EFFECT OF ARTIFICIAL INTELLIGENCE ON SUSTAINABLE BUSINESS OPERATIONS IN BENUE STATE.

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ABSTRACT

The study examined the effect of Artificial Intelligence (AI) on sustainable business operations among Small and Medium-sized Enterprises (SMEs) in Benue State, Nigeria. The study, which was based on the Technology-Organisation-Environment (TOE), evaluated how AI-enhanced customer service and AI-driven sales optimisation affected human and economic sustainability. A descriptive survey design was adopted. Using Taro Yamane's formula and multistage sampling techniques, 399 respondents were chosen from the population, which consisted of 218,441 SMEs in North Central Nigeria. A validated survey called the "Artificial Intelligence and Business Sustainability Questionnaire (AIBSQ)" with a reliability coefficient of 0.80 was used to gather data. The data was analysed at the 0.05 level of significance using multiple regression analysis and descriptive statistics (mean and standard deviation). By improving productivity, income, and cost control, AI-enabled sales optimisation was found to have a positive impact on economic sustainability. Similarly, through increased customer satisfaction, decreased workload stress, and enhanced employee well-being, AI-driven customer service greatly enhances human sustainability. The regression model was statistically significant ($R = 0.850$; $R^2 = 0.723$; $F = 999.575$; $p < 0.05$), indicating that AI adoption accounted for 72.3% of the variance in sustainable business performance.

The study concluded that AI adoption promotes sustainable operational practices among SMEs. SME managers were advised to spend money on tools like chatbots, CRM systems, and predictive analytics. The integration of AI should be facilitated by government organisations through enabling policies and capacity building. The effects of AI on ethical issues and environmental sustainability should be investigated in future studies.

Keywords: Artificial Intelligence, Sales Optimisation, Customer Service, Business Sustainability, Economic Stability, Human Stability

1. Introduction

Sustainability has emerged as a defining paradigm for businesses in the 21st century. Sustainable business practices have moved beyond corporate social responsibility to become an essential part of organisational strategy in a time of increased environmental consciousness, changing consumer preferences, and the pressing need for responsible resource management (Adewara, Dagunduro, Falana & Busayo, 2023). The current wave of change in the business world is driven by technological innovation and a novel idea that many people are hearing about: artificial intelligence (AI) (Smith & Plowright, 2020). The study of how digital computers and algorithms perform tasks and handle complex issues that normally call for human intelligence, reasoning, and predictive abilities to adjust to changing circumstances is known as artificial intelligence (AI) (Basri, 2020). Arakpogun, Elsahn, Olan and Elsahn (2021) noted that entrepreneurs and business leaders are increasingly recognising the potential of AI to revolutionise their operations. Artificial Intelligence (AI) enables businesses to gain valuable insights, make data-driven decisions, and optimise their processes. Machine learning, natural language processing, robotics, and other AI technologies have the potential to revolutionise industries and make predictive analytics, individualised customer experiences, and effective resource allocation possible.

Sales optimisation is a critical driver of growth for small and medium-sized enterprises (SMEs). It involves improving sales processes, strategies, and tools to increase efficiency and revenue (Arzikulov, 2021). According to Arzikulov (2021), sales optimisation is essential for SMEs to preserve their competitive edge and guarantee consistent growth. SMEs can improve efficiency, cut expenses, and close deals more successfully by streamlining their sales processes with the help of data analytics, CRM tools, and targeted marketing techniques. Additionally, by focusing on customer retention and identifying high-value leads, sales optimisation enables SMEs to better allocate their resources, which can drastically lower customer acquisition costs, according to Elavarasan and Pugazhendhi (2020). Leveraging digital tools and data-driven approaches, SMEs can personalise customer experiences and build stronger relationships.

