
ARTIFICIAL INTELLIGENCE ADOPTION AND SUSTAINABILITY OF SMALL AND MEDIUM SCALE ENTERPRISES IN DELTA STATE, NIGERIA

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Abstract: *This study investigates the relationship that exists between Artificial Intelligence (AI) adoption and sustainability of Small and Medium Scale Enterprises (SMEs) in Delta State, Nigeria. The study was based on Dynamic Capabilities Theory which affirms that AI enables firms to adapt and innovate to take advantage of business opportunities. Descriptive survey research method was employed for primary data in executing this study. Total population of the study was 150 made up of owners, managers and employees of registered SMEs in Delta State. Pearson Product Moment Correlation was employed to test the hypotheses at a 5% level of significance. Hypothesis one revealed that there is a significant positive relationship between robotics and supply chain efficiency in SMEs in Delta State, Nigeria, with $r=0.675$, $n=150$ and $(p<0.05)$. Hypotheses two indicated that there is a statistically positive relationship between predictive analytics and business continuity planning in small and medium scale enterprises in Delta State, Nigeria with $r=0.897$, $n=150$ and $(p<0.05)$. The study, therefore, concluded that AI adoption impacts positively on sustainability of SMEs in Delta State. Hence, among others, it was recommended that governmental and non-governmental organisations ought to establish programs to inform SMEs about the advantages and practical uses of AI-based technologies, in addition to offering training to improve their technological proficiency.*

Keywords: *Robotics, Artificial Intelligence (AI), Supply Chain Management, Predictive Analytics, Business Continuity Planning, and Sustainability*

Introduction

Artificial intelligence (AI) has become a game-changer for small and medium scale enterprises (SMEs) looking to improve their sustainability and competitiveness in today's fast-paced business environment. With the ability to analyse vast amounts of data, automate processes, and make

predictions, AI is revolutionizing the way SMEs operate, helping them to thrive in an increasingly digital world using predictive analytics tools such as Microsoft Excel, Power BI, and Tableau. The use of these tools has facilitated the way information is obtained and applied in the decision-making and business planning process, eliminating the tendency to use hunches, guesswork or intuitions to influence judgements. Quality decisions that have long-term impact are expected to be data-driven. Predictive analytics will increase management analytical skills and enable SMEs to make objective decisions.

Better efficiency and productivity are among the main ways AI is helping SMEs. AI can free staff members to concentrate on more strategic and creative work by including robotics in supply chain management, automating customer support, and inventory control. Apart from saving time and money, this helps SMEs to run more efficiently and keep ahead of the competition. Effective operations help SMEs to increase profits, hence attaining financial sustainability. By offering insightful analysis based on data analysis results, AI is also guiding SMEs towards better decisions. AI may help SMEs find chances for development, streamline their operations, and make wise decisions that propel success by examining consumer behaviour, market trends, and other important measures. For SMEs with little resources especially, this can be quite helpful since it lets them compete globally against bigger businesses.

Small and medium scale enterprises (SMEs) play a crucial role in the economic development of Delta State, Nigeria. Over the years, Arachie, Dibua and Idigo (2023) opine that SMEs have been observed to play a significant role in the job and employment creation dynamics of countries. These firms greatly help to create jobs, stimulate innovation, and drive general national economic growth (Bandari, 2019). Given the rising speed of competition both domestically and internationally, SMEs now have more and more need to investigate expansion prospects by using technology advancements. According to Helm et al., (2020), everyone in the corporate sector now speaks AI. The introduction of AI has transformed company operations by allowing companies to maximise resources, improve efficiency, and lower risks (Kumar et al., 2018). For example, supply chain management and robotics have helped to lower logistical costs, increase inventory control, and raise customer satisfaction by means of their respective applications. Predictive analytics has helped companies to make educated decisions, spot possible hazards, and project market trends (Shmueli et al., 2017). Risk assessment and mitigating techniques led by AI guarantees business continuity planning, therefore ensuring organisational resilience against uncertainty (Herbane et al., 2014).

