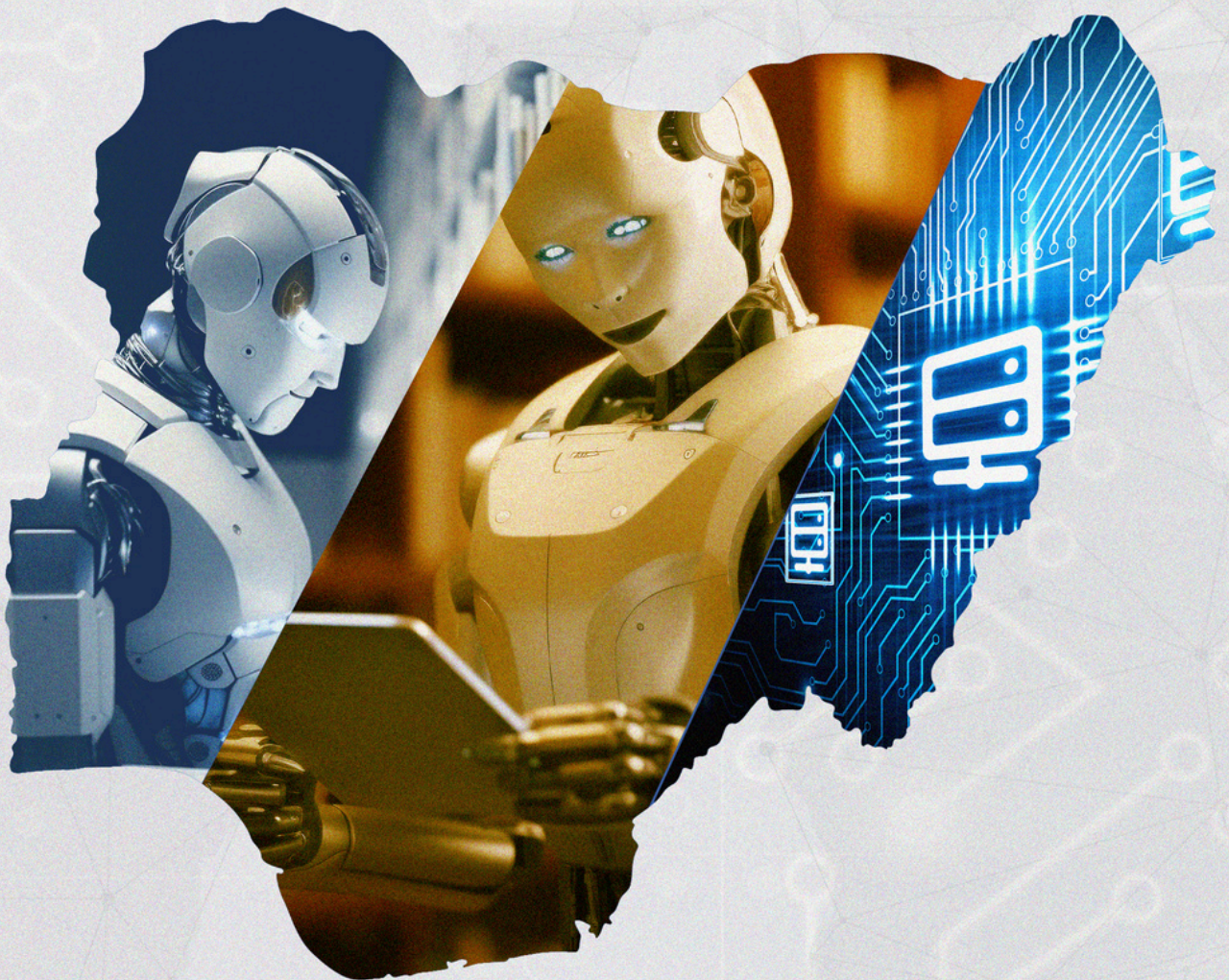


Artificial Intelligence Usage In Nigeria:

Evidence From Digitally-Enabled Firms

*Authors: Adedeji Adeniran, Ph.D, Anthony Okon,
Abdulkhalid Salihu, Peter Achi*



ACKNOWLEDGMENT

The Centre for the Study of the Economies of Africa (CSEA) wishes to express its sincere appreciation to the Hewlett Foundation for its support and funding of this research project. Their partnership and longstanding commitment to strengthening knowledge systems in Africa have been invaluable. Special acknowledgment goes to our Executive Director, Dr. Chukwuka Onyekwena, whose leadership, guidance, and unwavering dedication to excellence have been instrumental throughout the research process. Appreciation is also due to the research support from CSEA staff including Dr. Edafe Oluwatosin, Chinedu Ifionu, Isiaka Raifu, Christopher Ajewole, Ebube Agbo, and Princess Ewa, whose diligence, rigour, and expertise were central to bringing this report to completion. We also appreciate the Communications Team for their tireless efforts in ensuring the findings of this research reach policymakers, stakeholders, and the wider public in an accessible and impactful manner. The contribution of CSEA's Administrative Staff has been no less significant; through their commitment to smooth coordination, resource management, and operational support, they ensured the seamless delivery of this report. Gratitude is also extended to the firms and organisations that participated in this study. Their openness in sharing valuable experiences and insights on AI adoption greatly enriched the quality and credibility of the data collected. Finally, heartfelt thanks go to the many individuals and stakeholders who, through advice, feedback, collaboration, and encouragement, contributed in various ways to the successful completion of this work. Their support is truly appreciated.

EXECUTIVE SUMMARY

Nigeria's digital transformation is advancing within the broader global shift towards Artificial Intelligence (AI), a technology that is rapidly reshaping business models, productivity, and competitiveness across sectors. This report provides empirical findings into the state of AI use in Nigeria, drawing on data from a survey of 528 digitally-enabled firms located in Lagos State, Rivers State, and Abuja. It focuses on identifying key trends, drivers, benefits, barriers, risks, mitigation strategies, and data governance practices that shape AI usage by digitally-enabled firms in Nigeria.

Findings from the study reveal that AI adoption among Nigerian firms is expanding steadily, with over 74 percent of surveyed firms (digitally-enabled firms) reporting the use of AI in their operations. Adoption is more pronounced among larger firms and within service-oriented sectors, where AI is deployed to enhance operations management, data analytics, customer engagement, and strategic planning. While adoption is gradually spreading, it remains relatively limited among smaller enterprises and within the agricultural sector. Nonetheless, most firms reported moderate to high levels of AI integration, signalling that AI technologies are no longer peripheral but increasingly embedded within their core business processes.

