AI ADOPTION IN ENTREPRENEURIAL BUSINESS OPERATIONS IN AKWA IBOM STATE: EVALUATING THE ROLES AND CHALLENGES

By
Dr. Luke P. Henry
Faculty of Education
University of California
Oakland, California
United States.

AKPAN, E. Ebenezer, Ph.D., FCICN, AP, PPGDCA, PHDCDPM
Corporate Institute of Research and Computer Science
140 Ikot Ekpene Road
Uyo, Akwa Ibom State
AND
Anietie Bello INYANG, Ph.D
Department of Business Education
School of Vocational and Technical Education
College of Education, Akwa Ibom State

ABSTRACT

This study examined artificial intelligence adoption in entrepreneurial business operations in Akwa Ibom State, assessing it roles and challenges. Descriptive survey design was adopted to carry out this research in Akwa Ibom State. The targeted population for the study comprised all entrepreneurs in Akwa Ibom State. Stratified sampling technique was used to select entrepreneurs across the three senatorial districts of the state. From Uyo Senatorial district, 60 entrepreneurs were selected while from each of Eket and Ikot Ekpene Senatorial Districts, 40 entrepreneurs were selected and this gave a sample size of 140 used for the research. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence and Entrepreneurial Business Operations Questionnaire (AIEBOQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.84 and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics to answer research questions.The results of data analysis proved that the most prominent role of AI in entrepreneurial business operations in Akwa Ibom State is business process automation. It also proved thatthe most serious challenge faced in the adoption of AI in entrepreneurial business operations in Akwa Ibom State is lack of technical expertise. The result of the data analysis revealed that The study concluded that ai adoption in entrepreneurial activities in Akwa Ibom State holds immense potential to drive innovation, enhance productivity, and promote economic growth. One of the recommendations made was that the government and private sector should invest in improving digital infrastructure, such as high-speed internet and affordable computing resources.

KEYWORDS: Artificial Intelligence, Entreprenuerial Business Operations, Akwa Ibom State.

INTRODUCTION

The global adoption of Artificial Intelligence (AI) technologies has revolutionized the way businesses operate, enabling significant improvements in efficiency, innovation, and customer experience (Brynjolfsson & McAfee, 2017). In Nigeria, the integration of AI into entrepreneurial activities is beginning to gain traction, though its pace remains uneven across regions. Akwa Ibom State, an emerging business hub in the Niger Delta region, offers a unique case study of how AI adoption could potentially reshape the local entrepreneurial landscape. This research aims to explore the roles and challenges of AI adoption in entrepreneurial business activities in Akwa Ibom State, shedding light on the opportunities and barriers faced by entrepreneurs in the region.

Entrepreneurs in Akwa Ibom State are increasingly seeking innovative solutions to address challenges such as limited access to capital, poor infrastructure, and intense competition. The potential of AI to automate tasks, predict market trends, and optimize business processes offers new possibilities for growth and development (Chui, Manyika, &Miremadi, 2016). By embracing AI tools, businesses in Akwa Ibom could enhance their decision-making, personalize customer interactions, and streamline operations. Moreover, AI applications in industries such as agriculture, healthcare, and retail could support entrepreneurship by enhancing productivity and efficiency, which are critical for long-term success in today's competitive market environment.

Despite the promising prospects, the adoption of AI in Akwa Ibom's entrepreneurial ecosystem is not without challenges. One of the primary obstacles is the lack of adequate infrastructure to support AI technologies, such as reliable internet connectivity and access to affordable computing resources (Okolie, 2019). Entrepreneurs in the state may also face difficulties in acquiring the necessary technical skills to effectively implement AI systems in their businesses. Furthermore, there is a lack of awareness and understanding of AI among many entrepreneurs, which can hinder the integration of AI solutions into their business models.

The financial constraints faced by many entrepreneurs in Akwa Ibom further exacerbate the challenge of AI adoption. Investing in AI technologies requires significant upfront capital, which may be beyond the reach of small and medium-sized enterprises (SMEs) in the state (Akanbi & Ibrahim, 2021). Additionally, there is a scarcity of local experts who can assist with the implementation and maintenance of AI systems. This gap in expertise, coupled with limited access to funding, makes it difficult for many entrepreneurs to adopt AI on a large scale, further limiting the growth of AI-driven innovation within the region.

