

## ROLE OF ARTIFICIAL INTELLIGENCE ON SMALL AND MEDIUM-SIZED ENTERPRISES (SMES) MANAGEMENT IN SOUTHWEST, NIGERIA

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### Abstract

*The study examined the application of artificial intelligence (AI) in small and medium-sized enterprises (SMEs) in Southwest Nigeria. Specifically, the study assessed the level of awareness and understanding of Artificial Intelligence (AI) among the SMEs operators including the factors hindering the adoption and implementation of AI technologies in SMEs operations in the study area. Primary data was used for the study with the aid of a questionnaire on 355 respondents. The data gathered was analyzed using percentage, mean and standard deviation, while hypothesis was tested using t-test inferential statistics. The findings revealed that 75% of respondents are aware of AI technologies, but only 55-63% deeply understands industry-specific applications. Also revealed are the major barriers to the adoption, which include financial constraints, inadequate technological infrastructure, insufficient technical manpower skills, cultural and organizational resistance, regulatory challenges, data privacy and security concerns. The study recommended among others that targeted educational initiatives, financial support, and improved infrastructure to bridge the knowledge gap and enhance AI integration are key. Also that organizational culture, leadership openness, and employee readiness are crucial for successful AI adoption. Therefore the creation and implementation of comprehensive educational programs, financial incentives and policies to create a supportive environment for AI technologies should highly encouraged by all stakeholders.*

**Keywords:** AI Adoption, SMEs, Barriers to Technology, Organizational Culture

### Introduction

Prior to the development of Artificial Intelligence (AI), SMEs had to overcome a number of formidable challenges. These included low technical skills, a lack of proper technological infrastructure, and restricted financial resources, all of which made it difficult for them to scale operations and adopt cutting-edge technologies. Further complicating their efforts to stay competitive were organizational and cultural resistance to change, intricate legal obstacles, and worries about data security and privacy (Smallbone & Welter, 2021). The advent of Artificial Intelligence (AI) in recent times has provided SMEs with a glimmer of optimism in overcoming these obstacles and seizing fresh chances for expansion and creativity. Artificial Intelligence (AI) technologies comprise a broad range of instruments and methodologies, such as computer vision, natural language processing, and machine learning. These technologies have the capability to transform company operations, improve decision-making, and streamline procedures (Adeleke & Ayo, 2020). AI has the ability to significantly improve

efficiency, competitiveness, and innovation, especially for small and medium-sized organizations (SMEs) (Jiang et al., 2021). Furthermore, the simulation of human intelligence in robots that are designed to think and behave like people is known as artificial intelligence, or AI. It includes a range of methods, including robots, computer vision, natural language processing, and machine learning. Artificial intelligence (AI) systems are able to sense their surroundings, gather information, make judgments, and adjust to changing conditions (Russel & Norvig, 2021).

The South West area of Nigeria, which includes states like Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti, is a hive of economic activity with a wide variety of small and medium-sized enterprises (SMEs) operating in manufacturing, agriculture, retail, and services, among other industries. SMEs in South West Nigeria frequently confront a variety of difficulties, including restricted access to money, inadequate infrastructure, and a lack of technological know-how, despite their considerable contribution to the regional economy. In this light, SMEs in South West Nigeria have a compelling chance to overcome these obstacles and open up new growth opportunities by integrating AI technologies. Artificial intelligence (AI) tools like computer vision, machine learning, and natural language processing can help SMEs become more competitive by automating repetitive operations, gaining insights from data, and personalizing client experiences (Adeleke, 2019).