The primary drivers of AI adoption reflect practical business needs, with firms highlighting improvements in operational efficiency, decision-making, customer service, and competitiveness as key motivations. Firms are turning to AI to support data-driven insights, automate routine tasks, and optimise workflows, particularly in sectors facing intense competition or rapid technological evolution. In highly dynamic industries such as services and manufacturing, AI adoption is driven by the need to deliver faster, more efficient, and customer-centric solutions.

The reported benefits of AI adoption are wide-ranging, including increased efficiency, enhanced decision-making capabilities, improved service delivery, and greater innovation. Across sectors, firms noted that AI enhances their ability to manage data, forecast market trends, and improve the quality and speed of service delivery. These benefits, while broadly consistent, are most pronounced among firms with greater digital maturity and resources to sustain technological investments.

Despite these gains, several barriers continue to limit the full potential of AI adoption in Nigeria. High implementation costs, uncertain returns on investment, limited digital infrastructure, shortages of skilled personnel, and integration challenges are common constraints.

These barriers are particularly severe for small and medium-sized enterprises (SMEs), which often lack the financial and technical resources for digital transitions. Concerns about the scalability and sustainability of AI tools, especially in volatile market environments, further contribute to firms' cautious approach to adoption.

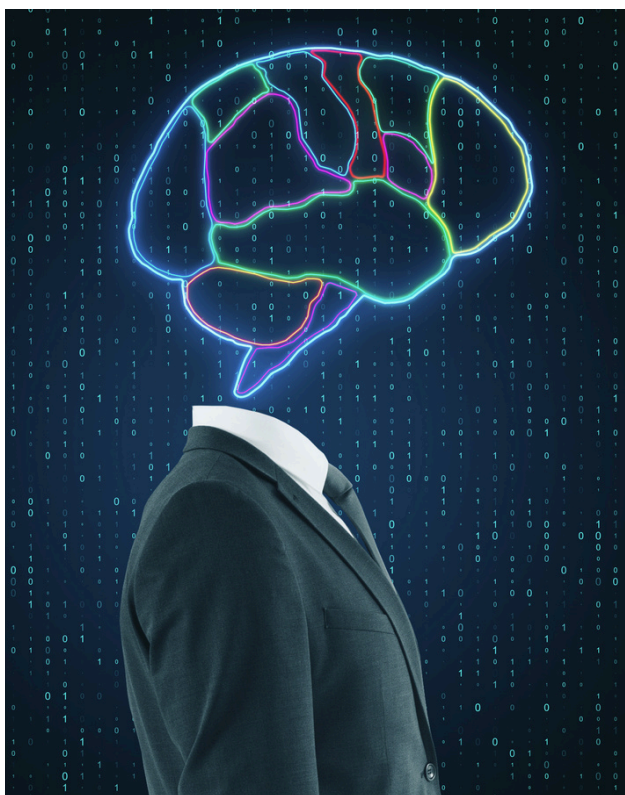
AI adoption also brings with it a range of risks, including data privacy concerns, cybersecurity vulnerabilities, integration challenges, and ethical dilemmas. Firms expressed apprehension over the security of sensitive data, potential breaches, and the reliability of AI systems in critical business functions. To mitigate these risks, many firms are investing in staff training, enhancing security protocols, developing internal guidelines for AI use, and establishing contingency plans. However, these efforts are largely fragmented and informal, with comprehensive governance structures still underdeveloped across most sectors.

Overall, Nigeria's AI landscape is evolving, with firms recognising AI's potential to drive efficiency, innovation, and competitiveness. However, the pace and depth of adoption remain uneven, shaped by structural challenges around cost, infrastructure, skills, and governance. While businesses are taking pragmatic steps to manage risks and strengthen their capacity for AI integration, substantial gaps persist, particularly among smaller enterprises. To bridge these gaps and unlock AI's full potential, targeted policy interventions are necessary. These include investments in digital infrastructure, cost-reduction measures for AI adoption, sector-specific capacity-building, and the development of practical, business-friendly governance frameworks to support responsible AI usage.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
1. INTRODUCTION	6
2. NIGERIA'S READINESS FOR AI	8
3. METHODOLOGY AND DATA COLLECTION	13
Study Objectives	13
Research Design and Data Collection Tools	14
Scope of the Study	14
Sampling Strategy	15
Source: Small and Medium Enterprises Development Agency of Nigeria (SMEDAN)	15
Geographical Distribution	15
Sampling Strategy and Selection Process	17
Stage 1: Identification of Business Clusters	17
Stage 2: Listing of Eligible Firms	18
Stage 3: Randomisation within Eligible Firms	18
Limitations of the Study	18
4. FINDINGS AND DISCUSSION	19
Section 1: Trends, Drivers, And Barriers to AI Adoption in Nigerian Businesses	19
Adoption rate of AI among Nigeria's firms	19
Duration of AI Use in Nigerian firms	20
Business Functions for Which AI is Being Deployed	21
Factors driving AI Adoption Across Business Sectors	23
Intensity of AI Adoption Among Businesses	25
Assessing the Ease of AI Integration Across Sectors	26
Primary Barriers to AI Adoption	27
Areas Affected by Barriers to AI Adoption in Firms	28
Strategies for Overcoming Barriers to AI Adoption in Firms	28
SECTION 2: BENEFITS, RISKS, AND MITIGATION STRATEGIES TO AI ADOPTION IN NIGERIAN FIRMS	30
Key Benefits of AI Adoption in Businesses	30
Challenges and Risks Associated with AI Adoption By Firms	32
Mitigation Strategies for AI-Related Risks and Vulnerabilities	33
SECTION 3: AI AND DATA GOVERNANCE	34
Data Governance Practices Adopted by Firms	34
Measures to Avoid Data Breaches	36
Ethical Concerns About AI Adoption	38
Measure Implemented due to Ethical Consideration	40
5. CONCLUSION AND POLICY RECOMMENDATION	43
6. APPENDIX	46
7. REFERENCES AND FURTHER READING	49