Adoption of AI-powered solutions would help Delta State's SMEs to increase operational efficiency, improve decision-making, and maximise resource allocation by means of betterment of their operational performance. These companies can improve their long-term sustainability and acquire a competitive edge by using AI by means of which Including artificial intelligence technology into Delta

State's SMEs offers numerous chances to improve their sustainability. Driven by AI-driven sensors and data analysis, precision farming methods can enable farmers to maximise resource use, raise crop yields, and change with the times regarding environmental circumstances. Furthermore, supply chain and logistics management systems driven by AI can improve distribution network efficiency and openness, thereby lowering costs and raising customer satisfaction.

Though AI is becoming more and more important in driving corporate sustainability, Delta State, a major Nigerian economic centre, struggles greatly to use AI-driven innovations to improve business operations and sustainability. Important problems include the absence of supply chains management systems driven by AI that would enable Delta State's companies to maximise inventory control, lower transportation costs, and improve customer satisfaction (Li et al., 2019) by means of robotics. The absence of predictive analytics capabilities limits businesses in Delta State from forecasting market trends, identifying possible hazards, and making informed decisions (Shmueli et al., 2017), the failure to adopt AI-driven business continuity planning strategies leaves businesses in Delta State vulnerable to operational disruptions, reputation damage, and financial losses (Herbane et al., 2014). The slow adoption of AI technologies in Delta State's business sector compromises competitiveness, innovation, and sustainability (Kumar et al., 2018); the lack of AI-related skills among Delta State's business sector professionals limits the efficient application and use of AI-driven solutions (Manyika et al., 2017).

Many SMEs in Delta State have been slow to adopt AI technologies despite their benefits. This reluctance may be due to a lack of knowledge of digital literacy tools, limited resources, and concerns about the associated risks about employee displacement. As a result, SMEs in the region seem to be missing out on opportunities to improve efficiency, productivity, and competitiveness. Decision-making has been fraught with personal intuition and guesswork as opposed to the use of data analytics tools. The economic consequences of these gaps may include reduced business competitiveness and profitability, increased operational risks and decreased customer satisfaction and loyalty, leading to limited economic growth and development in Delta State.

While existing studies have explored AI adoption in business sustainability, there is limited research focusing on the specific challenges and opportunities facing businesses in Delta State, hence necessitating this study. The broad aim of this study is to examine the relationship that exists between AI and sustainability of SMEs in Delta State, Nigeria. The specific objectives of the study are:

- a) To determine the relationship between robotics and effective supply chain management ability of SMEs in Delta State, Nigeria.
- b) To ascertain the correlation between predictive analytics and business continuity planning of SMEs in Delta State, Nigeria.

Review of Related Literature

Conceptual Review

Artificial Intelligence (AI)

Broad branch of computer science, AI has advanced significantly recently. Defined as the replication of human intellect in machines, AI includes computer vision, natural language processing, and machine learning among other things. Small and medium-sized businesses (SMEs) among other sectors could be completely transformed by the acceptance of AI technologies. The development of AI has profoundly affected many different sectors, including Delta State, Nigeria's small and medium-sized businesses (SMEs). Within the framework of SMEs in Delta State, this conceptual review seeks to investigate the interactions among AI adoption, digital literacy, process innovation, decision-making, and environmental sustainability.

Benefits of AI Adoption in SMEs

- a) **Cost Reduction:** AI adoption can lead to automation of routine tasks, reducing operational cost.
- b) **Increased productivity:** AI-driven tools can enhance productivity by optimizing processes and improving decision-making ability of managers.
- c) **Market Expansion:** AI can help SMEs access global markets by improving customer engagement and supply chain management.
- d) **Improved decision-making:** Application of AI tools can assist SMEs in gathering data quickly to make informed decisions. With the introduction of business intelligence applications such as MS Power BI, Excel, data analyses have become a simple task for managers and owners of SMEs.
- e) **Enhanced Customer Satisfaction:** Communications with customers have become easy and faster. Buyers and sellers now have wide access to information about each other to influence deals and contracts.