Southern part of Nigeria, depends heavily on Small and Medium-sized Enterprises (SMEs). These companies are the backbone of the local economy, making a substantial contribution to GDP growth, employment creation, and poverty alleviation. The use of Artificial Intelligence (AI) in Small and Medium-sized Enterprises in South West Nigeria presents notable obstacles, notwithstanding the technologies' revolutionary promise. These difficulties hinder SMEs' capacity to use AI to boost innovation, efficiency, and competitiveness by impeding the efficient integration of AI solutions into their operations. The possible uses of AI technologies in business operations are not well known or understood by many SMEs in South West Nigeria. Because SMEs may believe AI solutions are unnecessary or too sophisticated for their purposes, this lack of awareness prevents SMEs from adopting AI solutions (Ajayi, 2019). SMEs frequently lack the technical know-how and abilities needed to successfully install and oversee AI systems. One major obstacle to AI adoption among SMEs in the region is the lack of qualified workers capable of creating, implementing, and maintaining AI systems (Adewumi et al., 2020).

Furthermore, resource-constrained SMEs in South West Nigeria have a major hurdle because of the high cost of implementing AI, which includes software development, hardware infrastructure, and ongoing maintenance. The affordability barrier is made worse by limited access to financing, which prevents SMEs from investing in AI technologies (Afolabi et al., 2019). Furthermore, accessibility, quality, and availability of data are essential preconditions for implementing AI. But many SMEs in South West Nigeria struggle with fragmented data sources, poor data quality, and limited data infrastructure, which makes it difficult for them to use AI effectively and extract valuable insights from data (Oluwaseun et al., 2021). Businesses adopting AI must manage ethical and legal issues related to data security, privacy, and bias reduction. Concerns with respect to compliance and the moral application of AI technologies are raised by the lack of explicit legislative frameworks and guidelines that will cater for specific needs and circumstances of SMEs in South West Nigeria, which further complicates the adoption process (Ogundele et al., 2020). In order for SMEs in South West Nigeria to fully benefit from AI's transformative potential and use it to propel growth, innovation, and competitiveness in the region's ever-changing business environment, these obstacles must be overcome. Therefore, this paper aims to shed light on the application of artificial intelligence (AI) in small and medium-sized enterprises (SMEs) in Southwest Nigeria

The main objective of this paper is to explore the application of artificial intelligence (AI) in small and medium-sized enterprises (SMEs) in Southwest Nigeria. The specific objectives are to:

- i. assess the level of awareness and understanding of Artificial Intelligence (AI) among Small and Medium-Sized Enterprises (SMEs) in Southwest Nigeria;
- ii. identify the challenges and barriers hindering the adoption and implementation of AI technologies in SMEs in Southwest Nigeria;
- iii. examine the influence of cultural and organizational factors on the acceptance and integration of AI solutions within SMEs in Southwest Nigeria;
- iv. investigate the organizational concerns in relation to data privacy, security, and regulatory compliance associated with the adoption of AI in SMEs in Southwest Nigeria; and
- v. analyse the differences in perceptions between owners/managers and IT personnel, AI solutions within SMEs in Southwest Nigeria.

### **Research Questions**

- i. What is the level of awareness and understanding of Artificial Intelligence (AI) application among Small and Medium-Sized Enterprises (SMEs) in Southwest Nigeria?
- ii. What are the challenges and barriers hindering the adoption and implementation of AI technologies in SMEs in Southwest Nigeria?
- iii. How do cultural and organizational factors affect the acceptance and integration of AI solutions within SMEs in Southwest Nigeria?
- iv. What are the organizational concerns in relation to data privacy, security, and regulatory compliance associated with the adoption of AI in SMEs in Southwest Nigeria?
- v. What are the differences in perceptions between owners/managers and IT personnel, AI solutions within SMEs in Southwest Nigeria?

### **Literature Review**

#### **Concepts of Artificial Intelligence (AI)**

The simulation of human intelligence in robots that are designed to think and behave like people is known as artificial intelligence, or AI. It includes a range of methods, including robots, computer vision, natural language processing, and machine learning. Artificial intelligence (AI) systems are able to sense their surroundings, gather information, make judgments, and adjust to changing conditions (Russel & Norvig, 2021). AI has changed dramatically over time, moving from rule-based systems to neural networks and sophisticated machine learning algorithms. The creation of expert systems in the 1980s, the emergence of machine learning in the 2000s, and the most recent advances in deep learning are significant turning points. The quick development of AI technology has been fueled by improvements in processing power, data accessibility, and algorithmic creativity (Nilsson, 2020). Applications of AI are numerous and span a wide range of sectors, including manufacturing, transportation, healthcare, finance, retail, and entertainment. AI is used in medicine to find new drugs, analyze medical images, and provide individualized treatment plans. AI is used in finance to enable automated customer care, fraud detection, and algorithmic trading. In a similar vein, AI makes it possible for driverless cars in transportation, tailored recommendations in retail, and predictive maintenance in manufacturing (Marcus, 2020).