INTRODUCTION



Nigeria is at a strategic stage in its digital transformation as artificial intelligence (AI) reshapes global competitiveness. As a core driver of the Fourth Industrial Revolution, AI is transforming how data is generated, analysed, and applied across sectors. According to PricewaterhouseCoopers (PwC), AI is expected to contribute USD 15.7 trillion to the global economy by 2030, USD 6.6 trillion in productivity improvements, and USD\$9.1 trillion from increased consumer demand.^[1] At the national level, the National Information Technology Development Agency (NITDA)'s forecast of a \$434 million AI market by 2026 (44.2% compound annual growth rate [CAGR]) indicates the large opportunity at hand.^[2]

The benefits from AI innovation are not guaranteed and likely to be unequal, especially for developing countries like Nigeria. The urgency is clear; only 10 percent of AI's projected value is expected to accrue to the Global South, raising concerns about widening digital and economic inequalities.^[3] Nigeria ranks 96th in the world AI readiness index, trailing behind peers like South Africa (77th) and Mauritius (61st), due to weak digital infrastructure, significant skills gaps, and fragmented regulatory frameworks^[4]

The IMF 2023 AI Preparedness Index rates Nigeria a score of 0.34, indicating significant shortfalls across three key dimensions of digital infrastructure, skills (with only 3% of professionals possessing advanced AI skills), and regulatory capacity.^[5] The lack of data governance awareness compounds Nigeria's AI adoption challenges. In this age where the global datasphere will grow to 163 zettabytes (ZB) by 2025, a tenfold increase from 16.1 ZB in 2016, with 30% of which will be real-time IoT data according to International Data Corporation (IDC)^[6], Nigeria faces rising threats from digital space. These include major breaches such as BestFin's exposure of 846,000 records and the leak of data on 23 million citizens' from the National Social Investment Management System (NASIMS). Globally, incidents like Samsung's internal data inadvertently uploaded to ChatGPT, and Amazon's use of consumer data to train AI models without a clear consent illustrate common data governance gaps.

[1] <https://www.pwc.com/gx/en/issues/artificial-intelligence/publications/artificial-intelligence-study.html>
[2] https://ncair.nitda.gov.ng/wp-content/uploads/2024/08/National-AI-Strategy_01082024-copy.pdf
[3] <https://www.pwc.com/gx/en/issues/artificial-intelligence/publications/artificial-intelligence-study.html>
[4] https://www.unido.org/sites/default/files/files/2023-01/Government_AI_Readiness_2022_FV.pdf?utm
[5] https://www.imf.org/external/datamapper/AI_PI@API/ADVEC/EME/LIC

Thus, unauthorized AI training on sensitive and proprietary data has led to privacy violations, intellectual property theft, and unregulated outcomes. A stark example of such risks is the surge in deepfakes, hyper-realistic but fake audio or video content used to manipulate public opinion, impersonate individuals and defraud businesses. Those episodes exemplify how increasing reliance on digital technologies, without adequate governance, leaves businesses, people, and even governments exposed to threats they rarely understand or control.

Amid these challenges, there is a great deal of promise in the instances of Nigeria's digital ecosystem.^[7] There are signs of progress in government programs such as the government's 2023 National AI Strategy and the creation of the Nigeria Data Protection Commission (NDPC), as well as initiatives such as the 3 Million Technical Talent (3MTT) initiative and the Nigerian AI Research Scheme (NAIRS). There are signs of progress in government programs such as the government's 2023 National AI Strategy and the creation of the Nigeria Data Protection Commission (NDPC), as well as initiatives such as the 3 Million Technical Talent (3MTT) initiative and the Nigerian AI Research Scheme (NAIRS).

However, critical gaps persist. An estimated 40 million small and medium-sized enterprises (SMEs) remain unaware of their obligations under the Nigeria Data Protection Regulation (NDPR), despite NDPC's partnership with the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) to boost awareness.^[8] Sectoral adoption of AI remains uneven, while financial services have leveraged AI to reduce fraud losses by 25-30% (processing 1.1 million GB daily)^[9], and healthcare generates 10ZB of annual data^[10], key sectors like agriculture and manufacturing continue to lag significantly behind.

The short-term imperative is obvious; as the overwhelming majority of global organisations (72%) have adopted AI in business operations and 65% have continued to use generative AI (GenAI) on a regular basis, Nigeria's window to compete is fast shrinking. This report explores how and where Nigeria's firms are deploying AI within their value chain, the benefits of AI adoption, challenges arising from data governance threats and ethical considerations; and policy actions needed to close innovation gaps.

The report is structured into five sections. Section 1 provides the introduction, setting the stage for understanding AI's transformative role in Nigeria. Section 2 examines Nigeria's institutional, technological, and regulatory developments around AI, its current standing in AI preparedness, the governance risks of AI systems, and the broader implications for responsible AI adoption and digital transformation.

Section 3 covers the methodology, detailing the survey process and sources of data used in the analysis. Section 4 presents and discusses the key findings, focusing on the current levels of AI awareness, adoption, perceived benefits and risks, and governance readiness among Nigerian enterprises. Finally, section 5 draws on these findings to provide pragmatic recommendations for policymakers, business leaders, and regulators.

[6] <https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf>

[7] https://ncair.nitda.gov.ng/wp-content/uploads/2024/08/National-AI-Strategy_01082024-copy.pdf

[8] <https://nairametrics.com/2024/03/12/ndpc-smedan-sign-mou-to-boost-data-protection-among-40-million-smes-in-nigeria/>

[9] <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-2024#/>

[10] <https://www.hyland.com/-/media/Project/Hyland/HylandV2DotCom/pdfs-gated/Data-Excellence-in-Healthcare-The-Role-of-Connected-Content.pdf>