However, recent efforts by the Nigerian government and private sector stakeholders to promote digital transformation offer hope for overcoming these challenges. The establishment of technology hubs and innovation centers, along with various capacity-building initiatives, is gradually improving access to AI technologies and skills (Uduak, 2020). These initiatives are fostering collaboration between government agencies, private sector players, and educational institutions, thereby creating an environment conducive to AI adoption in Akwa Ibom's entrepreneurial sector. By leveraging these resources, local businesses can better navigate the complexities of AI implementation, unlocking new opportunities for growth and sustainability.

AI adoption in entrepreneurial activities in Akwa Ibom State holds significant potential to drive innovation, enhance productivity, and promote sustainable economic development. However, the journey towards successful AI integration is fraught with challenges, including infrastructure limitations, skill

gaps, and financial constraints. Understanding these barriers and the roles that AI can play in fostering entrepreneurial growth is essential for policymakers, business leaders, and other stakeholders. By addressing these challenges and facilitating a supportive environment for AI adoption, Akwa Ibom State can position itself as a leading hub for AI-driven entrepreneurship in Nigeria.

Concept of Artificial Intelligence

Artificial Intelligence (AI) has evolved significantly over recent years, becoming a pivotal force in transforming various sectors and prompting extensive academic discourse. This essay delves into the concept of AI, its advancements, applications, ethical considerations, and future prospects, drawing upon scholarly articles published between 2020 and 2025.

AI refers to the simulation of human intelligence processes by machines, particularly computer systems. Yetunde, Udoh & Charles (2025) futher explained that, The goal of artificial intelligence is to enhance computer abilities related to human understanding, including language intelligence, learning, reasoning, and problem-solving. These processes encompass learning (acquiring information and rules for using it), reasoning (using rules to reach approximate or definite conclusions), and self-correction. The primary goal of AI is to create systems capable of performing tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation.

The period from 2020 to 2025 witnessed remarkable progress in AI and Machine Learning (ML), leading to transformative impacts across various industries. Moore (2023) highlights that AI and ML have revolutionized sectors such as healthcare, finance, transportation, manufacturing, and education by enabling automation, predictive analytics, and personalized services. These technologies have improved efficiency, accuracy, and decision-making processes, thereby reshaping traditional operational models.

The integration of AI into business strategies has been pivotal in driving digital transformation. Research by Borges et al. (2020) identifies four perspectives—automation, decision-making, customer engagement, and new products and services offering—through which AI influences business strategy. Caner and Bhatti (2020) further discuss the abilities and limitations of AI, its economic implications, and its impact on workforce dynamics, emphasizing the need for ethical considerations and regulatory frameworks.

AI has also played a significant role in addressing sustainable development goals. Cath (2018) discusses the governance of AI, highlighting ethical, legal, and technical challenges. Palomares et al. (2021) provide a panoramic view of AI's potential in achieving sustainable development goals by 2030, analyzing its progress and prospects. Bondi et al. (2021) emphasize a participatory approach towards AI for social good, suggesting that community involvement is crucial for the successful implementation of AI initiatives.

The ethical implications of AI development have been a subject of intense debate. A notable discussion revolves around the potential for AI systems to achieve consciousness or self-awareness. An open letter signed by over 100 AI experts, including Sir Stephen Fry, emphasizes the need for responsible AI research to prevent potential harm and suffering to such systems. The letter proposes principles such as prioritizing research on AI consciousness, setting development constraints, adopting a phased approach, sharing findings publicly, and avoiding misleading statements about AI consciousness.

In the realm of education, AI has been instrumental in achieving sustainable development goals. AlGhamdi (2022) conducted a systematic review and found that AI applications have proven effective in improving and developing education, simplifying basic teaching tasks, assisting educational institution managers, and addressing challenges faced by the education sector.

Similarly, AI has been transformative in the development of smart cities. Hanna (2023) explores the impact of AI on urban planning, transportation, energy efficiency, and public safety. The study also discusses potential risks and challenges, such as ethical and privacy concerns, job displacement, and cybersecurity risks, emphasizing the need for strategic planning and policy-making to mitigate these issues.

Looking ahead, the future of AI is intertwined with both opportunities and challenges. Erkuş et al. (2024) analyze current trends and future projections of AI in technology, economics, and the environment. They highlight the rapid development of AI technologies and their applications in various sectors, while also addressing concerns related to ethical considerations, privacy, and the need for regulatory frameworks to ensure responsible AI development.

