E-ISSN: 1115 - 8530 P-ISSN: 3026-8958
MPRI-JFRBD | INTERNATIONAL JOURNAL OF FINANCIAL RES. AND BUSINESS DEVELOPMENT
VOL. 04 NO. 7 – APRIL, 2024

INFLUENCE OF ADOPTION OF INDUSTRY 4.0 ON INSURANCE COMPANIES PROFITABILITY IN NIGERIA

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Abstract

This study examines the effect of integrating Industry 4.0 technology adoption on the profitability of insurance companies in Nigeria. Employing a quantitative research approach, along with cross-sectional and survey research methodologies, the investigation aims to provide a thorough understanding of how adopting industry 4.0 technology impacts the financial performance of insurers in Nigeria. The study's population consists of 504 managerial staff from 56 insurance firms, ensuring a diverse and representative sample of the industry workforce. Initially, a sample size of 228 was determined using Taro Yamane's formula for finite populations, which was then increased by 20% in anticipation of non-response and missing data, resulting in a final sample of 208 completed questionnaires. The empirical findings illuminate a compelling narrative, indicating a strong and statistically significant positive ring-fence Industry 4.0 technology adoption on insurance company profitability in Nigeria. This underscores the necessity for insurance companies to embrace advanced technological solutions to enhance operational efficiency, competitiveness, and long-term financial viability in Nigeria's dynamic insurance sector.

Keywords: Adoption, Industry 4.0, Profitability, Technology Acceptance Model

Introduction

Insurance industry provides unique financial services to the growth and development of every economy (Grima, Spiteri & Romānova, 2020). Insurance is an assurance of repayment in the occurrence of loss, paid to individuals or company apprehensive about hazards by an insurance company (Iyodo, Samuel & Inyada, 2018). The life insurance industry contributes immensely to the economic development of countries. The

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importance of insurance, such as other financial institutions, e.g., banking and the stock market, is vital for the sustainable economic growth of any country (Ul Din, Abu-Bakar & Regupathi, 2017). A well- developed and evolved insurance industry is a boom for economic development as it provides long- term funds for development (Fujianti, 2018; Efuntade & Akinola, 2020).

The functions of insurance firms include: providing indemnity services, loss prevention, job creation, life assurance policies amongst others (Kartiningsih & Daryanto, 2020). Profitability shows how well a firm uses its asset from its primary mode of business to generate income (Fujianti, 2018). It is the overall efficiency of a company's ability to earn profit. At the micro level, profit is the essential pre-requisite for the survival, growth and competitiveness of insurance firms and the cheapest source of funds. Without profits, insurers cannot attract outside capital to meet their set objectives in this ever changing and competitive globalized environment (Adeniyi, Adeyinka & Babayaro, 2019). The insurance firms' ability to cover risk in the economy hinges on their capacity to create profit or value for their shareholders (Ja'afar, Sani, Isah & Alhassan, 2022).

The Nigerian insurance sector has performed poorly over time as it contributes only 0.4% to the nations (GDP), making it the poorest when compared to other countries within the continent. This poor profitability recorded over the years might not be unconnected with so many issues which comprise religious, cultural, low penetration, poor understanding and above all, nonpayment of claims by insurance companies which has led to good will reduction (Ja'afar *et al.,* 2022). The insurance sector is daily confronted with the challenges of low level of financial literacy, poverty, lack of trust (failure of insurance companies to settle claims), adding that the combination of all of these have continued to negatively affect profitability of listed insurance firm and their level of penetration (Kerim, Alaji & Innocent, 2019). Understanding the key factors and its magnitude determining profitability assists managers in developing an effective profitability strategy for their company (Hollas *et al.,* 2021).