Impact of AI on Sustainability

- a) **Resource Optimisation:** AI can contribute to sustainability by optimizing resource usage, reducing waste, and improving operational efficiency.
- b) **Sustainable Practices:** AI-driven insights can promote sustainable business practices such as energy conservation and waste management.
- c) **Innovation:** AI fosters innovation, enabling SMEs to develop new products and services that meet sustainability goals.

One could understand the sustainability of SMEs as a multi-dimensional notion comprising economic, social, environmental, and competitive sustainability (WCED, 1987). Adoption of AI can influence these aspects of sustainability by raising operating efficiency, lowering costs, and so boosting competitiveness.

Various elements can affect SMEs' adoption of AI: technological, financial, social, environmental, and technical ones (Kotler et al., 2018). These elements might affect SMEs' sustainability results and should be taken into account while looking at the link AI usage and SMEs.

Factors Influencing the Adoption of AI by Small and Medium Scale Enterprises

The rise in the awareness and adoption rate of AI in small and medium scale enterprise is caused by many factors, which are explained below:

1. **Business Compatibility:** Kerr (2004) discovered this factor in his study. This factor covers the factors pointed out by interviewees (42%) related to the size and business core values. A business that has innovation as one of its core values will encourage its employees to take risks and try new things over time.
2. **Social Influence:** This is recognized as a factor by (Ajzeb, 1991; Vankatech et al, 2003). It is the degree users believe others believe they should use an information system in solving problems. Thus, an organisation can maintain a database system and allow employees access to it as a way of sharing knowledge among work teams.
3. **Trial Ability:** Kerr (2004) explained this to be the ability and possibility to try the information system before deciding to adopt it. During trial, error may be identified and fixed to improve the process further.
4. **Technical Support:** (Buchana, Sainter, &Saunders, 2013; Eneizan et al., 2018; Khlaif, 2018; Lee & Coughlin, 2015; Ngai, Poon, & Chan, 2007; Sumner & Hostetler, 1999) asserted that availability of technical support helps in the spread and adoption of AI tools in the system. When entrepreneurs are aware that technical problems encountered can be resolved, the risk of failure is reduced.

The Role of Governing in the Adoption of AI by Small and Medium Scale Enterprises

The government plays a crucial role in stimulating AI adoption by small and medium-scale enterprises (SMEs) through various initiatives and policies. Some key roles of the government in this regard include:

- a) **Funding and grants:** The government can provide funding and grants to SMEs to help them adopt AI technologies. This financial support can help SMEs invest in AI solutions and develop their capabilities in this area. Government can partner with Bank of Industry and assign reasonable financial sum in the budget to support SMEs seeking AI adoption in their businesses.
- b) **Training and capacity building:** The government can support SMEs by providing training programs and capacity-building initiatives to help them understand and implement AI technologies effectively. This can include workshops, seminars, and online resources to help SMEs integrate AI into their business processes. It can partner with the Industrial Training Fund (ITF) to make this a reality within the state's economic system.
- c) **Regulatory support:** Governments can create a regulatory framework that encourages AI adoption by SMEs. This includes developing guidelines for AI implementation, data privacy regulations, and standards for AI technologies to ensure that SMEs can trust and safely use AI solutions.
- d) **Collaboration and partnerships:** The government can facilitate collaborations and partnerships between SMEs and AI technology providers, research institutions, and other stakeholders. By

fostering these relationships, SMEs can access the expertise and resources needed to adopt AI successfully.

- e) Awareness and advocacy: Government agencies can raise awareness about the benefits of AI adoption for SMEs and advocate for its use in various sectors. This can help SMEs understand the potential of AI in improving their competitiveness, productivity, and innovation.

Overall, the government's role in stimulating AI adoption by SMEs is crucial for fostering economic growth, innovation, and competitiveness in the digital era. By providing support, training, regulatory frameworks, and partnerships, governments can help SMEs harness the full potential of AI technologies.