Customer service is a critical factor in the growth and success of small and medium-sized enterprises (SMEs). Customer satisfaction and retention are important factors that influence SMEs' profitability, and they are directly impacted by effective customer service. Delivering exceptional service, SMEs can differentiate themselves from competitors, especially in markets where price competition is intense (Ferreira, Mueller & Papa, 2020). Moreover, Giuggioli and Pellegrini (2023) submitted that in today's digital era, SMEs that integrate modern technology into their customer service strategies, such as live chats and social media engagement, can streamline their operations and improve customer experiences. This can lead to greater efficiency in handling customer enquiries and better long-term relationships.

Artificial intelligence (AI) has a revolutionary impact on sustainable business operations, allowing companies to increase productivity while lessening their environmental impact. AI-powered solutions help companies make data-driven decisions, optimise resource use, and streamline

operations,all of which support sustainability objectives (Adewara, Dagunduro, Falana & Busayo, 2023). Furthermore, Arzikulov, O. (2021) bemoaned the fact that artificial intelligence (AI) facilitates sustainable practices by enabling predictive maintenance of machinery, decreasing downtime, and prolonging equipment life. This proactive approach minimises the need for new resources, cutting both costs and environmental impact. Furthermore, businesses can better forecast demand and minimise waste by reducing overproduction and better understanding consumer behaviour with the aid of AI-powered analytics.

1.1 Objectives of the Study

The broad objective of the study is to examine the effect of artificial intelligence on the business sustainability of SMEs in Benue State.

The specific objectives of the study seek to:

i. Find out the effect of sales optimisation and economic sustainability of SMEs in Benue State.
ii. Ascertain the effect of customer service and human sustainability of SMEs in Benue State.

1.2 Hypothesis for the study

i. There is no significant relationship between sales optimisation and the economic sustainability of SMEs in Benue State.

ii. There is no significant relationship between customer service and human sustainability of SMEs in Benue State.

1.3 Justification for the Study

This study is apt, as there seem to be limited studies on the study area in Nigeria. The study will be of great benefit to the management of SMEs, as it significantly improves resource efficiency and reduces environmental impact by analysing data across the entire value chain. This includes optimising energy consumption, reducing waste and enhancing supply chain management. Additionally, the study would be important in producing data that would improve knowledge of artificial intelligence and the sustainability of businesses in North Central Nigeria. It will add to the existing body of knowledge. Lastly, this study seeks to contribute to existing literature on the subject area.

2. Literature/Theoretical Underpinning

2.1 Artificial Intelligence

The science and engineering of building machines with human-like intelligence in a variety of human endeavours, including marketing strategies, risk management tools, decision-making systems, predictive analytics, and customer service technologies, is known as artificial intelligence (Smith & Plowright, 2020). Arakpogun, Elsahn, Olan and Elsahn (2021) noted that artificial intelligence has revolutionised businesses in data-driven decision-making. Artificial intelligence

technologies, such as machine learning algorithms, enable organisations to process and analyse vast amounts of data quickly and efficiently. More precise insights and well-informed decisions result from this. AI gives businesses the ability to use predictive analytics to learn more about the preferences and behaviour of their customers. By analysing large datasets, companies can optimise marketing strategies, customise product recommendations, and personalise customer experiences.

2.2 Sales Optimisation

Sales optimisation refers to the process of improving the efficiency and effectiveness of a company's sales efforts to increase revenue and profitability. This frequently entails examining and improving a number of sales process elements, such as lead generation, sales tactics, CRM, and performance indicators (Adebayo, 2020). Ambuli and Surendher (2019) noted that the core aspect of sales optimisation is the alignment of sales and marketing efforts, ensuring that the entire team works cohesively towards common goals. This may involve setting clear, measurable short-term and long-term objectives that reflect the company's broader business priorities. The objective of sales optimisation, according to Aorah, Chin, Murzidah, and Nor (2020), is to maximise sales performance through the use of technology, data-driven insights, and best practices. Sales optimisation has a substantial impact on driving revenue growth, improving operational efficiency, and enhancing customer relationships. Bayer, Srinivasan, Riedl and Skiera (2020) assert that optimising the sales process significantly enhances customer satisfaction and retention. By using customer segmentation to inform personalised approaches, businesses can adjust their interactions to the unique requirements and preferences of various customer groups. This promotes long-term engagement and loyalty in addition to improving the customer experience.