NIGERIA'S READINESS FOR AI



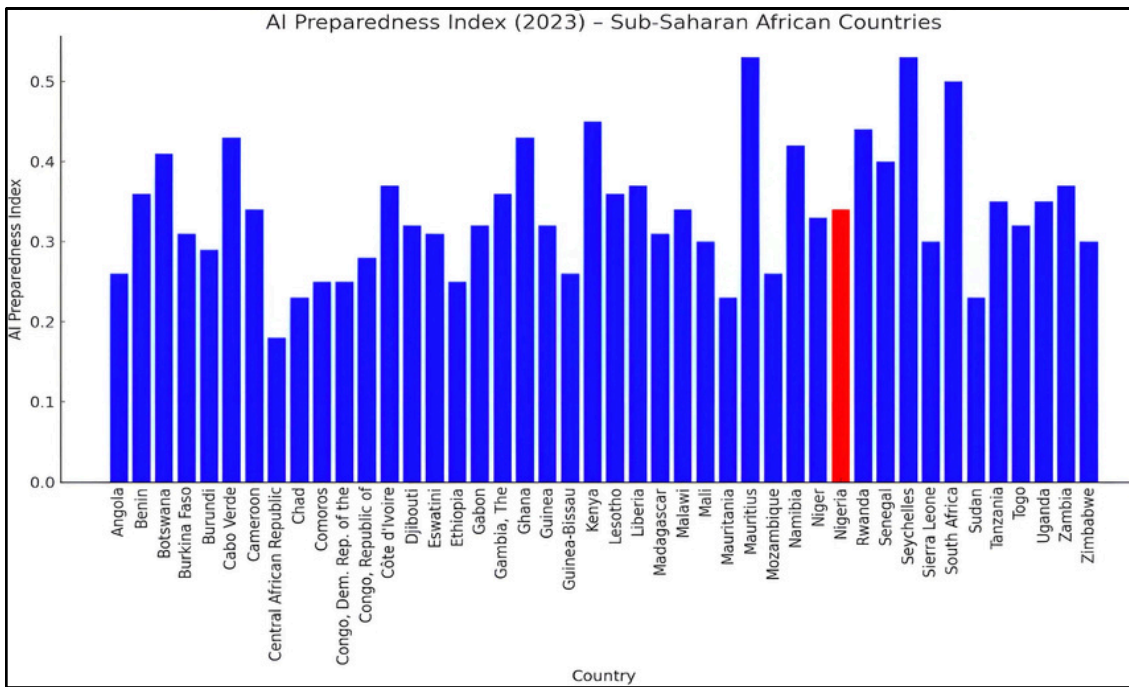
Over the past decade, Nigeria has witnessed a steady acceleration in digital transformation, driven by the widespread adoption of mobile technology, digital payment systems, e-governance platforms, and internet-enabled services.^[11] This growing digital ecosystem fueled by increasing internet penetration, mobile connectivity, and innovation hubs has laid the foundation for the integration of AI into the economy. At the macro level, government agencies such as NITDA and the National Centre for Artificial Intelligence and Robotics (NCAIR) are spearheading innovative strategies to mainstream AI through policy, infrastructure, and capacity-building initiatives. At the micro level, micro, small and medium enterprises (MSMEs) are beginning to adopt AI-driven tools in logistics, customer service, diagnostics, and market forecasting.

However, despite this growing momentum, progress is uneven, as Nigeria's preparedness and readiness for AI adoption remain limited. According to the IMF AI Preparedness Index (2023),^[12] most African nations, including Nigeria, fall within a preparedness score range of 0.2 to 0.4, which is aligned with the average score of 0.32 for low-income countries (LICs). Nigeria scored 0.34, positioning the country marginally above the LIC average but still within a category reflecting limited readiness (see fig. 1).

[11] <https://www.cseaafrica.org/index.php/postdetails/data-driven-enterprises-in-africa-an-evaluation-of-winners-and-losers>

[12] (2021). Imf.org. https://www.imf.org/external/datamapper/AI_PI@AIP/ADVEC/EME/LIC/ZMB/COD/ZAF

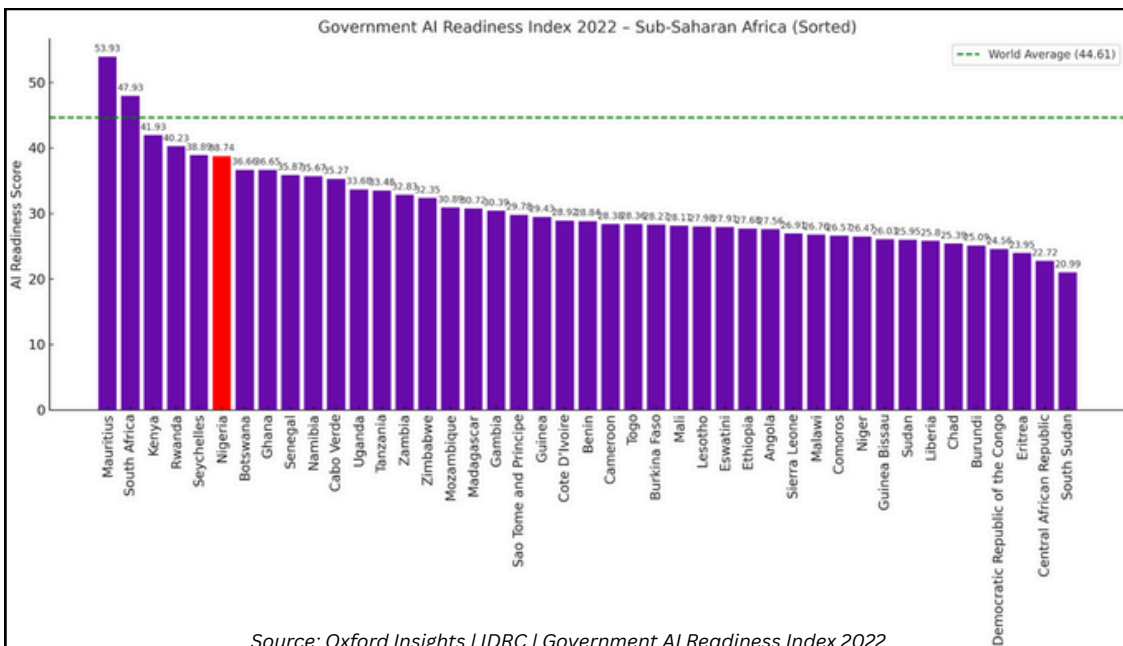
Figure 1: AI Preparedness Index (2023)-Sub-Saharan African Countries



Source: Researcher's Computation using Data from IMF (2025)

Also, the Government AI Readiness Index (2023) notes that the top 3 out of 193 countries with the highest AI readiness indices were highly developed countries (see Fig. 2). The countries, the United States, Singapore, and the United Kingdom, ranked the highest in AI readiness, with scores of 84.80, 81.97, and 78.57 scores, respectively. Nigeria ranked 103rd out of 193 countries, with a score of 39.58, an indication of moderate progress but also a wake-up call.