Industry 4.0 is the convergence of industrial operations technologies and information and communication technologies (Skilton & Hovsepian, 2017). Industry 4.0 also relates to the convergence of the internet of things (IoT), the internet of persons (IoP), and the internet of everything (IoE) (Hermann, Pentek & Otto, 2016). Insurance 4.0 is a disruptive innovation similar to the three previous revolutions. They have in common the use not of a single technology, but the interaction of several technologies whose effects create new modes of operation. The results have also influenced the organizations, the environment, and social functions (Nicoletti, 2021). Industry 4.0 provides opportunities for easier, better quality and cost-effective fulfillment of already built businesses. In addition, it has the potential to contribute to the creation of business models, ways of doing business, new processes and activities that do not exist yet (Yıldırım, 2020). The concept of Industry 4.0 was first introduced in 2011 as a proposal by a group of representatives from different fields to increase competitiveness (Gilhuber, 2017). Industry 4.0 is expected to affect all

sectors. It is expected that the insurance sector will experience change and transformation with Industry 4.0. It is inevitable that the insurance sector will be affected in many areas such as access to insurance customers, determination of insurance prices, sales of insurance policies and damage transactions (Banger, 2017).

With Industry 4.0, dynamic and pay-per-use insurance products will become widespread and these insurance products will offer new opportunities based on consumer behavior (Shafig, Sanin, Toro & Szczerbicki, 2015). Although an extensive amount of literature exists on Industry 4.0 and its related problems and issues, relatively few researchers investigate the links between Industry 4.0 implementation and company financial performance/profitability (Neumann, Winkelhaus, Grosse, & Glock, 2021; Marcucci, Antomarioni, Ciarapica & Bevilacqua, 2022). Little is therefore known about how Industry 4.0 maturity affects corporate financial performance. Understanding how Industry 4.0 maturity influences financial performance/profitabilty is essential to enhance Industry 4.0 implementation and its impact on company financial performance.

It was formulated thus, what is the influence of adoption of Industry 4.0 on insurance profitability of Nigeria? Based on the aforementioned research questions, the main objective of this study is to examine the influence of adoption of Industry 4.0 on insurance profitability of Nigeria.

Research Hypothesis

H_0: Adoption of Industry 4.0 does not have significant influence on insurance companies' profitability in Nigeria

Concept of Profitability

Profitability is the ability of an organisation to consistently make profit or surplus over expenses (Rosko, Al-Amin & Tavakoli, 2020). Profitability is the primary goal of all business ventures; without profitability the business will not survive in the long run. In measuring profitability of an organisation, profitability ratios are mostly adopted (Abass, 2019). Profitability ratios are indicators for the firm's overall efficiency. They are used as a measure for earnings generated by the company during a period of time based on its level of sales, assets, capital employed, net worth and earnings per share (Alarussi, 2021; Rashid, 2021). Various scholars have used various types of financial ratios to measure profitability of an organisation.

Return on Assets (ROA) measures an organisation ability to utilize its assets to create profits. It gives an organisation an idea on how efficient management is using its assets to generate earnings (Hada & Mihalcea, 2020; Sapuan, Abdul Wahab, Fauzi & Omonov, 2021). ROA is more sensitive to capital structure. ROA has been extensively used as conventional measure of profitability of insurance companies' operations (Obalola & Abass, 2016). A higher ROA signifies the business's superior capability in generating profits from its assets, making it an indicator of profitability and productivity efficiency, as

highlighted by (Wong, Batten, Mohamed-Arshad, Nordin & Adzis, 2021). Return on Equity (ROE) however measures an organisation's profitability which reveals how much profit a company generates with the money shareholders have invested. It is an indicator that shows how much profit a company generates with shareholders' investment (Dansu, 2016; Bui, Nguyen & Pham, 2023). Return on equity (ROE) is also useful for evaluating the profitability of insurance companies (Ibrahim, 2016).

Concept of Industry 4.0

Industry 4.0, also known as the fourth industrial revolution, can be described as the advent of cyber-physical systems involving entirely new capabilities for people and machines (Schwab, 2016). While these capabilities are reliant on the technologies and infrastructure of the third industrial revolution, the Fourth Industrial Revolution (4IR) represents entirely new ways in which technology becomes embedded within societies and even our human bodies (Mhlanga, 2020). 4IR is defined as the fusion of technologies that is blurring the lines between the physical, digital, and biological worlds (Moloi, 2020). The term 4IR was first coined by Klaus Schwab, founder and executive chairman of the World Economic Forum.