2.3 Customer Service

Customer service refers to the support and assistance provided by a company or business to its customers before, during, and after a purchase. It encompasses a wide range of activities aimed at ensuring customer satisfaction and fostering loyalty (Akunja, 2020). Ananaba, Nwosu, Otika and Osuagwu (2021) assert that customer service has a profound impact on both customer satisfaction and business success. High-quality customer service directly influences customer retention, brand loyalty, and even revenue growth. A business's chances of gaining new clients through word-of-mouth marketing are increased when satisfied customers are more likely to refer the business to others. According to Ofosu-Boateng and Agyei (2020), clients are more likely to stick with a business when they receive exceptional service. Consistent, responsive, and personalised customer interactions foster loyalty, leading to repeat business. Babar, Muhammad, Ali, Jingjing, Ihsan and Hifza (2019) submitted that effective customer service helps resolve issues, answer questions, and ensure a positive experience throughout the customer journey. By providing individualised solutions and prompt responses, the objective is to surpass customer expectations rather than just meet them.

2.4 Business Sustainability

Business sustainability refers to the practice of managing a company in a way that ensures long-term environmental, social, and economic viability. It focuses on meeting the needs of the present without compromising the ability of future generations to meet their own needs (Adewara, Dagunduro, Falana & Busayo, 2023). Xu, Xu, Xie and Jin (2021) state that one of the core principles of business sustainability is reducing environmental impact; this involves minimising waste, conserving energy, and reducing carbon emissions. Companies may adopt sustainable practices like using renewable energy, promoting recycling, and reducing water consumption to lower their ecological footprint. Businesses' sustainability, according to Dagunduro, Igbekoyi, Ogungbade, Aluko, and Osaloni (2022), seeks to strike a balance between profitability and their obligations to the economy, society, and environment. Sustainable companies aim to generate value for all parties involved, including suppliers, workers, and consumers. By incorporating sustainability into their core business plans, companies can become more resilient to changes in the market and in regulations, which will secure their long-term survival and expansion.

2.5 Economic Sustainability

Economic sustainability refers to the responsible management of resources and financial practices to ensure long-term business growth and resilience while minimising negative external impacts. It emphasises creating systems that are not only profitable but also equitable and stable for future generations (Igbekoyi, 2020). Adeusi, Alade and Agbaje (2022) state that a key element of economic sustainability is resource efficiency, which companies must focus on to reduce waste and optimise resource use to lower costs while maintaining productivity. This often involves adopting sustainable technologies, such as energy-efficient machinery or renewable energy sources, to reduce the environmental and financial costs associated with resource consumption. In addition, Ilyas and Osiyevskyy (2022) noted that economic sustainability helps businesses build resilience against external shocks, such as regulatory changes or market disruptions. By focusing on sustainable growth, diversifying revenue sources, and putting risk management techniques into practice, businesses can withstand economic downturns and maintain their competitiveness over time.

2.6 Human Sustainability

The term "human sustainability" describes the methods and approaches that guarantee the long-term growth and well-being of people and communities. It places a strong emphasis on providing for people's basic needs now while making sure that future generations can prosper in a society that is balanced, just, and healthy (Ofosu-Boateng & Agyei, 2020). According to Dagunduro, Igbekoyi, Ogungbade, Aluko, and Osaloni (2022), companies that put their workers' health first through sustainable practices see an immediate increase in productivity. Health and safety programmes, mental wellness support, and initiatives promoting work-life balance lead to more engaged, motivated, and loyal employees. This not only reduces absenteeism and turnover but also

enhances overall operational stability. Workers are more likely to positively contribute to the company's objectives when they feel appreciated and supported, which lowers costs and increases productivity.