Associated Risks with AI Adoption

- a) Machine that thinks for us: AI has become the thinking engine for some people. This will likely render human being mere dolls at workplace if not controlled.
- b) Machines that take away jobs through Job manipulations: AI will take away some jobs from human and render them unemployed. Some jobs are being automated using robots and chat-box. This has been a source of huge worry to today's workforce.
- c) Machines that make decisions we do not understand: What decisions AI makes is not under our control. We are advised to re-examine the output of AI reports before finally taking the final decision.
- d) Machines that do not understand what is important to people:
- e) Machines that use human weaknesses to create us.
- f) Invasion of privacy

Robotics and Supply Chain Management

Studies on AI-driven robotics have found that they can lower costs, boost customer happiness, and streamline supply chains (Li et al., 2019). Studies on inventory management driven by AI have also shown advantages including lower stock outs and more accuracy (Kumar et al., 2018). Still, poor nations as Nigeria (Ojeka et al., 2020) have only recently embraced AI-driven robotics in supply chain management. Robotics improves accuracy, efficiency, productivity, and supply chain management greatly changing them.

Here are key areas where robotics influences supply chain management:

- a. **Inventory Management:** Robotics-based inventory management systems optimize stock levels, reduce errors, and improve inventory turnover (Kumar et al., 2018).
- b. **Warehouse Automation:** Robotics-powered warehouse automation streamlines picking, packing, and shipping processes, increasing fulfillment rates and reducing labour costs (Li et al., 2019).

- c. **Material Handling:** Robotics-based material handling systems efficiently move goods throughout warehouses and distribution centers, reducing damage and improving safety (Mussomeli et al., 2017).
- d. **Transportation and Logistics:** Autonomous vehicles and drones, enabled by robotics, enhance transportation efficiency, reduce costs, and improve delivery times (DHL, 2019).
- e. **Quality Control:** Robotics-based quality control systems inspect products, detect defects, and ensure compliance with quality standards (Bahrin et al., 2019).
- f. **Predictive Maintenance:** Robotics-powered predictive maintenance optimizes equipment performance, reduces downtime, and extends machinery lifespan (Bagheri et al., 2019).

Benefits of Robotics in Supply Chain Management

- a) **Increased Efficiency:** Robotics automates repetitive tasks, freeing human labor for higher-value activities (Kumar et al., 2018). The tools can work for longer hours with rest or breaks, thus guaranteeing continued process workflow in production and distribution.
- b) **Improved Accuracy:** Robotics reduces errors in inventory management, picking, and packing (Li et al., 2019) as well as in data processing.
- c) **Enhanced Productivity:** Robotics increases throughput and reduces processing times (Mussomeli et al., 2017).
- d) **Cost Savings:** Robotics reduces labor costs, energy consumption, and maintenance expenses (DHL, 2019).
- e) **Scalability:** Robotics enables scalability and flexibility in supply chain operations (Bahrin et al., 2019).

Challenges and limitations

- a) **Initial Investment:** High upfront costs for robotics implementation (Kumar et al., 2018).
- b) **Integration Complexity:** Integrating robotics with existing systems and infrastructure (Li et al., 2019).
- c) **Maintenance and Support:** Ongoing maintenance and support requirements (Mussomeli et al., 2017).

Predictive Analytics and Business Continuity Planning

Based on historical and real-time data, predictive analytics—a fantastic tool utilising statistical models, machine learning algorithms, and data mining techniques—forecasts future events, behaviours, or trends. It makes use of methods including time series analysis, machine learning, deep learning, natural language processing (NLP), regression analysis, decision trees, neural networks, Descriptive analytics uses past data to project into the future, therefore explaining what has happened. Predictive analytics reveals possible outcomes or consequences of future projects or activities, thereby allowing management to create scenario plans to assess their impact. Based on the

objective assessment of all possible solutions or courses of action, prescriptive analytics addresses proposals or recommendations to solve either present or future corporate challenges.

