk.

Test of Hypotheses Two: Problem solving has no significant influence on customer service delivery

The analysis determined that the t-value for the Problem-solving application was 2.23. Using the rule of thumb, the critical t-value at a 95% confidence interval is ± 1.96 . Since the calculated t-value of 3.031 surpasses this critical value ($3.031 > 1.96$), it falls within the rejection region. Therefore, we reject the second null hypothesis (H02) and conclude that the Problem-solving application of artificial intelligence does not significantly influence customer service delivery.

Test of Hypotheses Three: Decision making has no significant effect on insurance claims processing

The analysis revealed that the t-value for the Decision-making application was 2.23. According to the rule of thumb, the critical t-value at a 95% confidence interval is ± 1.96 . Since the calculated t-value of -3.815 is less than the critical value (that is, $-3.815 < 1.96$), it falls within the acceptance region. Therefore, we accept the third null hypothesis (H03) and conclude that the Decision-making application of artificial intelligence does not significantly affect insurance claims processing.

Discussion of the Findings

The first hypothesis tested demonstrated a positive correlation between the application of Perception in insurance underwriting and the amount of insurance risks covered. This suggests that HMOs have effectively managed to underwrite insurance risks in a timely manner. As a result, many enrollees may have found it easier to obtain coverage, which likely encourages high utilization among the socio-economic class of the FCT. This finding aligns with Anderson's socio-economic status model, suggesting that accessibility to insurance coverage is influenced by socio-economic factors.

Furthermore, the second hypothesis examined the relationship between the application of artificial intelligence in problem-solving and the delivery of customer service. The findings indicated that problem-solving applications contributed 21.8% to the perceived performance of HMOs in the FCT regarding customer service delivery. This aligns with the study by Leebov and Ersoz (2003), which emphasized the importance of doing things correctly, ensuring continuous improvements, and achieving the best possible clinical outcomes to satisfy patients. Thus, the results support the

premise that quality healthcare relies on effective problem-solving and continuous enhancement of services. However, the third hypothesis on the relationship between Decision making application of artificial intelligence and insurance claims processing shows a negative effect and decision-making application of artificial intelligence contributes -.222 to insurance claims processing in the FCT.

CONCLUSIONS AND RECOMMENDATIONS

Although the use of artificial intelligence in healthcare service delivery to enrollees does not seem to be at a world-class level, it does improve customer service and insurance risk underwriting but has a negative effect on the processing of insurance claims. As a result, the researchers draw the conclusion that the adoption of artificial intelligence has enhanced both the effectiveness of the Nigerian healthcare delivery system and the NHIS. The following suggestions are made in light of the facts and conclusion mentioned above:

- i. In order to improve insurance risk underwriting, NHIS should recruit more standard hospitals to put medical facilities closer to enrollees and bolster their monitoring team and artificial intelligence.
- ii. It is urgently necessary to assess customer service delivery in all accredited hospitals in order to make improvements in line with artificial intelligence.
- iii. The government may diversify from to other area of insurance instead of investing more on insurance claims processing since it has negative impact.

LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDIES

The study is limited to the inability of the student researcher to study other organizations apart from Nigeria Health Insurance Authority, since the study is on the effect of Artificial Intelligence on operational performance of Nigeria Health Insurance Authority, other study should be conducted in effect of artificial intelligence on operational performance of organizations looking at the private sectors.

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