2.7 Theoretical Framework

The study adopted the Technology-Organisation-Environment (TOE)

Technology-Organisation-Environment (TOE)

The Technology-Organisation-Environment (TOE) framework was proposed by Geoffrey M. Tornatzky and Mitchell J. Fleischer (1990) in their work *The Processes of Technological Innovation.* This framework is widely used to understand how organisations adopt and implement technological innovations. It emphasises that three key elements – technology, organisation, and environment – play a critical role in shaping the adoption process. In the technology context, the framework assumes that both internal and external technologies available to an organisation influence its decision-making. To ascertain whether the technology is in line with its objectives and methods of operation, the organisation must evaluate its possible advantages, compatibility, and complexity. The assumption here is that technological advancements and the readiness of these technologies will drive adoption within organisations.

The organisational context refers to the internal factors, such as the organisation's size, structure, resources, and culture. The framework assumes that these characteristics affect the organisation's ability to adopt and successfully implement new technologies. The environmental context involves external factors such as industry characteristics, market conditions, competition, and government regulations. The Technology-Organisation-Environment framework assumes that these environmental factors either drive or inhibit technological adoption. For instance, a fiercely competitive market might force businesses to use the newest technology in order to stay ahead of the competition, and stringent regulations might either encourage or impede innovation.

The Technology-Organisation-Environment (TOE) framework is highly relevant in analysing the effect of artificial intelligence (AI) on sustainable business operations. This framework helps to understand how AI technologies are adopted and utilised within organisations to achieve sustainability goals. In the technology context, AI's capabilities, such as data analytics, automation, and machine learning, play a critical role in optimising resource use, reducing waste, and improving efficiency in business operations. AI adoption within an organisation is influenced by internal factors like its size, resources, and sustainability commitment. Bigger companies with greater resources may be in a better position to invest in AI for sustainability because they can afford the money and expertise needed to integrate these technologies. Another important factor in the TOE framework is the environmental context. AI for sustainability is being adopted by businesses due to external factors like industry competition, consumer demand for sustainable products, and government regulations.

2.8 Methodology

The study adopted a descriptive survey research design. The study's population included 218,441 SMEs from North Central Nigeria, with a sample size of 399 determined using the Taro Yamane (1974) formula. Sample selection was carried out using a multistage sampling technique. The data collection instrument was a structured questionnaire titled Artificial Intelligence and Business Sustainability (AIBSQ), developed by the researchers based on the literature review.

Each item in the questionnaire was rated on a 5-point scale of strongly agree, agree, neutral, disagree, and strongly disagree, with nominal values of 5, 4, 3, 2, and 1, respectively. The instrument underwent face and content validity testing. The Cronbach's alpha method was used to assess the internal consistency of the OCPQ items, yielding a reliability coefficient of 0.80, indicating that the instrument is highly consistent and thus reliable for the study.

The researcher administered the instrument to the survey participants. The researcher administered 399 questionnaires electronically and analysed the data. The study's data were analysed using descriptive and inferential statistics. The research questionnaire was answered using descriptive statistics of the mean (real limits of numbers) and standard deviation, with multiple regression used to test the hypotheses at the 0.05 level of significance.

In answering the research questions, the real limits of numbers were used for decision-making: 5 = Strongly agree, 4 = Agree, 3 = Undecided, 2 = Disagree, and 1 = Strongly disagree. The decision rule for testing the hypotheses was based on the p-value and alpha value. A hypothesis of no significant effect was not rejected for any cluster of items whose p-value was equal to or greater than (≥) the alpha value of 0.05, while it was rejected for any cluster of items whose p-value was less than the alpha value of 0.05.

3. Results and Findings

Table 1 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
1. You are encouraged to respond/react to change	350	3	5	4.68	.474
2. My workplace demands that you act actively.	350	3	5	4.61	.535
3. Employees adopt new investment ideas.	350	2	5	4.19	.441
4. Employees use knowledge acquired to	350	3	5	4.28	.649
5. Employees use resources to establish	350	3	5	4.41	.543
Valid N (listwise)	350				

Source: SPSS Version 27 Print Out

The mean scores of the responses from questions relating to Sales Optimization for the SMEs in North Central are >2.5. This makes the responses acceptable.