#### **Importance of Artificial Intelligence in Small and Medium-Sized Enterprises (SMEs)**

In every economy, SMEs are essential for fostering innovation, job creation, and economic growth. SMEs contribute significantly to GDP and jobs in many nations. They support the generation of wealth, the eradication of poverty, and socioeconomic advancement (OECD, 2021). Adopting AI can help SMEs become more competitive, efficient, and productive, among other benefits. SMEs can

automate tedious procedures, optimize operations, and make data-driven choices with the help of AI technologies. They can more successfully penetrate new markets, improve customer service, and customize goods and services (McKinsey Global Institute, 2021). The adoption of AI by SMEs is on the rise globally, primarily due to cost-cutting measures, increased competitiveness, and technological breakthroughs. AI is being used by SMEs for a range of tasks, such as supply chain optimization, predictive analytics, and marketing automation. Nonetheless, adoption rates differ between industries and geographical areas (Deloitte, 2021).

### **Challenges and Barriers to AI Adoption in SMEs in Southwest Nigeria**

SMEs in Southwest Nigeria frequently struggle with funding issues and resource shortages, which makes it difficult for them to make investments in AI technologies. For SMEs with little money and little access to funding, the high cost of obtaining AI systems and continuing maintenance and support charges present serious hurdles (Falaki et al., 2021). In order to properly deploy and use AI, many SMEs in Southwest Nigeria lack the requisite technology infrastructure and qualified staff. Technological hurdles and skill gaps are exacerbated by inadequate access to high-speed internet, obsolete gear and software, and a lack of skilled specialists in data science and artificial intelligence (Oni et al., 2020). The adoption of AI in SMEs is frequently hampered by organizational and cultural factors, such as a preference for traditional methods and resistance to change. However, adoption attempts of AI are severely hindered by established organizational structures that are averse to change, fear of losing one's job, and ignorance of the advantages of AI. The deployment of AI technologies by SMEs in Southwest Nigeria may present regulatory and legal obstacles (Brynjolfsson & Mitchell, 2017). AI adoption is also hampered by uncertainty over data privacy rules, intellectual property rights, and compliance requirements, which also raises the perceived dangers of deploying AI systems. Concerns about data security and privacy are crucial for SMEs thinking about implementing AI. Concerns about the ethical and legal ramifications of using AI among SMEs are heightened by issues like data breaches, illegal access to sensitive data, and misuse of customer information (Ojo et al., 2019).

### **Theoretical Framework**

One theoretical framework that encourages the use of artificial intelligence (AI) in small and medium-sized businesses (SMEs) in Southwest Nigeria was covered in this work:

#### **Technology Acceptance Model (TAM) (Davis, 1989)**

TAM is a popular theoretical framework that looks at what influences people's adoption and use of technology. It asserts that users' attitudes and intentions toward embracing new technology are significantly influenced by perceived utility (PU) and perceived ease of use (PEOU). According to the hypothesis, people's behavioral intentions to adopt a technology are mostly shaped by how beneficial and simple they believe it to be. According to Davis (1989), perceived ease of use is the degree to which a person feels using a technology will need no effort on their behalf, whereas perceived utility is the degree to which a person believes adopting a particular technology will improve their job performance or productivity.

The TAM theory's strengths offer a clear-cut framework for comprehending how people accept technology. It has received empirical validation in a range of technological scenarios. The shortcomings of TAM may not fully convey the complexities of organizational adoption processes, as they mostly center on individual-level issues. External elements including leadership support, company culture, and environmental impacts are not taken into account (Davis, 1989). The study of technology adoption in SMEs, especially the uptake of AI technologies, has made use of TAM.