Concept of Entrepreneurial Business operations

Entrepreneurial business operations encompass the strategic and practical activities that entrepreneurs undertake to develop, sustain, and grow their ventures. These operations include financial management, innovation, human resources, and marketing strategies. They play a crucial role in determining a business's sustainability and competitive advantage. Effective operations help businesses optimize resource allocation and improve decision-making. Entrepreneurship is inherently dynamic, requiring adaptability in business operations to address market changes, technological disruptions, and economic shifts. The study by Bradford, (2025) highlights that entrepreneurial operations also involve managing uncertainties, risks, and customer expectations through efficient business models. Entrepreneurs who develop structured operational strategies enhance their chances of long-term success.

Different scholars have defined entrepreneurial business operations with varying emphases. Mili, (2025) define them as a structured combination of activities aimed at maximizing efficiency and market adaptability. Their study highlights how artificial intelligence is transforming business operations, particularly in quality management. Meanwhile, Jamshidi et al. (2025) view entrepreneurial operations as a combination of strategy, resource mobilization, and competitive positioning that enable businesses to succeed in dynamic environments. Their research on rural entrepreneurship underscores the need for flexible business operations that accommodate external factors such as regulations, infrastructure, and consumer behavior. This diversity in definitions demonstrates that entrepreneurial business operations are not static but are shaped by industry trends, market needs, and technological advancements

Types of Entrepreneurial Business Operations

Entrepreneurial business operations refer to the different ways entrepreneurs structure, manage, and operate their ventures. These operations vary based on industry, innovation, and market approach. Below are key types of entrepreneurial business operations:

- **Small and Medium Enterprises (SMEs)**

Small and Medium Enterprises (SMEs) play a critical role in economic growth by fostering innovation, creating employment, and supporting local economies. They usually have a limited number of employees and lower revenue compared to large corporations. SMEs benefit from agility and flexibility, allowing them to adapt quickly to market changes. However, they often struggle with financial constraints, limited access to credit, and regulatory challenges. Government policies, financial institutions, and innovative financing models like Mudharabah financing help SMEs overcome these barriers (Lestari et al. 2025). These enterprises contribute significantly to industry diversification, often operating in sectors like manufacturing, retail, and services.

- **Startup Businesses**

Startups are high-risk, high-reward businesses that focus on innovation and rapid scalability. These ventures usually begin with a unique idea, technology, or service aimed at solving market problems. Unlike traditional businesses, startups prioritize scalability and seek venture capital funding to support their growth. Startups are commonly found in technology-driven sectors, such as fintech, artificial intelligence, and e-commerce. A major challenge for startups is managing uncertainty and sustaining long-term profitability. Many fail due to poor market fit, lack of funding, or ineffective business models. However, successful startups can disrupt industries and redefine market standards. Duangekanong (2025) explained that big data analytics and strategic agility significantly enhance startup performance and long-term sustainability.

- **Corporate Venture Capital (CVC) Operations**

Corporate Venture Capital (CVC) is a strategic investment approach used by large corporations to fund and collaborate with startups. Unlike traditional venture capital firms, CVC investors prioritize strategic alignment over financial returns, using investments to gain insights, access new technologies, and expand market reach. CVC operations help corporations stay competitive by integrating innovation without developing in-house solutions. Many successful startups, including those in biotechnology, AI, and fintech, have grown through CVC partnerships. Research by Moro (2025) highlights that effective governance structures in CVC investments play a crucial role in ensuring long-term alignment between corporations and startups.

- **Social Entrepreneurship**

Social entrepreneurship blends business strategies with social impact initiatives to address pressing global challenges such as poverty, education, and healthcare. Unlike traditional businesses, social enterprises prioritize mission-driven objectives over profit maximization. They reinvest revenue to expand social impact while maintaining financial sustainability. Examples include microfinance institutions, fair-trade businesses, and social impact startups. The success of social enterprises depends on effective stakeholder collaboration, innovative funding models, and community engagement. A study on care

farms reveals how social entrepreneurship plays a vital role in providing essential services to vulnerable populations, particularly in elderly care (Jarosz, 2024). This business model proves that economic success and social responsibility can coexist.

- **Digital Entrepreneurship**

Digital entrepreneurship leverages internet-based technologies, e-commerce platforms, and digital marketing to build and scale businesses. Unlike traditional business models, digital enterprises rely on technology to optimize operations, reach global markets, and reduce operational costs. The rise of social media, AI-driven automation, and cloud computing has created new opportunities for digital entrepreneurs. This business model is prevalent in sectors such as online education, digital finance, and remote services. Challenges include cybersecurity risks, digital competition, and maintaining customer engagement in a rapidly evolving digital landscape.