Figure 2: Government AI Readiness Index (2022) – Sub-Saharan African Countries



Source: Oxford Insights | IDRC | Government AI Readiness Index 2022

While global indices reveal Nigeria’s limited preparedness for AI adoption, real-world incidents, both globally and locally, illustrate the tangible consequences of inadequate data governance. **Table 1** presents selected high-profile incidents of AI-driven data risks from around the world. For instance, the Samsung data leak in May 2023 exposed sensitive company information due to inadequate safeguards when using third-party tools. Incidents like Google Bard’s misinformation release and Air Canada’s refund error illustrate how unregulated systems can erode public trust and violate compliance standards. In Nigeria, several major breaches reflect similar governance failures. The NASIMS data leak in October 2024 compromised records of 23 million citizens due to a misconfigured cloud server. The BestFin breach in July 2024 and Konga’s 2021 data exposure further indicate weak data protection measures in the private sector.

Table 1: Examples of AI-Driven Data Risks Linked to Inadequate Data Controls

Incident	Date	Governance Issue(s)	Need for Governance
Samsung Data Leak via ChatGPT	May 2023	Unauthorised exposure of sensitive code through a third-party AI.	Clear policies are needed to restrict data shared with external AI tools.
Chevrolet AI Chatbot Offers Car for \$1	Dec 2023	Lack of input validation and guardrails.	AI systems must have safety mechanisms and human oversight.
Air Canada Refund Incident	Feb 2024	Misinterpretation of policy due to unsupervised AI	Need for accountability and proper AI training based on verified rules.
Google Bard’s Misinformation Incident	Feb 2023	Public dissemination of false info due to poor model validation.	Emphasises model testing and content accuracy control.
DPD Chatbot Incident	Jan 2024	Inappropriate AI responses to unusual inputs.	Stronger prompt controls and monitoring of customer-facing AI.
Snapchat’s “My AI” Incident	Aug 2023	Harmful and erratic AI behaviour in a social media setting.	Reinforces the need for AI alignment with safety and ethical standards.
Amazon Data Used for Training	Jan 2023	Internal data appearing in AI outputs.	Clear internal data usage policies and AI training data boundaries.
Data Exfiltration via Slack AI	Aug 2024	Internal data appearing in AI outputs.	Need for broad prompt injection defences and access controls

NASIMS Data Leak (Nigeria)	Oct 2024	Exposure of 23 million citizens' records due to a misconfigured AWS S3 bucket.	Highlights the need for strict access controls and regular security audits.
BestFin Nigeria Data Breach	July 2024	Unsecured database exposing 846,000 customers' personal data.	Necessitates enforcement of data protection regulations and secure data storage practices.
XpressVerify Data Sale (Nigeria)	Mar 2024	Unauthorised sale of citizens' personal data online.	Urges implementation of stringent data privacy laws and monitoring mechanisms.
PLASCHEMA Data Exposure (Nigeria)	Apr 2022	Open AWS S3 bucket revealing personal details of 75,000 citizens.	Calls for immediate action on cloud storage security and data access policies.
Konga Customer Data Exposure (Nigeria)	Nov 2021	Public exposure of user data due to weak access controls.	Indicates the need for stronger private sector compliance and data handling protocols.
Magecart E-commerce Breaches (Nigeria)	Dec 2022	Card-skimming attacks on over 500 e-commerce platforms.	Demonstrates the urgency of cybersecurity enforcement and sector-wide awareness.

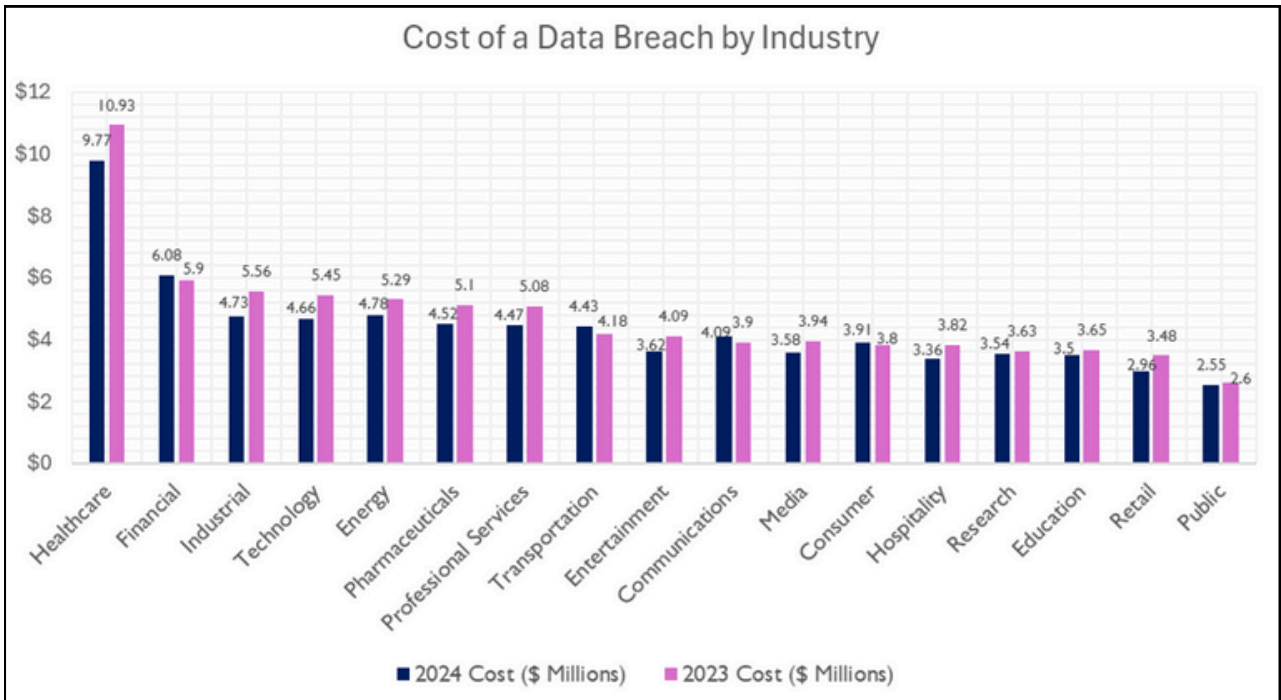
(Source: Researchers' Compilation (2025) | N.B: Full list in Appendix/Report Table 1.)

These examples validate concerns raised by the Gartner report (2024), which predicts that by 2025, all organisations will need data governance frameworks to meet global regulatory expectations, like the General Data Protection Regulation (GDPR).^[13] The IBM report on the Cost of a Data Breach (2024) also found that poor data governance costs firms up to 20% of revenue due to inefficiencies and breaches.^[14] Figure 3 illustrates the cost implications of poor governance across sectors, drawing on IBM's 2024 global breach report.