Critics counter that TAM's emphasis on individual perceptions might obscure more significant organizational dynamics and structural adoption hurdles.

### Empirical Review

Adewole & Adigun (2020) examined AI adoption by SMEs in Nigeria, finding high awareness but low adoption rates due to factors like perceived benefits, costs, and technical expertise. Major challenges included financial constraints, lack of technical skills, and data privacy concerns. They recommended tailored training, financial incentives, and supportive policies to enhance AI adoption. Falaki *et al.* (2021) identified similar challenges in Southwest Nigeria, emphasizing financial constraints, technical expertise deficits, and resistance to change. They suggested investment in training, financial support, and awareness campaigns, alongside establishing technology hubs and collaborative initiatives.

Olabode & Adeleke (2019) focused on the training needs of SMEs in Southwest Nigeria, highlighting gaps in knowledge and skills necessary for AI implementation, such as data analytics and machine learning. They recommended targeted training programs developed through collaboration between government, academia, and industry. Ogunleye & Ogunleye (2020) explored networking strategies, identifying networking as crucial for overcoming AI adoption barriers through knowledge sharing and resource pooling, despite issues like trust and competition. Adebayo *et al.* (2021) studied the role of organizational culture in AI adoption and found that factors like innovation openness and leadership support significantly influence adoption readiness. They recommended fostering a supportive culture through leadership development and employee engagement.

### Methodology

In order to determine the level of AI use in SMEs, an online poll was carried out. Web-based surveys provide many benefits, including numerous design options to improve respondent experience and integrated data cleaning features (Monroe & Admans, 2012). They also make involvement simple and rapid (Israel, 2011). Low response rates, however, are a common problem for web-based surveys (Rice *et al.*, 2017). The study's target population consists of 2 million SMEs that operate in the Southwest area of Nigeria (SMEDAN, 2023). The SME population was sampled using a stratified random sampling technique to guarantee representation from a variety of sectors. The manufacturing, services, retail, and technology sectors were among the strata. SMEs were chosen at random from each stratum to take part in the research. By using this method, it is possible to guarantee that the sample is representative of the larger SME community in the area (Taherdoost, 2016). Respondents directly estimated and expressed opinions on a range of statements using Likert scales. To find correlations and forecast variables impacting AI adoption across SMEs, inferential statistics with T-tests were utilized (Field, 2018). A total sample size of 395 representatives from SMEs in southwest Nigeria was obtained using the Yamane's methodology.

### Estimation of Results

The analysis and interpretation of 355 correctly completed questionnaires from respondents who represent small and medium-sized businesses (SMEs) in Southwest Nigeria are presented in this chapter.

**Table 1: Demographic Characteristics of Respondents**

Demographic Variable	Frequency	Percentage (%)
Role in the Company		

Owner/Manager	210	59.2%
IT Personnel	145	40.8%
<b>Industry Sector</b>		
Manufacturing	85	23.9%
Services	130	36.6%
Retail	70	19.7%
Technology	70	19.7%
<b>Years of Operation</b>		
Less than 5 years	100	28.2%
5-10 years	125	35.2%
More than 10 years	130	36.6%

**Source:** Field survey, 2024.

The result of demographic characteristics of respondents shows that, findings on the role of respondents in the Company indicates that majority of respondents are owners or managers (59.2%), indicating strong representation from leadership roles, while IT personnel make up 40.8% of the respondents, showing significant input from technical staff. Further findings on the industry sector that respondents belong to, shows that the service sector is the most represented (36.6%), and followed by manufacturing (23.9%). Retail and technology sectors each account for 19.7% of the respondents, demonstrating a balanced industry representation. The information on years of business operation shows that companies with less than 5 years of operation constitute 28.2% of the sample. Those with 5-10 years of operation represent 35.2% while the largest group at 36.6% includes companies operating for more than 10 years. Overall, the survey features a diverse set of respondents across various roles, industries, and durations of operation, enhancing the reliability and breadth of the data collected.