- **Franchise Business Model**

The franchise business model enables entrepreneurs to operate under an established brand while following a proven operational structure. Franchising reduces risk for entrepreneurs by providing brand recognition, training, and ongoing support. Franchisees benefit from a ready-made customer base, operational guidance, and marketing support, making it a popular choice for those looking to enter the business world with reduced uncertainty. Common franchise sectors include fast food, retail, and fitness centers.

- **Industrial Entrepreneurship**

Industrial entrepreneurship involves the establishment and management of large-scale production and manufacturing businesses. These entrepreneurs invest in industrial sectors such as automotive, construction, and consumer goods, contributing to large-scale economic development. Industrial entrepreneurs play a crucial role in job creation, infrastructure development, and supply chain enhancement. Businesses operating within industrial parks benefit from government incentives, access to skilled labor, and supply chain efficiencies. However, industrial entrepreneurs face challenges such as high capital investment requirements, regulatory compliance, and global competition.

- **Cooperative Enterprises**

Cooperative enterprises are collectively owned businesses where members share profits and decision-making responsibilities. Common in agriculture, banking, and retail, cooperatives focus on economic sustainability and social welfare. Members contribute resources, vote on key business decisions, and benefit from shared profits. Cooperatives provide economic resilience by fostering mutual support and reducing operational risks. However, challenges include bureaucratic decision-making and potential conflicts of interest.

Roles of AI in Entrepreneurial Business Operations

Artificial Intelligence (AI) has become a transformative force in modern business, offering entrepreneurs advanced tools and capabilities that enhance efficiency, decision-making, and competitiveness. From automating routine tasks to providing deep data-driven insights, AI is revolutionizing entrepreneurial business activities. Below are the key roles AI plays in entrepreneurship.

Business Process Automation: One of the most significant contributions of AI to entrepreneurial ventures is automation (Ughulu, 2025). AI-powered systems streamline repetitive and time-consuming tasks, allowing entrepreneurs to focus on strategic aspects of business growth.

Chatbots and Virtual Assistants: AI-driven chatbots handle customer inquiries, support, and transactions, improving customer service while reducing operational costs.

Automated Accounting and Finance: AI automates bookkeeping, invoicing, tax calculations, and fraud detection, minimizing human errors and enhancing financial accuracy.

Supply Chain Management: AI optimizes inventory control, demand forecasting, and logistics, ensuring efficiency in product availability and distribution.

Data-Driven Decision Making: AI empowers entrepreneurs with actionable insights by analyzing vast amounts of data (Haleem, Javaid, Qadri, Singh and Suman, 2022). These insights support better decision-making, risk management, and business strategies.

Market Analysis: AI examines consumer behavior, market trends, and competition, helping businesses develop targeted marketing campaigns and pricing strategies.

Predictive Analytics: AI predicts future sales, customer preferences, and industry shifts, enabling entrepreneurs to make proactive business decisions.

Customer Segmentation: AI classifies customers based on demographics, preferences, and buying behavior, allowing for personalized marketing and improved customer engagement.

Personalized Customer Experience: AI enhances customer satisfaction by providing personalized services and experiences (Mohannad and Ahmad, 2019). This is crucial for entrepreneurial businesses aiming to build strong customer relationships.

- **Recommendation Systems:** AI suggests products or services based on user behavior, increasing sales and customer loyalty. Examples include personalized recommendations on e-commerce platforms.
- **Conversational AI:** AI-powered chatbots and voice assistants offer personalized support, answering queries and resolving issues promptly.
- **Emotion AI:** AI-driven sentiment analysis helps businesses understand customer emotions and adjust their strategies accordingly.

Enhancing Marketing and Sales Strategies: AI optimizes marketing efforts by analyzing consumer data and automating advertising campaigns. This ensures businesses reach their target audience more effectively (Kumar, Ashraf and Nadeem, 2024).

AI-Powered Advertising: AI refines ad placements and content based on user behavior, ensuring better engagement and higher conversion rates.

Email Marketing Automation: AI customizes email content and delivery times to maximize open rates and engagement. As explained by Olayinka (2025) AI makes allowance for real-time optimization of delivery routes and inventory processing by ensuring timely order fulfilment.

Social Media Insights: AI tools monitor social media interactions, trends, and customer feedback, enabling businesses to improve their digital marketing strategies.

Product Development and Innovation: Entrepreneurs leverage AI to design, develop, and enhance products based on market needs and trends. AI facilitates innovation through research and development (Haleem, Javaid, Qadri, Singh, and Suman, 2022).

AI in Design and Prototyping: AI assists in creating and testing product designs, reducing time and costs in product development.