The 4IR is affecting almost every facet of our daily life, impacting how individuals relate to technology and changing how and where work is done (Schwab, 2019). Another way to have an understanding of industry 4.0 is to appreciate the technology used in this revolution. Some of the technologies include artificial intelligence and robotics, ubiquitous linked sensors, virtual and augmented realities, additive manufacturing, blockchain and distributed ledger technology, advanced materials and nanomaterials, energy capture, storage and transmission, new computing technologies, biotechnologies, geoengineering, neurotechnology, space technologies. These are some of them that are driving the fourth industrial revolution in the 21st century (Mhlanga, 2020; Moloi, 2020). The 4IR is still generating attention despite entering a new decade and being used in increasing economic sectors (Valaskova, Nagy, Zabojnik & Lăzăroiu, 2022). It integrates smart and connected production systems and leads to increased productivity, sustainability, and energy efficiency while optimizing competitiveness (Kostrzewski, Sompolski & Królikowski, 2022).

Empirical Review

Bugaj, Durana, Blazek and Horak (2023) aim to confirm the positive sequel of applying Industry 4.0 to chosen indicators of profitability. The positive, negative, or no shift in the development of 534 businesses was based on Pettitt's test. The Pearson chi-square test disclosed the significant dependency between Industry 4.0 and shifts in profitability ratios. Then, more than 25% of enterprises involved in Industry 4.0 had positive shifts in Return on assets (ROA), Return on costs (ROC), Return on sales (ROS), and Return on revenue (ROR).

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Lin, Wu and Song (2023) investigates the driving force of the Industry 4.0 in China's manufacture industry, and evaluates the impact of Industry 4.0 on firm's performance. First, a textual mining is conducted to identify 460 companies that are implementing Industry 4.0 strategy, and then a Probit model is adopted to examine the driving forces of Industry 4.0. Through the propensity scores matching difference-in-difference method, the impacts of Industry 4.0 on firm's performance are evaluated. The results reveal that private and large companies show a higher motivation to promote the Industry 4.0 strategy, and government subsidies have no significant impact on firm's Industry 4.0 decision. The implementation of Industry 4.0 can significantly improve firm's financial performance, innovation activities and stock returns, but has no significant impact on supply chain efficiency.

Chen (2021) evaluates the moderated mediation effects of Industry 4.0 maturity on financial performance. The results show that Industry 4.0 maturity significantly affects internal business process performance (IBPP), which influences customer performance through the mediating effect of supply chain performance (SCP), and IBPP and SCP affect financial performance fully through the mediating effect of customer performance. The results also show that Industry 4.0 maturity moderates the positive relationship between customer performance and financial performance. Customer performance and IBPP have the largest direct and total effects on financial performance in the context of Industry 4.0 implementation, respectively. The results indicate that Industry 4.0 magnifies the potential returns to companies mainly through IBPP, SCP, and customer performance.

Technology Acceptance Model

The Technology Acceptance Model (TAM) is a popular hypothesis in information systems research that describes how users develop attitudes and intentions to embrace new technologies. It asserts that two critical elements impact technology acceptance: perceived utility and perceived ease of use. Perceived usefulness refers to an individual's belief that a technology will improve their performance and help them achieve their goals, whereas perceived ease of use refers to how easy a technology is to learn and use (Davis, 1989). These two components interact with one another as well as external variables such as social influence and conducive settings, eventually influencing an individual's behavioural intention to utilise technology. TAM has been widely used and modified to better understand technology adoption in a variety of situations, making it an invaluable tool for both researchers and practitioners (Davis, Bagozzi, & Warshaw, 1989).

The Technology Acceptance Model (TAM) serves as a core theoretical framework in a study exploring the influence of Industry 4.0 adoption on insurance profitability in Nigeria. TAM provides a systematic way to analysing how different players in the Nigerian insurance market perceive and interact with Industry 4.0 technology. TAM provides stakeholders with insights into the attitudes and intentions of insurance professionals, employees, and customers towards adopting technologies such as artificial intelligence,

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big data analytics, and Internet of Things (IoT) devices by assessing key factors such as perceived usefulness and ease of use. Understanding these impressions is critical for making strategic decisions about how to effectively integrate and use Industry 4.0 innovations to increase insurance profitability and operational efficiency in Nigeria.