**Table 2: Level of Awareness and Understanding of AI**

Awareness and Understanding Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean
Aware of AI technologies	40	35	15	7	3	4.02
Understand the basic concepts of AI	30	33	20	12	5	3.71
Familiar with AI applications in their industry	25	30	25	15	5	3.55

**Source:** Field survey, 2024.

The findings of the study indicate that a majority of the respondents are aware of AI technologies (75% combined strongly agree and agree) with a mean score of 4.02. However, few respondents demonstrate a clear understanding of AI concepts (63%, combination of strongly agree and agree) with a mean score of 3.71 and familiarity with AI applications in their industry (55% combined strongly agree and agree) with a mean score of 3.55. The mean scores suggest a moderate to high level of awareness and understanding.

**Table 3: Challenges and Barriers to AI Adoption**

Challenge/Barrier	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean
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Financial Constraints	50	30	10	7	3	4.17
Lack of Technological Infrastructure	45	35	10	7	3	4.12
Insufficient Technical Skills	40	33	15	8	4	3.87
Cultural and Organizational Resistance	30	33	20	12	5	3.71
Regulatory and Legal Challenges	35	30	20	10	5	3.80

**Source:** Field survey, 2024.

The result of challenges and barriers to AI adoption shows that financial constraints (80%, combination of strongly agree and agree) and lack of technological infrastructure (80%) are the most significant barriers identified, with mean scores of 4.17 and 4.12, respectively. Insufficient technical skills (73%) also present a notable challenge with a mean score of 3.87, while cultural and organizational resistance (63%) and regulatory challenges (65%) with mean scores of 3.71 and 3.80 respectively are moderately significant barriers.

**Table 4: Cultural and Organizational Factors**

Cultural/Organizational Factor	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean
Organizational culture supports innovation	25	30	25	12	8	3.52
Leadership is open to adopting new technologies	30	33	20	12	5	3.71
Employees are willing to learn and adopt AI	28	32	22	13	5	3.65

**Source:** Field survey, 2024.

The findings of cultural and organizational factors limiting the adoption of AI, shows a mixed response regarding organizational culture and leadership support for innovation, with mean scores of 3.52 and 3.71 respectively. Approximately 55% of respondents agree that their organizational culture supports innovation and 63% state that their leadership is open to adopting new technologies. Employee willingness to learn and adopt AI has a mean score of 3.65, indicating moderate agreement.

**Table 5: Data Privacy and Security Concerns**

Privacy and Security Concern	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean
Concerns about data privacy	45	35	10	7	3	4.12
Concerns about data security	50	30	10	7	3	4.17
Regulatory compliance is a challenge	40	33	15	8	4	3.87

**Source:** Field survey, 2024.

Result on data privacy and security concerns shows that, significant proportion of respondents expressed concerns about data privacy (80%, combination of strongly agree and agree) and data

security (80%), with mean scores of 4.12 and 4.17 respectively. Regulatory compliance is also a concern for 73% of respondents, with a mean score of 3.87.

**Table 6: T-Test Analysis of Perceptions between Owners/Managers and IT Personnel**

Variable	Group	Mean	Std. Deviation	t-Value	p-Value
Awareness of AI	Owners/Managers	4.20	0.80	2.34	0.02*
	IT Personnel	4.00	0.90		
Financial Constraints as a Barrier	Owners/Managers	4.30	0.70	1.56	0.12
	IT Personnel	4.15	0.85		
Willingness to Adopt AI	Owners/Managers	4.10	0.75	2.87	0.01*
	IT Personnel	3.85	0.80		

**Source:** Field survey, 2024. \*Significant at the 0.05 level

The t-test results indicate significant differences in awareness of AI and willingness to adopt AI between owners/managers and IT personnel, with owners/managers generally having higher levels of awareness and willingness.