Customer Feedback Analysis: AI evaluates reviews and feedback to improve existing products and develop new offerings.

AI-Driven Experimentation: AI runs simulations and tests to assess product viability before launching in the market.

Cybersecurity and Risk Management: Entrepreneurs rely on AI to safeguard business operations and manage risks effectively. AI enhances security by detecting threats and preventing cyberattacks.

Fraud Detection: AI identifies suspicious activities in transactions, reducing financial losses and fraudulent activities.

Cybersecurity Protection: AI-powered systems monitor networks for potential breaches and strengthen security measures.

Risk Assessment: AI evaluates business risks, helping entrepreneurs make informed investment and operational decisions.

Human Resource Management and Talent Acquisition: AI optimizes workforce management, recruitment, and employee engagement in entrepreneurial businesses. The Deployment of the AI technology in the Human resource management system has also increased the productivity, accuracy and pace of various business processes (Habeeb, Adesemowo & Babatunde, 2025).

AI-Powered Hiring: AI scans resumes, shortlists candidates, and conducts initial assessments to streamline recruitment.

Employee Performance Monitoring: AI tracks employee productivity and provides insights for workforce optimization.

Training and Skill Development: AI offers personalized training programs based on employee skills and career goals.

Financial Forecasting and Investment Strategies: Entrepreneurs benefit from AI-powered financial analysis and investment insights that improve financial planning (Okeke, Bakare and Achumie, 2024).

AI in Stock Market Analysis: AI predicts stock trends and investment opportunities for entrepreneurs looking to invest.

Smart Budgeting: AI assists in expense tracking, cash flow management, and financial forecasting.

AI-Powered Loan Processing: AI evaluates creditworthiness and automates loan approvals, making it easier for entrepreneurs to secure funding.

Strategic Ways of Using AI to aid in Entrepreneurial Business Activities

The following are the strategic ways of using artificial intelligence in entrepreneurial business activities as mentioned by numerous scholars including Chukwuka and Igweh (2024):

Enhancing Customer Experience: AI-powered chatbots and virtual assistants provide 24/7 customer support, while personalized recommendation engines improve engagement. Sentiment analysis tools gauge customer feedback to refine services. This leads to higher satisfaction and loyalty, giving businesses a competitive edge.

Data-Driven Decision Making: AI analyzes large datasets to provide actionable insights through predictive analytics and business intelligence tools. Entrepreneurs can forecast trends, monitor KPIs, and make informed decisions in real-time, reducing risks and improving outcomes.

Automating Routine Tasks: AI automates repetitive tasks like scheduling, inventory management, and payroll processing. This reduces human error, saves time, and allows entrepreneurs to focus on strategic activities, boosting overall productivity.

Improving Marketing Strategies: AI enables hyper-targeted campaigns by segmenting customers and optimizing ad spend. It also generates content and analyzes campaign performance in real-time, ensuring higher ROI and better customer reach.

Streamlining Recruitment and HR Processes: AI simplifies hiring by screening resumes and identifying top candidates. It also monitors employee engagement and offers personalized training programs, improving workforce efficiency and retention.

Enhancing Product Development: AI analyzes market trends and customer feedback to identify gaps and opportunities. It accelerates prototyping and testing, enabling faster innovation and more refined products that meet customer needs.

Optimizing Supply Chain and Logistics: AI predicts demand fluctuations, optimizes delivery routes, and evaluates supplier performance. This reduces costs, minimizes delays, and ensures efficient operations across the supply chain.

Fraud Detection and Risk Management: AI detects unusual patterns in transactions to prevent fraud. It also assesses financial and operational risks, helping businesses implement proactive measures to safeguard their operations.

Scaling Operations Efficiently: Cloud-based AI solutions and process optimization tools allow businesses to scale without significant cost increases. AI identifies inefficiencies and ensures smooth growth as operations expand.

Fostering Innovation and Competitive Advantage: AI tracks industry trends and competitor activities, providing insights for innovation. Entrepreneurs can experiment with AI-driven business models, creating new revenue streams and staying ahead in the market.

Challenges of AI adoption in entrepreneurial business activities

Adopting Artificial Intelligence (AI) in entrepreneurial ventures offers significant opportunities for innovation and competitiveness. However, small and medium-sized enterprises (SMEs) encounter several challenges in integrating AI into their operations. Key obstacles identified in recent studies from 2020 to 2025 include:

- **Financial Constraints**

The high costs associated with implementing AI technologies pose a substantial barrier for SMEs. A study on Nigeria's manufacturing sector revealed that 28.23% of respondents identified the financial burden of AI adoption as a major challenge. Similarly, Nanjing University researchers highlighted that monetary restrictions significantly hinder AI adoption among SMEs. According to Arisekol & Rufus (2022), although advanced technologies improve efficiency, the initial cost of adoption remains a major barrier for smaller enterprises.