Predictive analytics significantly enhances business continuity planning (BCP) by enabling organizations to:

- a) Identify Potential Risks: Predictive models identify potential disruptions, allowing for proactive mitigation (Herbane et al., 2014).
- b) Assess Risk Likelihood: Predictive analytics assesses the likelihood of disruptions, prioritizing mitigation efforts (Kumar et al., 2018).
- c) Develop Targeted Strategies: Predictive insights inform targeted strategies for risk mitigation and business continuity (Shmueli et al., 2017).
- d) Improve Incident Response: Predictive analytics enhances incident response plans, reducing downtime and impact (Wang et al., 2020).
- e) Optimize Resource Allocation: Predictive models optimize resource allocation for business continuity initiatives (Ivanov et al., 2019).

Benefits of predictive Business Continuity Planning

- a) Enhanced Resilience: Predictive analytics improves organizational resilience to disruptions (Herbane et al., 2014).
- b) Reduced Downtime: Predictive insights reduce downtime and business impact (Kumar et al., 2018).
- c) Cost Savings: Predictive analytics optimizes resource allocation, reducing costs (Shmueli et al., 2017).
- d) Improved Compliance: Predictive analytics ensures compliance with regulatory requirements (Wang et al., 2020).
- e) Competitive Advantage: Organizations leveraging predictive analytics gain a competitive advantage through enhanced business continuity (Ivanov et al., 2019).

Decision-Making and AI Adoption

Adoption of AI can profoundly affect Delta State's SMEs' decision-making procedures. Value insights from AI-powered analytics and predictive models will help SMEs' managers and owners to make better informed, data-driven decisions by means of which they will be able to cope with challenges. Better resource allocation, risk management, and the identification of new market prospects resulting from this enhanced decision-making help to sustain SMEs by means of their respective effects.

Environmental Sustainability and AI Adoption

The incorporation of AI technologies can enhance the environmental sustainability of SMEs in Delta State. AI-driven enhancements in resource utilisation, energy management, and waste reduction can assist SMEs in reducing their environmental footprint and fostering sustainable business practices

(Akinwale et al., 2018). Through the implementation of AI-driven solutions, SMEs may enhance their environmental performance, comply with evolving sustainability requirements, and address the increasing demand for eco-conscious products and services.

Theoretical Review

Several theoretical frameworks can be applied to understand AI adoption and sustainability in SMEs.

Resource-Based View (RBV) & Technology Acceptance Model

The Resource-Based View posits that a firm's competitive advantage derives from its distinctive resources and skills. AI can be seen as a significant asset that can improve a company's competitive standing. The resource-based view (RBV) paradigm asserts that AI adoption serves as a valuable asset that improves the sustainability results of SMEs (Barney, 1991). The Resource-Based View (RBV) paradigm posits that enterprises with unique and valuable resources can attain enduring competitive advantage. The Technology Acceptance Model (TAM) posits that the adoption of AI by small and medium-sized enterprises (SMEs) is driven by perceived usefulness and perceived ease of use (Davis, 1989). The TAM model can be employed to examine the determinants affecting AI adoption within SMEs.

Sustainability Transition Management (STM)

STM emphasises the transition to a sustainable economy. It underscores the significance of collaboration, creativity, and systemic transformation. The idea of sustainable development posits that the sustainability outcomes of SMEs are influenced by environmental, social, and economic issues (WCED, 1987). The theory of sustainable development can be employed to examine the effects of AI adoption on the sustainability outcomes of SMEs.

Empirical

Although the research on AI use in SMEs is expanding, empirical studies particularly addressing Delta State, Nigeria, remain scarce. Nevertheless, research from other areas offers significant insights. The integration of AI has been increasingly prevalent in recent years, and its influence on the sustainability of Small and Medium Enterprises (SMEs) has garnered attention from scholars. Numerous researches have examined the correlation between AI deployment and the sustainability outcomes of SMEs. In 2020, Oxford Economics did a study on the effects of AI on SMEs in Africa, including Nigeria. The research indicated that the implementation of AI can augment the sustainability of SMEs by enhancing operational efficiency, decreasing expenses, and bolstering competitiveness.