Methodology

The research approach used in this study is quantitative, using both cross-sectional and survey research methods. Cross-sectional research collects data from a specific group at a single moment in time in order to investigate links or trends (Ojeleye & Bakare, 2020). In contrast, survey research collects information from respondents using organised questionnaires or interviews (Sekaran & Bougie, 2016). According to statistics from the National Insurance Commission's (NAICOM) website, Nigeria had 56 listed insurance firms as of January 31, 2022. The study focuses on managerial positions within these insurance companies, including Managing Directors, Executive Directors Technical, Heads of Technical Underwriting and Reinsurance, Chief Financial Officers, Heads of Audit, Heads of Enterprise Risk Management (ERM), Chief Risk Officers (CROs) specialising in Risk and Compliance, and Heads of Human Resources/Administration. While the study primarily examines the management level as the unit of analysis, it notes that future research might go into employee subunit levels. This emphasises the importance of intermediate and senior managers in everyday operations, since they can contribute vital insights to meet the study's goals. Taro Yamane's method for finite populations was used to get a sample size of 228 from a population of 504 (56 insurance firms x 9 management personnel). In accordance with Israel's (2013) suggestion to raise sample size by 10% to 30% to account for non-response, sufficient filling, and missing variables, the initial sample size was increased by 20% to 274. Finally, 208 (78%) of the disseminated questionnaires were correctly completed and used for analysis.

Instrument

All the questionnaire items were derived from previously validated research instruments. The measure of readiness for Industry 4.0 adoption was adapted from a scale developed by Nimawat and Gidwani (2016). An example item is: "The use of electronic commerce has enabled our company to complete specific tasks more efficiently," assessed on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." The reported Cronbach's alpha of 0.812 indicates the reliability and appropriateness of this instrument for the study. Similarly, the measure of profitability was adapted from a scale created by Spillan and Parnell (2006). An example item is: "Our company's profit targets were met," also rated on a five-point Likert scale from "strongly disagree" to "strongly agree." The reported Cronbach's alpha of 0.789 attests to the reliability and suitability of this instrument for the study.

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Result

Summary of regression analysis for the effect of Adoption of Industry 4.0 on Profitability of Insurance Companies in Nigeria.

Model, N=208	Beta	T	Sig.	R	R^2	Adj. R^2	Anova Sig.	F(df)
(Constant)	48.532	6.411	0.000	0.375[a]	0.274	0.221	0.000[b]	48.765 (1,192)
Adoption of Industry 4.0	0.376	2.894	.000					

a. Dependent Variable: Profitability
b. Predictor: (Constant), Adoption of Industry 4.0

Source: Researcher's Field Survey Results (2024)

The regression analysis conducted on the effect of Industry 4.0 adoption on profitability of insurance companies in Nigeria, based on data from 208 observations, revealed a statistically significant model fit (R-squared = 0.274), indicating that approximately 27.4% of the variance in profitability of insurance companies can be explained by the adoption of Industry 4.0. The constant term was 48.532, representing the expected profitability of insurance companies when Industry 4.0 adoption is zero. Overall, the model was significant ($F = 48.765$, $p < 0.001$), indicating that the predictor collectively contributed to explaining the variance in profitability of insurance companies.

Table 1 above the regression coefficient for Industry 4.0 adoption was 0.376 ($t = 2.894$, $p < 0.001$), suggesting a positive relationship between the two variables. Therefore, adoption of industry 4.0 has statistically significant effect on profitability of insurance companies in Nigeria.