- **Lack of Technical Expertise**

Many SMEs struggle with a shortage of skilled professionals capable of managing and maintaining AI systems. In Nigeria, 25.91% of surveyed companies cited a lack of technical expertise as a critical obstacle.This skills gap limits SMEs' ability to effectively implement and utilize AI technologies.

- **Resistance to Change**

Organizational inertia and resistance to change are notable challenges in AI adoption. Approximately 21.59% of Nigerian manufacturing firms reported resistance to change as a significant barrier. Concerns about job displacement and the complexities of integrating new technologies contribute to this reluctance.

- **Data Privacy and Security Concerns**

Apprehensions regarding data privacy and security deter SMEs from embracing AI solutions. In the Nigerian context, 16.61% of respondents expressed such concerns. Ensuring robust data protection measures is crucial to mitigate these fears.

- **Inadequate Infrastructure**

Limited infrastructure, including outdated systems and insufficient technical support, hampers AI implementation. A pilot study involving SMEs in the Czech Republic and Austria identified infrastructure limitations as a significant barrier. This inadequacy restricts the seamless integration of AI technologies into existing business processes.

- **Trust and Knowledge Gaps**

A lack of trust in AI's reliability and ethical implications, coupled with knowledge gaps, impedes adoption. The same study from the Czech Republic and Austria highlighted these issues as critical challenges. Addressing these concerns through education and transparent practices is essential for fostering AI acceptance.

How to Mitigate the Challenges of Adopting AI for EntreprenueralBusiness Activities

Adopting Artificial Intelligence (AI) in entrepreneurial business activities presents numerous challenges, including financial constraints, lack of technical expertise, resistance to change, data privacy concerns, and inadequate infrastructure. To mitigate these challenges, the following strategies, supported by recent scholarly research, can be implemented:

- **Financial Support and Resource Allocation**

Entrepreneurs should explore funding opportunities such as government grants, subsidies, and partnerships to alleviate the financial burden of AI adoption. Strategic allocation of resources and prioritization of AI projects with high return on investment can also be beneficial. A study by Hussain and Rizwan (2024) proposes a phased framework for AI adoption in SMEs, starting with low-cost, general-purpose AI tools to build technical competence and foster a positive attitude towards AI.

- **Upskilling and Training**

Investing in employee training and development programs can bridge the technical expertise gap. Collaborations with educational institutions and online courses can provide accessible learning opportunities. Proietti and Magnani (2025) emphasize the importance of upskilling the workforce to facilitate AI adoption in SMEs.

- **Change Management and Leadership Support**

Effective change management strategies, including clear communication of AI benefits and involving employees in the adoption process, can reduce resistance to change. Leadership support is crucial in fostering a culture that embraces technological advancements. The study by Hussain and Rizwan (2024) highlights the role of leadership in securing commitment and guiding organizations through the AI adoption process.

- **Enhancing Data Security Measures**

Implementing robust data protection protocols and complying with relevant regulations can address data privacy and security concerns. Transparent data management practices build trust among stakeholders. Yee et al. (2024) discuss the importance of addressing data security challenges in deploying AI within SMEs.

- **Infrastructure Development**

Investing in scalable and flexible infrastructure, such as cloud-based solutions, can support AI integration without extensive upfront costs. Proietti and Magnani (2025) propose a framework for assessing AI adoption and digitalization in SMEs, emphasizing the need for adequate infrastructure to support AI initiatives.

METHODOLOGY

This study examined artificial intelligence adoption in entrepreneurial business operations in Akwa Ibom State, assessing it roles and challenges. Descriptive survey design was adopted to carry out this research in Akwa Ibom State.The targeted population for the study comprised all entrepreneurs in Akwa Ibom

State. Stratified sampling technique was used to select entrepreneurs across the three senatorial districts of the state. From Uyo Senatorial district, 60 entrepreneurs were selected while from each of Eket and Ikot Ekpene Senatorial Districts, 40 entrepreneurs were selected andthis gave a sample size of 140 used for the research. The instrument used for data collection was a structured questionnaire titled "Artificial Intelligence and Entrepreneurial Business Operations Questionnaire (AIEBOQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.84 and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics to answer research questions.