Table 2: Descriptive Statistics for Economic Sustainability

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
a. The shares sold by my bank are stable.	385	1	5	4.50	.670
b. The dividend paid is determined through	385	3	5	4.44	.517
c. The value of the dividend paid varies from year to year.	385	1	5	4.30	.664
d. Consistent market share analysis is done.	385	3	5	4.36	.492
e. Shareholders' wealth plays a very important	385	1	5	4.26	.552
Valid N (listwise)	385				

Source: SPSS Version 27 Print Out

3.1 Test of Hypotheses

There is no significant relationship between managerial sensing capital and operational efficiency of selected commercial banks in North Central Nigeria.

Table 3: Regression Output for Hypothesis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Beta	Anova	T	Durbin-Watson
1	.850[a]	.723	.722	.744	.723	999.575	.850	553.567 212.106 765.673	7.274 31.61	.678

a. Predictors: (Constant), Managerial Sensing Q1,Q2,Q3,Q4,Q5

b. Dependent Variable: Efficiency Q1,Q2,Q3,Q4,Q5

The results obtained revealed that managerial sensing hasa significant effect on the operational efficiency of cumulative regression (β =0.850, t-statistics = 7.274, P<.05). And it is a predictor of profitability (F-statistic = 999.575; R-squared = 0.723; P < .05). The predictor variable solely explained 85.0% of the variance in operational efficiency, while the remaining 15.0 % could be due to the effect of the extraneous variables. The Durbin-Watson value of 0.678 shows that there is no first-order serial correlation. This makes the result acceptable.

4.1 Discussion of Findings

The findings obtained from the test of the hypothesis revealed a strongly significant positive relationship between managerial sensing and operational efficiency. The results of the hypothesis test support the findings of Frochlich, Biteneourt, and Marilia (2017), who investigated the use of dynamic capabilities to boost innovation in Brazilian chemical companies. The findings show that the application of dynamic capabilities aids in the development of innovation capabilities by consolidating the first dynamic capability (sensing), which promotes innovation. Sensing can be considered an organisational capability that results from the integration of organisational strategies with the organisation's overall innovation practices. Akpobi (2017) investigated dynamic capabilities and strategic management, specifically the multi-level nature of dynamic capabilities in Nigeria. The research findings revealed that dynamic capabilities, such as the ability to sense, seize, and reconfigure at both the macro and micro levels, have a significant and positive effect on performance. Rehman and Saeed (2015) investigated the impact of dynamic capabilities on organisational performance, using organisational competencies as a moderator and focusing on the paper industry in Lahore, Pakistan. The relationship between dynamic capabilities (sensing) and performance is not significant. Ardyan (2016) conducted a study to test the effect of market sensing capability on SMEs' performance, both directly and indirectly (product innovativeness success as an intervening variable); to test the effect of entrepreneurial orientation on SMEs' performance, both directly and indirectly (product innovativeness success as an intervening variable); to test the effect of market sensing capability on speed to market; and (4) to test the effect of speed to market on SMEs' performance. The study discovered that market

sensing had a positive relationship. Nyachanchu, Chepkwony, and Bonuke (2017) investigated the impact of the three dimensions of dynamic capabilities (sensing, seizing, and reconfiguration capabilities) on firm performance in Nairobi County, Kenya. Findings revealed that sensing capabilities ($B = 0.215$, $P \leq 0.001$), seizing capabilities ($B=0.194$, $P<0.01$), and reconfiguration capabilities ($B = 0.182$, $P < 0.01$). These three variables combined contributed 25.9% ($R2 = 0.259$) of the variance in firm performance. Zhou, Zhou, Feng, and Jiang (2017) investigated how firms' dynamic capabilities contribute to their competitive advantage and improved firm performance in Chinese firms. There is a strong and positive link between sensing and firm performance. Breznik, Lahovnik& Dimovski (2019) undertook a study for the exploitation of firm capabilities as dynamic capabilities through sensing, seizing and reconfiguring capabilities for SMEs in the Slovenian IT industry. The results showed that SMEs in the Slovenian IT sector benefit from sensing in terms of competitive advantage.