Arachie, et al. (2023) examined the role of AI in small business operations. The survey clearly outlined potential uses of AI, challenges to its implementation, listed AI tools used in business, and assessed the number of SMEs that deliberately integrate any form of AI into their operations. This study utilised a descriptive design. The study population consisted of 27,546 small firms registered

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with the Corporate Affairs Commission (CAC) in southeast Nigeria, and a sample size of 379 was established using Krejcie and Morgan's 1970 sample size calculation formula. The data source was solely primary, obtained from interviews, which ultimately formed the basis for the structured questionnaire employed in the study. The instrument was subjected to validation and reliability assessments. Data analysis was performed using descriptive statistics, encompassing frequencies and percentages. The results revealed that most SMEs in Nigeria persist in manual operations, hence neglecting the significant advantages of AI deployment and remained persistently limited in size.

McKinsey (2020) also conducted a study on the impact of AI on SMEs in Nigeria. The study found that AI adoption can lead to significant improvements in SMEs' sustainability outcomes, including increased revenue, improved customer satisfaction, and enhanced competitiveness. A study by Adeleke et al. (2020) examined the impact of AI adoption on SMEs' sustainability in Nigeria. The study found that AI adoption can enhance SMEs' sustainability by improving operational efficiency, reducing costs, and increasing competitiveness.

A separate study conducted by Oluwatobi et al. (2020) examined the correlation between AI adoption and the sustainability results of SMEs in Nigeria. The research indicated that the application of AI can result in substantial enhancements in the sustainability results of SMEs, encompassing elevated revenue, augmented customer satisfaction, and improved competitiveness. A study by Chaudhuri et al. (2022) demonstrated that the implementation of AI substantially influences the sustainability of manufacturing and production companies, with technological and leadership support serving as moderating factors.

Akoh (2024) conducted a study that evaluates AI adoption by South African manufacturing SMEs, identifies challenges faced, and develops a framework for AI adoption to enhance growth and survival. The objectives of the study are to evaluate AI adoption by South African manufacturing SMEs, identify challenges in adopting AI, and develop a framework to improve AI adoption for growth and survival. The study conducted a systematic literature review, analyzing 206 articles as population, with 54 shortlisted for in-depth analysis as sample size. It employed a document sampling method, where 206 articles were initially identified, and 54 were shortlisted for in-depth analysis using the PRISMA framework. The research method involves a systematic literature review using articles from Scopus and Google Scholar databases (2018-2024), analyzed using the PRISMA framework. Research Instruments used are literature review and qualitative analysis tools. The study found that AI adoption among South African manufacturing SMEs is low, limiting innovation and productivity, and that a major constraint is the lack of a framework to enhance AI adoption and implementation. The study developed a framework to improve AI adoption, contributing to the body of knowledge and providing insights for SMEs. The study recommended the development of an AI Adoption Framework to guide the integration of AI technologies into their operations for better growth and survival and

that policymakers should create an enabling environment for AI adoption by offering incentives such as grants, subsidies, or tax breaks for SMEs implementing AI as well as organizing regular workshops and training programs to improve awareness and technical skills related to AI among SME owners and employees.

Adeyemi and Fashola (2023) evaluated the role of AI in improving the operational performance of SMEs in Nigeria with the following objectives in mind: to assess how AI enhances operational efficiency in SMEs, to determine the impact of AI adoption on customer engagement and satisfaction, and to identify challenges faced by SMEs in adopting AI. The population of the study were SMEs in Lagos, Nigeria, with a sample size of 250 SMEs selected through stratified random sampling. This sampling technique ensured that SMEs from various sectors were proportionally represented in the sample. Descriptive survey design was the methodology applied and primary data collected using structured questionnaires. Collected data were statistically analysed using multiple regression analysis and ANOVA. The study found that AI adoption significantly improves operational efficiency, particularly in customer engagement and inventory management. The major challenges include lack of technical expertise and high implementation costs. The study recommended government subsidies and training programs to encourage AI adoption, and that investment in technology infrastructure, such as improved internet access and electricity supply, is essential to support AI adoption while partnering with technology companies to access affordable and scalable AI solutions tailored to their specific needs.