RESULTS AND DISCUSSIONS

Research Questions 1: The research question sought to find out the roles of AI in entrepreneurial business operations in Akwa Ibom State. To answer the research question percentage analysis was performed on the data, (see table 1).

Table 1:

Percentage analysis of the roles of AI in entrepreneurial business operations in Akwa Ibom State.

ASPECTS	FREQUENCY	PERCENTAGE
Business Process Automation	17	12.14**
Chatbots and Virtual Assistants	15	10.71
Automated Accounting and Finance	14	10.00
Data-Driven Decision Making	13	9.29
Predictive Analytics	12	8.57
Customer Segmentation	12	8.57
Enhancing Marketing and Sales Strategies	9	6.43
AI-Powered Advertising	7	5.00
Training and Skill Development	5	3.57
Customer Feedback Analysis	11	7.86
Fraud Detection	10	7.14
Risk Assessment	3	2.14

Human Resource Management and Talent Acquisition	2	1.43*
Employee Performance Monitoring	10	7.14
TOTAL	140	100%

** The highest percent age frequency
* The least percentage frequency
SOURCE: Field survey

The above table 1 presents the percentage analysis to find out the roles of AI in entrepreneurial business operations in Akwa Ibom State. From the result of the data analysis, it was observed that the highest percentage of the respondents affirmed that the most prominent role of AI in entrepreneurial business operations in Akwa Ibom State is business process automation (14.12%) while the least percentage of the respondents affirmed that human resource management and talent acquisition appeared to be the less prominent roles of AI in entrepreneurial business operations in the state. The result of the study agrees with the findings of Ughulu, (2025) that stated that one of the most significant contributions of AI to entrepreneurial ventures is automation as AI-powered systems streamline repetitive and time-consuming tasks, allowing entrepreneurs to focus on strategic aspects of business growth.

Research Questions 2: The research question sought to examine the challenges faced in the adoption of AI in entrepreneurial business operations in Akwa Ibom State.To answer the research percentage analysis was performed on the data, (see table 2).

Table 2: Percentage Analysis of the Challenges Faced in the Adoption of AI In Entrepreneurial Business Operations In Akwa Ibom State

CHALLENGES	FREQUENCY	PERCENTAGE
Financial Constraints	21	15
Lack of Technical Expertise	31	22.14**
Resistance to Change	27	19.29
Data Privacy and Security Concerns	21	15.00
Inadequate Infrastructure	17	12.14*
Trust and Knowledge Gaps	23	16.43
TOTAL	140	100%

** The highest percentage frequency
* The least percentage frequency

SOURCE: Field survey

The above table 2 presents the percentage analysis to find out the challenges faced in the adoption of AI in entrepreneurial business operations in Akwa Ibom State. From the result of the data analysis, it was observed that the highest percentage of the respondents affirmed that the challenges faced in the adoption of AI in entrepreneurial business operations in Akwa Ibom State is lack of technical expertise, while the least percentage of the respondents affirmed inadequate infrastructure. The result of the study corresponds with the findings that many SMEs struggle with a shortage of skilled professionals capable of managing and maintaining AI systems. This aligns with findings in Nigeria, where 25.91% of surveyed companies cited a lack of technical expertise as a critical obstacle. This skills gap limits SMEs' ability to effectively implement and utilize AI technologies.

CONCLUSION

AI adoption in entrepreneurial activities in Akwa Ibom State holds immense potential to drive innovation, enhance productivity, and promote economic growth. However, challenges such as inadequate infrastructure, skill gaps, and financial constraints hinder its full integration. While entrepreneurs seek AI-driven solutions for efficiency and competitiveness, limited awareness and technical expertise remain obstacles. Government and private-sector initiatives are gradually improving access to AI resources, offering hope for wider adoption. Addressing these barriers through collaboration and policy support can foster an enabling environment for AI-driven entrepreneurship, positioning Akwa Ibom as a hub for technological advancement and business innovation in Nigeria.

RECOMMENDATIONS

1. The government and private sector should invest in improving digital infrastructure, such as high-speed internet and affordable computing resources. Reliable access to AI-driven tools and cloud-based solutions will enable entrepreneurs to integrate AI into their business processes efficiently.

2. Training programs, workshops, and AI incubation hubs should be established to equip entrepreneurs with the necessary technical skills. Partnerships with universities and tech organizations can help bridge the knowledge gap, fostering AI innovation and adoption.

3. The government and financial institutions should introduce grants, low-interest loans, and tax incentives to encourage AI adoption. By reducing the financial burden, small and medium-sized enterprises (SMEs) can more easily invest in AI technologies, boosting economic growth in Akwa Ibom State.