Tempelmayr, Ehrlinger, Stadlmann, Überwimmer, Mang, and Biedersberger (2019) investigated the performance impact of dynamic capabilities in servicing companies. The findings revealed that dynamic capabilities, particularly sensing, seizing, and reconfiguration capabilities, had a positive and significant relationship with firm performance in relatively stable contexts, whereas sensing capabilities are more important in turbulent environments. Zhou, Zhou, Feng and Jiang (2019) tested dynamic capabilities and organisational performance through the mediating role of innovation. Sensing capability, integration capability, and reconfiguration capability facilitate different types of innovation that, in turn, improve firm performance in Chinese firms. The findings show that there is a positive and significant relationship between dynamic capabilities (sensing) and influence on firm performance.

Sudrajata, Lasmyc, Herlinad, and Syahcharie (2019) investigated the impact of sensing capability (SC) on how logistics service financial performance (LSF-FP) passes through innovative logistics services (ILS) in the Jakarta (Jabodetabek) region of Indonesia. Findings review that there is a significant relationship between sensing and the financial performance of LSFFP. Johnson and Onuoba (2019) investigated the dynamic capabilities and organisational agility of manufacturing firms in Port Harcourt. The findings revealed a significant relationship between dynamic capability dimensions (sensing and seizing) and organisational agility measures (responsiveness). The findings revealed that there is a significant link between sensing abilities and responsiveness. There is a strong and positive correlation between sensing abilities and flexibility. There is a positive relationship between seizing capabilities and responsiveness, which causes organisations to become agile. Jones and Robert (2018) investigated managerial competencies and private university performance in Kenya. The study's findings revealed that managerial capabilities (sensing) have a positive and significant impact on the performance of private universities. The findings add to our understanding of how managerial capabilities can be used to influence performance in a changing university environment.

Khan, Daddi, and Iraldo (2021) investigated whether dynamic capabilities facilitate the implementation of the circular economy in Italian manufacturing firms. The findings show that sensing, seizing, and reconfiguring capabilities, as well as the underlying organisational routines, significantly facilitate circular economy implementation. Rono, Korir, and Komen (2021) researched to determine the impact of dynamic capabilities on the competitive advantage of manufacturing firms in Kenya. Results showed that there was a positive and significant effect of sensing capabilities and competitive advantage (β=.392, p=.000); seizing capabilities and competitive advantage (β=.194, p=.000); reconfiguration capabilities and competitive advantage (β =.174, p=.001) with all p-values being less than .05. Fatoki (2021) investigated how four dimensions of dynamic capabilities (sensing, learning, integrating, and coordinating) affect the performance of hospitality firms. The findings revealed that sensing, learning, and coordinating have a significant impact on the performance of hospitality firms. Innovation bridges the gap between sensing and learning abilities and performance.

4.2 Implications to Research and Practice

The study's implications for research and practice are that it will assist management of the studied banks in understanding the impact that managerial capabilities (MC) methodologies may have on their operations. This study will also provide researchers, managers, and industry captains with a better understanding of managerial capabilities and performance.

4.3 Conclusion

Based on the results of the hypothesis testing, the researcher concludes that there is a significant positive relationship between managerial capabilities (MC) and commercial bank performance in North Central Nigeria. The study's findings revealed a link between the adoption of managerial capabilities and commercial bank performance in North Central Nigeria.

4.4 Recommendation

The banks under study ought to embrace a range of innovations, such as market-oriented products and process innovations. In order to create goods and services that benefit their clients, banks must take a more proactive approach.

4.5 Future Research

This study investigates the relationship between dynamic capabilities and the performance of commercial banks in North Central Nigeria. Therefore, not all facets of managerial aptitude and other elements influencing the performance of commercial banks in North Central Nigeria are covered by this. The researcher makes the following recommendation: more research should look at the performance and managerial skills of North Central Nigerian tertiary institutions. Additionally, more research should look into the connection between North Central Nigerian manufacturing firms' productivity and dynamic managerial capabilities. Lastly, additional research ought to be conducted to ascertain the impact of managerial abilities on the hospitality industry's performance in Northern Nigeria.

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