[13] <https://www.gartner.com/en/newsroom/press-releases/2024-04-29-gartner-finds-61-percent-of-organizations-are-evolving-their-data-and-analytics-operating-model-because-of-ai-technologies?>

[14] <https://www.ibm.com/reports/data-breach>

Table 1: Examples of AI-Driven Data Risks Linked to Inadequate Data Controls



Source: Researchers' Computation using Data from [IBM Report \(2024\)](#).

As Nigeria deepens the country's participation in the digital economy, data governance will become a key factor in determining who benefits and who is left behind. This report provides two key contributions to the discourse on AI adoption and data governance in Africa. First, the report presents both sectoral and emerging use cases of AI and data analytics that are specifically relevant to indigenous firms, while also identifying the factors that enable or constrain these firms' business adoption and awareness. Second, the report emphasised data governance, responsible AI adoption and data value creation, given increasing global concerns about data exploitation, algorithmic bias, and governance vacuums in AI systems.

METHODOLOGY AND DATA COLLECTION



This section outlines the approach used to collect and analyse the data used for this study. It discusses the sectors covered, the research design and tools used, the sampling strategy, the geographical spread of the study, and the structure of participating firms in terms of size. The primary objective of the study was to gather firm-level perspectives on their use of artificial intelligence.

Study Objectives

The survey was designed to provide data-driven answers to the following key research questions:

i Trends, Drivers, and Barriers to AI Adoption in Nigerian Businesses

- What is the level of AI adoption among Nigerian businesses?
- What are the primary factors driving or hindering the use of AI in businesses?

ii Benefits, Risks, and Mitigation Strategies

- What benefits are businesses experiencing or expecting from adopting AI?
- What risks or concerns are associated with AI adoption?
- What strategies are businesses using to manage these risks?

iii AI and Data Governance

- How are businesses managing data privacy, protection, and compliance in relation to AI systems?
- What role does data governance play in enabling or restricting AI use?

Research Design and Data Collection Tools

This study employs a firm-level enterprise survey tailored to gather primary data on the current landscape of Artificial Intelligence (AI) adoption in Nigeria. The methodology was selected as the most suitable for obtaining firsthand insights from firms directly, providing evidence on organisational experiences, behaviours, challenges, and expectations relating to AI technologies.

The survey sought to capture the perspectives of firms that are either currently adopting, planning to adopt, or positioned to adopt AI technologies in the foreseeable future. Accordingly, this study is not a national census of all firms using AI in Nigeria; rather, it focuses deliberately on selected firms that show clear elements of digitalisation in their operations. These firms were selected because their existing digital infrastructure positions them as potential adopters of AI, thus offering insights into Nigeria's readiness and barriers to AI adoption within the private sector.

The study employed a structured questionnaire as the primary research instrument to collect primary data from firms. The questionnaire was divided into three broad sections aligned with the key research areas: Trends, Drivers, and Barriers to AI Adoption in Nigerian Businesses; Benefits, Risks, and Mitigation Strategies, and AI and Data Governance. It was programmed into SurveyCTO, a digital data collection tool that allowed for real-time monitoring and validation of responses. Trained field enumerators administered the survey across the selected locations, with oversight and monitoring provided by CSEA staff to ensure data quality.

Scope of the Study

The study focused on three major sectors of the Nigerian economy: agriculture, industry, and services. These sectors were selected because they form the foundation of Nigeria's economic activity, contributing to the nation's growth, employment, and technological investment. The firms considered under the agricultural sector include both core agricultural firms that are involved in direct farming activities and firms that offer agricultural services. The industrial sector includes manufacturing, construction, and extractive subsectors. These subsectors are vital to industrial growth. The services sector includes subsectors such as ICT, finance, health, and other emerging technology-driven areas where AI is expected to achieve significant advancements.

Sampling Strategy

The study used a purposive sampling approach, focusing on firms likely to have some degree of engagement with AI or digital technologies. Businesses were surveyed across all size categories, using the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) classification shown in Table 2:

Table 2: Firm Size Classification by Employment and Asset

Size Category	Number of Employees	Assets (=N= Million)
Micro	Less than 10	Less than 5
Small	10 – 49	5 to less than 50
Medium	50 – 199	50 to less than 500
Large	200 and above	Above 500

Source: Small and Medium Enterprises Development Agency of Nigeria (SMEDAN)

Geographical Distribution

The study was conducted in three major urban and industrial centres in Nigeria: Lagos, Rivers, and Abuja (FCT).

These locations were purposely selected based on their economic significance, concentration of firms with advanced digital footprints, and roles as hubs for innovation, technology adoption, and enterprise development in Nigeria.

The study was conducted in three major urban and industrial centres in Nigeria: Lagos, Rivers, and Abuja (FCT).

These locations were purposely selected based on their economic significance, concentration of firms with advanced digital footprints, and roles as hubs for innovation, technology adoption, and enterprise development in Nigeria.

Lagos State was prioritised due to its status as the commercial capital of Nigeria and the heart of the country’s digital economy, hosting numerous technology firms, start-ups, financial institutions, and business clusters such as Ikeja (Computer Village and industrial hubs), Victoria Island (corporate headquarters, fintechs), and Yaba (tech clusters, start-ups, and incubators).

River State represents one of the most industrial states of southern Nigeria, with a concentration of manufacturing, oil and gas, and service industries increasingly adopting digital technologies to enhance operational efficiency.

Abuja was selected for its mix of public sector, service sector firms, and emerging tech-driven enterprises within the Federal Capital Territory.

These cities collectively provide a balanced cross-section of Nigeria’s evolving digital economy across both established corporations and smaller technology-driven businesses. The distribution of surveyed firms by location is shown in Table 3.

Table 3: Firm Size Classification by Employment and Asset

Location	Number of Firms Surveyed
Lagos	262
Port Harcourt	122
Abuja (FCT)	144
Total	528

The 528 businesses surveyed were distributed across different size categories as shown in Table

Table 4: Distribution of Surveyed Firms by Size Category

Firm Type	Number of Firms	Percentage (%)
Large Enterprise	107	20.3%
Medium Enterprise	114	21.6%
Small Enterprise	217	41.1%
Micro Enterprise	90	17.0%
Total	528	100%

Sampling Strategy and Selection Process

A multi-stage, purposive sampling strategy with elements of randomisation was employed to ensure the selection of firms aligned with the study objectives. The sampling approach was carefully designed to prioritise firms that exhibited signs of digital maturity, as these firms are more likely to experiment with or adopt AI technologies.