Chukwu and Adewale (2022) studied the Impact of Artificial Intelligence on the Financial Performance of SMEs in Nigeria. They examined the effect of AI adoption on the financial performance of SMEs in Nigeria. The objectives of the study are to determine how AI adoption influences cost reduction in SMEs and to assess the role of AI in increasing profitability and financial sustainability. The population of the study included SMEs in retail and service sectors across Delta State. Sample Size was 300 SMEs using purposive sampling technique focusing on SMEs already adopting AI technologies. Descriptive survey research design was adopted as research method and self-administered questionnaires as research instrument used for in study. Structural Equation Modeling (SEM) and t-tests were the Statistical Analysis tools. The findings of the study stated that AI adoption leads to significant cost reductions and increased profitability and financial constraints remain a major barrier to wider AI implementation. The study therefore recommended that financial institutions should create AI-specific loan products for SMEs, SME owners should prioritize AI technologies with high ROI potential, and AI solution providers should offer flexible pricing models.

Artificial Intelligence (AI) has emerged as a pivotal technology capable of revolutionising corporate operations and fostering sustainable growth across diverse global industries. The incorporation of AI technology within Small and Medium Scale Enterprises (SMEs) in Delta State, Nigeria, offers both prospects and obstacles.

Methodology

Descriptive survey research design was adopted to gather primary data from SME owners and

managers in Delta State. In order to gather information on the adoption of AI, a survey was sent to 180 SMEs in Delta State, hence the population of the study were 180 SMEs comprising owners, managers and employees of registered SME owners in Delta State. A stratified probability random sampling technique was used to select a representative sample of 160 from 25 selected SMEs from different industrial sectors in the state. The data for the study was collected using structured questionnaire, which was subjected to both validity and reliability test, before deployment for the study. Inferential (Pearson Product Moment Correlation Coefficient) and descriptive statistics was used to analyse collected data to understand relationships and patterns and the hypotheses were tested at a 5% level of significance.

Decision Rule: Decision in this section is determined by the average of the responses of respondents: Strongly agree-5, Agree-4, Disagree-3, strongly disagree-2, undecided-1. The average (mean) of the responses is $(5+4+3+2+1)/5=15/5$ or 3. Mean score below 3.0 would be rejected while mean score greater than or equal to 3.0 would be accepted.

A total of 160 copies of questionnaire were distributed with regards to the sample size, out of which 152 were returned, but only 150 were fit to be used for the study as 2 of the returned copies were not completely filled.

Data Analysis and Interpretation of Results

Research Question 1: What is the relationship between robotics and supply chain management in small and medium scale enterprises in Delta State, Nigeria?

Table 1: Descriptive Statistics for Research Question One

S/N	Questionnaire Items	N	Mean	Remark
	Robotics			
1	I am willing to learn robotic skills	150	4.62	Accept
2	Robotic applications make work efficient	150	3.67	Accept
3	Management supports employees on skills training	150	2.95	Reject
	Supply Chain Management			
4	Employees can achieve cost efficiency with AI tools	150	3.73	Accept
5	Robotics improves deliveries and customer satisfaction	150	3.13	Reject
6	There is teamwork among employees	150	3.49	Accept

Source: Field Survey, 2024

In table 1, all items were treating the first question which is “what is the relationship between robotics AI and supply chain applications in small and medium scale enterprises in Delta State, Nigeria. From analysis of the data, items 1, 2, 4, 5, and 6 produced a mean rating above the criterion mean of 3.0 and items 3 only produced a mean less than 3.0. The result of the analysis showed that majority of the respondents supported robotic adoption as it has a positive impact on supply chain management objective of SMEs in Delta State.

Research Question 2: Does predictive analytics correlate with business continuity planning of SMEs in Delta State, Nigeria?