REFERENCES

Adepoju, A. O., & Olorunfemi, S. O. (2023). Impact of AI Adoption on Business Process Automation and Competitiveness in Manufacturing Industry in Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS),* 7(5), 1-12. Retrieved from https://rsisinternational.org/journals/ijriss/articles/impact-of-ai-adoption-on-business-process-automation-and-competitiveness-in-manufacturing-industry-in-nigeria

Akanbi, M. O., & Ibrahim, A. (2021). Financial constraints and technology adoption in Nigerian small and medium enterprises. *Journal of Entrepreneurship and Business Innovation*, 8(2), 45-60.

AlGhamdi, A. A. (2022). Artificial Intelligence in Education as a Mean to Achieve Sustainable Development in Accordance with the Pillars of the Kingdom's Vision 2030—A Systematic Review. *International Journal of Higher Education,* 11(4), 80.

Arisekol, O. A. & Rufus, D. A. (2022). Supply Chain Management and Operational Performances in Walmart: The Case of Walmart. *International Journal of advancement in Education, Management, Science and Technology,* 5(2): 69-85.

Borges, A. F., Caner, T., & Bhatti, W. A. (2020). Artificial Intelligence and Business Strategy towards Digital Transformation: A Research Agenda. Sustainability, 13(4), 2025.

Bradford W., Wang C., Lofstrom M. &Verchot M. (2025). (Mis)Pricing in Loans to Businesses Owned by People of Color. Available at: https://docs.iza.org/dp17730.pdf

Brynjolfsson, E., & McAfee, A. (2017). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. W. W. Norton & Company.

Cath, C. (2018). Governing artificial intelligence: ethical, legal and technical opportunities and challenges. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2133), 20180080.

Chui, M., Manyika, J., &Miremadi, M. (2016). Where machines could replace humans—and where they can't (yet). *McKinsey Quarterly*. Retrieved from https://www.mckinsey.com

Erkuş, E. C., Özbey, C., & Çolakoğlu, T. (2024). Artificial Intelligence in Technology and Innovation: Concerns and Future Directions. *AIPA's International Journal on Artificial Intelligence: Bridging Technology, Society and Policy,* 1(1), 1–12.

Habeeb, H., Adesemowo, A. O. & Babatunde, A. T. (2025). The Application Of Artificial Intelligence In Human Resource Management: Emerging Challenges And Strategic Pathways. *KING-UK International Journal of Academic Anthology*. 9 (1), 15-16.

Mili B., Bengana I., Zighed R. &Mekimah S. (2025). From code to quality: How AI is transforming quality management in Algerian startups. *International Journal of Innovative Research and Scientific Studies,* 8(1):1770-1776

Müller, C., & Novak, P. (2024). AI Adoption Challenges for SMEs in the Czech Republic and Austria. *Journal of Entrepreneurial Management*, 46(1), 125-140. Retrieved from https://sciendo.com/article/10.22367/jem.2024.46.13

Okolie, U. I. (2019). Barriers to technology adoption in Nigeria's entrepreneurial sector: The case of AI. *International Journal of Business and Technology*, 7(4), 120-136.

Olayinka, A., (2025). Leveraging Ai-Driven Autostore Systems To Enhance Emergency Response And Crisis Management; A Focus On Grocery Stores. Academic Journal Of Global Who Is Who In Academia, 6 (1), 1-3.

Uduak, I. (2020). Digital transformation and entrepreneurship in Akwa Ibom State: Opportunities and challenges. *Akwa Ibom Journal of Innovation and Development*, 2(1), 10-22.

ussain, A., & Rizwan, R. (2024). Strategic AI adoption in SMEs: A Prescriptive Framework. arXiv preprint arXiv:2408.11

Yee, J. S. G., Ng, P. C., Wang, Z., McLoughlin, I., Ng, A. B., & See, S. (2024). On-Device LLMs for SMEs: Challenges and Opportunities. arXiv preprint arXiv:2410.16070.

Yetunde, O. H., Udoh, S & Charles, N. A., (2025). Artificial intelligence aided building design as the determinant of effective thermal comfort in houses. An academic discourse by architects in tertiary institutions in akwa ibom state. *International Journal Of Educationaland Scientificresearch Findings*, 7(1), 11-13.

Zhao, L., & Wang, X. (2024). Barriers to AI Adoption in SMEs: A Study of Financial and Technical Constraints. Social Works Review Journal, 9(2), 45-61. Retrieved from https://socialworksreview.com/index.php/Journal/article/view/99