From Table 1 the regression model showing the effect of adoption of industry 4.0 on profitability of insurance companies is expressed as:

$$P = 48.532 + .376\ AI \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{ eq. i}$$

Where:

P = Profitability of insurance companies
AI = Adoption of Industry 4.0

In the regression equation above, when the value of adoption of industry 4.0 is constant at zero, profitability of insurance companies was 48.532. The regression coefficient of adoption of industry 4.0 was 0.376, which imply that an increase in adoption of industry 4.0 by one unit leads to an increase in profitability of insurance companies' level by 0.376 units. Results further indicate that adoption of industry 4.0 and profitability of insurance companies had a positive and significant effect ($\beta = 0.376$, $p<0.05$). Therefore, the null hypothesis one (H_o) which states that adoption of industry 4.0 has no significant effect on profitability of insurance companies in Nigeria is hereby rejected.

Discussion of Finding

The adoption of Industry 4.0 technology has significantly increased the profitability of Nigerian insurance businesses. This is incongruence with past studies of Bugaj et al., 2023;

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Lin et al, 2023 & Chen 2021. One key factor is the increase in operational efficiency through automation and digitalization. Insurance operations, including underwriting, claims processing, and customer support, have become more efficient and accurate as a result of the integration of technology such as artificial intelligence (AI), machine learning, and data analytics. This efficiency minimises administrative expenses and speeds up processes, resulting in increased production and profitability (Ojo, 2020). Furthermore, Industry 4.0 allows insurance businesses to provide more personalised goods and services by exploiting data insights, attracting new clients while maintaining old ones, resulting in higher revenue and profitability (Adekanmbi & Adeyeye, 2019).

Furthermore, Industry 4.0 enables Nigerian insurance companies to improve risk management and detect fraud. Advanced technologies offer real-time risk monitoring and fraud detection, allowing insurance firms to efficiently limit risks and reduce losses. For example, using Internet of Things (IoT) devices for telematics in auto insurance allows insurers to watch driving behaviour, lowering the incidence of accidents and fraudulent claims (Olabode, Olufemi, & Ogunnaike, 2021). This proactive risk management approach protects insurance businesses' interests while also improving their reputation and consumer confidence, resulting in improved market share and profitability in Nigeria's competitive insurance industry.

Implications

The use of Industry 4.0 technology by Nigerian insurance firms has practical and theoretical ramifications. Integrating Industry 4.0 technology into insurance operations improves operational efficiency and reduces costs. Automation of activities including underwriting, claims processing, and customer support improves workflows, minimises mistakes, and saves time and money. This enhanced efficiency leads to higher profitability for insurance businesses since they can serve more consumers with less resources. Furthermore, the use of technology such as AI and data analytics allows insurers to provide more personalised products and services, meeting the different demands of clients and improving their overall experience. As a result, this increases client loyalty and retention, which contributes to the bottom line.

On a theoretical level, the acceptance of Industry 4.0 technologies is consistent with the concepts of the Technology Acceptance Model (TAM), which holds that the perceived utility and simplicity of use of a technology impact its adoption. In the Nigerian insurance market, implementing market 4.0 technology increases perceived usefulness by enhancing operational efficiency, risk management, and client happiness. Furthermore, these technologies are becoming more user-friendly, promoting their acceptance by insurance experts. Theoretical frameworks like TAM aid in understanding the drivers of technology adoption and can assist insurance businesses in properly executing Industry 4.0 efforts to maximise their advantages. Thus, the practical consequences of Industry 4.0 adoption in Nigeria's insurance sector are consistent with the theoretical foundations of models such as TAM, offering a thorough grasp of the variables driving technology adoption and its influence on organisational performance.

Conclusion

The use of Industry 4.0 technology provides a big potential for Nigerian insurance businesses to increase profitability and competitiveness. By embracing sophisticated

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technologies such as artificial intelligence, data analytics, and the Internet of Things, insurers may simplify operations, enhance risk management, and provide clients with more personalised products and services. This study emphasises the practical ramifications of Industry 4.0 adoption, such as cost savings, increased productivity, and customer happiness, while also demonstrating its compatibility with theoretical frameworks such as the Technology Acceptance Model (TAM). As Nigerian insurance businesses continue to embrace sector 4.0 efforts, it is critical that they harness both practical insights and theoretical frameworks to maximise advantages and successfully navigate the developing insurance sector landscape.

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