Stage 1: Identification of Business Clusters

Within each city, specific business clusters known for concentrated economic activities and digital technology use were mapped out.

- In Lagos, clusters such as Ikeja (especially Computer Village), Victoria Island, and Yaba's tech ecosystem were identified.
- In Port Harcourt, industrial areas with high concentrations of oil and gas service companies, manufacturing firms, and other related firms were targeted.
- In Abuja (AMAC district), emphasis was placed on commercial districts within housing ICT, financial services, consultancy, and emerging tech-driven businesses.

Stage 2: Listing of Eligible Firms

Within these clusters, firms were identified through:

- Existing business directories and registries
- Industry associations and professional networks
- On-ground reconnaissance and referrals through networks known to engage in technology or digital solutions

The eligibility criterion for inclusion was evidence of some degree of digitalisation, and this included businesses utilising digital platforms, data management tools, automated processes, or those engaged in digital service delivery. Firms that demonstrated no digital footprint (entirely analogue operations) were excluded from the sampling frame.

Stage 3: Randomisation within Eligible Firms

Once lists of eligible firms within clusters were compiled, random selection was applied within the lists to minimise bias. The aim was to achieve diversity in firm size, sector, and level of digital maturity while ensuring all selected firms met the minimum digitalisation threshold necessary for AI adoption considerations.

The use of this approach ensures that, while the sampling was purposive in its focus on digitalised firms, selection within identified clusters included an element of randomness to reduce selection bias.

Limitations of the Study

While the methodology adopted ensured robust data collection from firms actively engaged in digital operations, it is important to recognise the study's limitations in scope and generalisability. Specifically:

- The findings cannot be extrapolated to the entire Nigerian business environment but should be understood as insights into a specific subset of firms with existing digital footprints.
- Firms entirely outside the digital or technological space were deliberately excluded to focus on those most relevant to the study's AI-centric research objectives

FINDINGS AND DISCUSSION

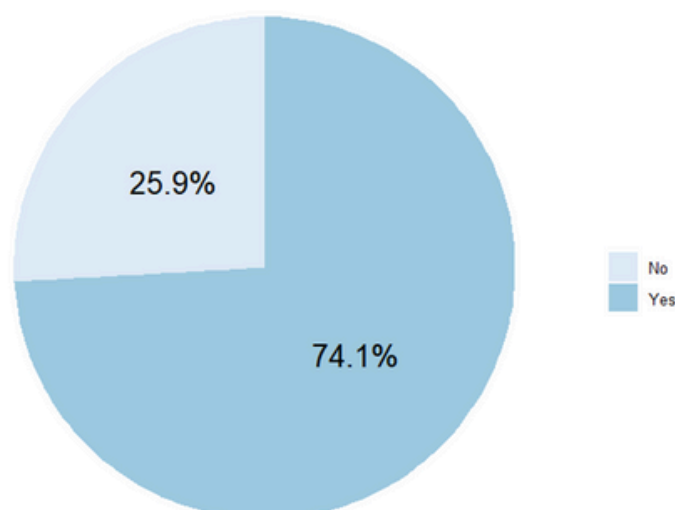
SECTION 1: Trends, Drivers, And Barriers to AI Adoption in Nigerian Businesses

This section explores the AI culture, adoption patterns, and functional use of AI across Nigeria's businesses. Analysis of the survey data provides insights on AI usage patterns, duration of use, areas of business operations it supports, and the extent to which it has become part of business processes. Furthermore, this section examines businesses' comparison of ease of use for AI with other technologies. The findings help to highlight both the opportunities and the challenges that come with integrating AI into everyday business practices, especially in a context where digital readiness varies across industries.

Adoption rate of AI among Nigeria's firms

The survey found that 74.1% of firms reported using AI in some aspect of their operations. This high adoption rate is largely attributable to the survey's focus on already digitalized firms, highlighting that AI uptake is more likely among firms that have embraced digital technologies. This suggests that AI can be integrated effectively within existing digital infrastructures. Moreover, the human capital required for AI adoption is often already enhanced through prior technological engagement.

Distribution of firms by AI Usage



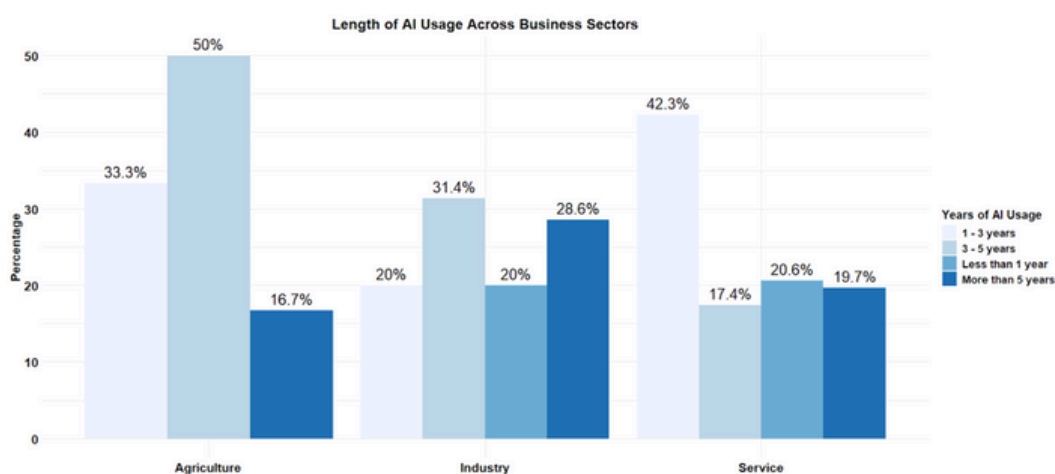
Duration of AI Use in Nigerian firms

The survey results reveal that the industry sector leads in long-term AI adoption, with 28.6% of firms reporting use of AI for more than five years, the highest share across all sectors. Beyond this, the sector shows a relatively balanced spread: 31.4% of firms have used AI for 3–5 years, another 20% fall within the 1–3-year range, and 20% adopted it within the past year. This distribution points to gradual but steady adoption patterns in a sector where technological upgrades are typically capital-intensive and implemented in phases.