Table 2: Descriptive Statistics for Research Question Two

S/N	Questionnaire Items	N	Mean	Remark
	Predictive Analytics			
1	I like to improve decision-making process	150	3.83	Accept
2	My firm collects data on process improvement	150	3.64	Accept
3	My firm’s culture supports process improvement	150	2.73	Reject
	Business Continuity Planning			
4	My firm’s maintain database for planning	150	3.56	Accept
5	We reward employees for making good sales forecasts	150	2.61	Accept
6	My firm’s culture supports data sharing	150	2.52	Reject

Source: Field Survey, 2024

In table 2, all items were addressing the research question “Does the predictive analytics correlate with business continuity planning in small and medium scale enterprises in Delta State, Nigeria?” From available data, items 1, 2, 4, and 5 obtained a mean rating greater than the mean value of 3.0. while items 6 obtained values below the mean. The result of the analysis showed that predictive analytics correlates with business continuity planning of small and medium scale enterprises in Delta State, Nigeria.

Test of Hypotheses

Decision Rule: Reject the null hypothesis and accept the alternative if *P*-value < 0.05; otherwise, accept the null hypothesis.

Hypothesis 1

H₁: There is a significant relationship that exists between robotics and supply chain management in SMEs in Delta State, Nigeria.

Table 3: Correlations Analysis for Hypothesis One

		ROBOTICS	SCM
ROBOTICS	Pearson Correlation	1	.673**
	Sig. (2-tailed)		.010
	N	150	150
SCM	Pearson Correlation	.673**	1
	Sig. (2-tailed)	.010	
	N	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Field Survey/SPSS, 2024

Table 3 shows there is a positive significant relationship between robotics and supply chain management in SMEs in Delta State, Nigeria, with $r = 0.673$, $n = 150$, and p -value of 0.010 ($p < 0.05$). Therefore, the study accepted the alternative hypothesis and concluded that there is a statistically significant positive relationship between robotics and supply chain management in SMEs in Delta State, Nigeria. This denotes that robotics directly drives supply chain management efficiency.

Hypothesis 2

H₁: There is a significant correlation between predictive analytics and business continuity planning in SMEs in Delta State, Nigeria.

		ROBOTICS	SCM
ROBOTICS	Pearson Correlation	1	.897**
	Sig. (2-tailed)		.000
	N	150	150
SCM	Pearson Correlation	.897**	1
	Sig. (2-tailed)	.000	
	N	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Field Survey/SPSS, 2024

Table 4 shows that there is a statistically positive significant relationship between process innovation and environmental sustainability of SMEs in Delta State, Nigeria, with $r = 0.897$, $n = 150$, and p -value of 0.000 ($p < 0.05$). The study accepted the alternative hypothesis and concluded that there is a statistically positive relationship between predictive analytics and business continuity planning in SMEs in Delta State, Nigeria. This suggests that predictive analytics applications increase business continuity planning and ultimately business sustainability.

Results/Findings

1. Positive Impact of Robotics on Supply Chain Management:
The study established a statistically significant positive relationship between robotics and supply chain management in SMEs in Delta State, Nigeria, with a correlation coefficient of $r=0.673$ ($p <$

0.05). Robotics adoption was found to enhance supply chain efficiency, improving cost management, delivery effectiveness, and overall operational performance.

2. Predictive Analytics and Business Continuity Planning: There is a strong positive correlation between predictive analytics and business continuity planning in SMEs, with $r=0.897$ ($p < 0.05$). Predictive analytics enables SMEs to make data-driven decisions, forecast market trends, identify risks, and ensure resilience against operational disruptions.

Conclusion

The study concluded that AI adoption impacts positively on sustainability of SMEs in Delta State. The findings suggest that AI technology can offer significant benefits for SMEs in the state, including improved efficiency, productivity, business planning, and competitiveness. To promote the sustainable use of AI in SMEs, policymakers, business owners, and other stakeholders should develop strategies to address these barriers and support the growth and development of SMEs in Delta State.

Recommendations

1. Promote Awareness and Training Programs on AI Technologies: Governmental and non-governmental organizations should establish initiatives to educate SMEs on the advantages and practical applications of AI tools such as robotics and predictive analytics. This includes offering training to enhance employees' technological skills and promote digital literacy.
2. Encourage AI Integration through Subsidized Technology Access: Policymakers should create programs to subsidize the cost of acquiring AI-driven tools and infrastructure for SMEs. This can address resource constraints and incentivize wider adoption of AI technologies to enhance operational efficiency and sustainability.

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