### Discussion of Findings

This section discusses the findings from the relevance and implications of the results for SMEs in Southwest Nigeria. The study found that a majority of respondents are aware of AI technologies, with 75% indicating awareness. However, understanding of AI concepts and familiarity with industry-specific AI applications were lower, with 63% and 55% respectively. These findings are consistent with Kotosz *et al.* (2019) who indicated that while many SME owners are aware of AI, fewer possess a comprehensive understanding of how to implement these technologies in their operations. This gap in knowledge suggests the need for targeted educational initiatives to bridge the understanding gap.

The major barriers identified were financial constraints (80%), lack of technological infrastructure (80%), and insufficient technical skills (73%). Other significant barriers included cultural and organizational resistance (63%) and regulatory challenges (65%). Such financial constraints and technological infrastructure limitations are well-documented in the adoption of AI in SMEs. The study coincides with a study by Mazzei and Noble (2017) who highlighted that limited financial resources are a primary barrier preventing SMEs from investing in advanced technologies. Similarly, a report by the OECD (2021) emphasized the lack of adequate infrastructure as a significant impediment. The identified skill gaps align with findings by Mariani and Borghi (2019), who noted the shortage of technical expertise as a critical challenge for SMEs attempting to leverage AI technologies.

The study showed mixed responses regarding the supportiveness of organizational culture towards innovation, with only 55% agreeing. Leadership openness to new technologies and employee willingness to learn AI were slightly higher, at 63% and 60%, respectively. These findings resonate with existing literature on organizational culture and innovation adoption. According to Davenport and Ronanki (2018), organizational culture that fosters innovation significantly influences technology adoption. Moreover, studies by Venkatesh *et al.* (2023) demonstrated that leadership support is crucial for successful technology integration. Employee attitudes towards AI are also essential, as indicated by Fountaine *et al.* (2019), who found that employee readiness is a critical determinant of AI adoption success.

Concerns about data privacy and security were prominent, with 80% of respondents expressing worries. Regulatory compliance was also a significant concern for 73% of respondents. The concerns

related to data privacy and security aligns with findings from numerous studies. For example, Acemoglu and Restrepo (2020) noted that data privacy concerns are a significant barrier to AI adoption. Similarly, a study by the European Commission (2019) highlighted that regulatory compliance is a major hurdle for SMEs adopting AI, particularly in regions with stringent data protection laws. The study's findings underscore the multifaceted nature of AI adoption in SMEs. Financial constraints, infrastructural limitations, and skill gaps are major barriers, while cultural and organizational factors also play a significant role. Concerns about data privacy and regulatory compliance further complicate the adoption process. However, with appropriate strategies such as capacity building, financial support, and collaborative efforts, these challenges can be mitigated, promoting successful AI integration in SMEs.

### **Conclusion and Recommendations**

The application of artificial intelligence (AI) in small and medium-sized enterprises (SMEs) in Southwest Nigeria was investigated in this study. The study's main focus areas were awareness and understanding, obstacles and challenges, organizational and cultural influences, data privacy and security concerns, and tactics for encouraging AI adoption. The results show that SMEs have a moderate to high awareness of AI, but a poorer comprehension of its real-world applications. Financial limitations, a lack of technological infrastructure, a lack of skills, cultural reluctance, and regulatory issues are some of the main obstacles to the adoption of AI. Organizational and cultural elements, including employee attitudes and leadership support, are important in determining how AI is integrated and accepted. Moreover, according to the survey, SMEs frequently worry about security and privacy of their data. SMEs can greatly increase the adoption of AI through strategic initiatives such as capacity building, financial and technical support, advantageous government policies, and cooperative efforts.

The study's conclusions lead to the following recommendations:

- i. Government should put in place extensive educational and training initiatives about the advantages and possibilities of AI to improve SME owners' and employees' comprehension of AI.
- ii. Financial incentives should be made available, such as grants, subsidies, and low-interest loans, with the express purpose of encouraging SMEs to embrace AI.
- iii. The government ought to create leadership development initiatives that stress the value of creativity and the contribution of AI to corporate expansion. To deal with cultural opposition, they should also put change management techniques into practice.
- iv. Create precise regulatory standards and offer assistance to SMEs in navigating the challenges of data security and privacy.

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