The services sector follows closely, with 19.7% of firms that have used AI for more than 5 years. These firms likely include fintechs, telecom companies, and e-commerce platforms that began experimenting with AI earlier on, especially in areas such as fraud detection, customer service automation, and real-time market analytics. About 42.3% of firms report AI usage within the past 1–3 years, the highest concentration in this time bracket. An additional 20.6% only began using AI within the last year, showing signs toward newer adoption. The service sector's overall momentum can be attributed to its customer-facing nature and intense competition, which pushes firms to continually explore new tools that enhance speed, efficiency, and user experience.

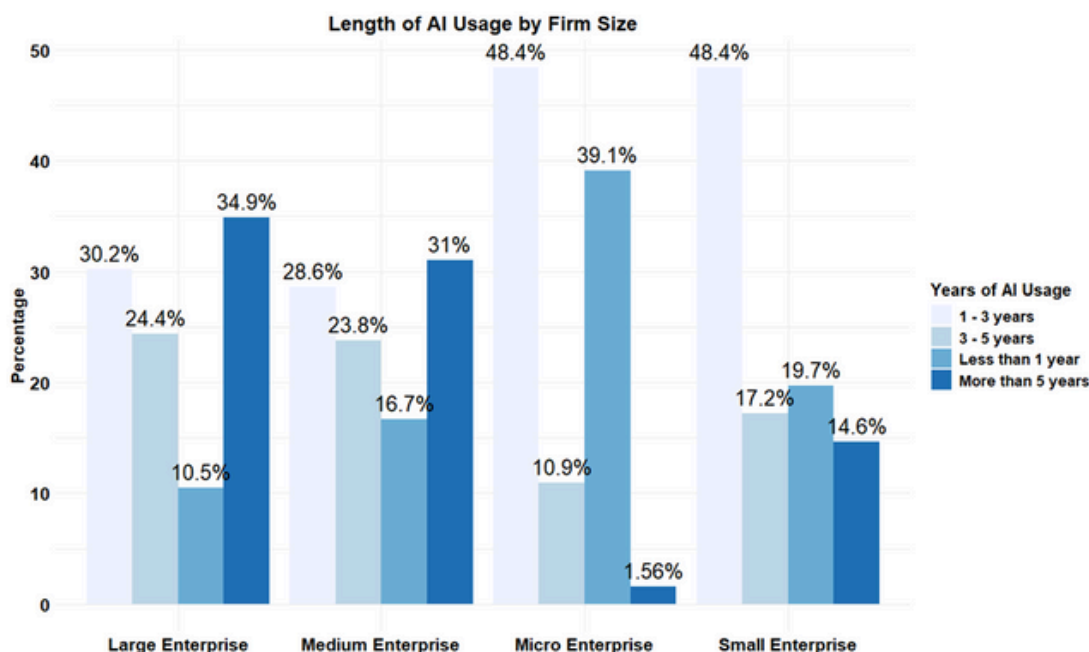
In contrast, the Agriculture sector presents a smaller and more concentrated base of firms (16.7%) that have adopted AI for more than 5 years. However, the sector also shows signs of earlier usage, with over 50% of firms within the sector adopting AI between 3 to 5 years and 33.3% of firms with usage less than 3 years.

Figure 4: Duration of AI use across Nigerian Business Sectors



Source: CSEA Survey on State of AI, 2024.

Figure 5: Duration of AI use across Nigerian Businesses by Firm Size



Source: CSEA Survey on State of AI, 2024.

This emerging growth of AI usage is also visible when the data is disaggregated by firm size. Large (34.9%) and medium-sized (31%) firms show the longest period of AI adoption, with the highest share of respondents in each category reporting over five years of use. In contrast, adoption among micro and small enterprises is much more recent. Nearly half of both micro (48.4%) and small (48.4%) enterprises fall within the 1–3-year usage range, while a sizable share of micro firms (39.1%) only began using AI within the last year. Longer-term use is rare among these smaller firms, just 1.6% of micro and 14.6% of small enterprises report more than five years of experience with AI. (See Figure 5.)

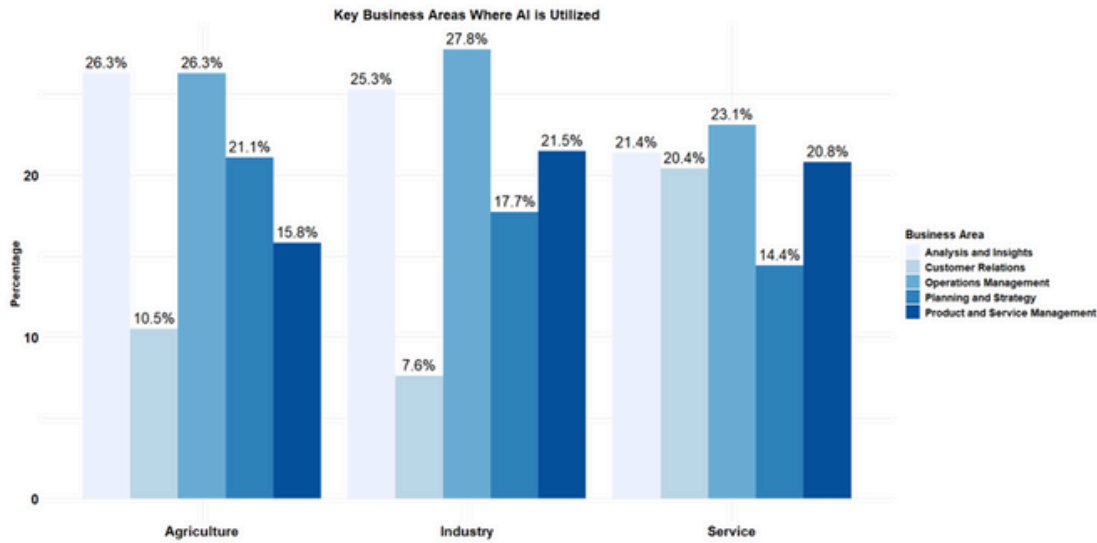
Business Functions for Which AI is Being Deployed

The data on how Nigerian businesses are applying AI reveals a widespread distribution across different functional areas, but with some clear patterns tied to the nature of each sector. Overall, the findings suggest that AI tools are not confined to a single aspect of operations; rather, businesses are integrating them into multiple workflows.

In the services sector, AI is used across every aspect of business activity. The highest levels of usage were reported in operations management (23.1%), closely trailed by analysis and insights (21.4%), product and service management (20.8%), and customer relations (20.4%). This trend is consistent with the demands placed on service-orientated businesses to streamline internal processes, make data-informed decisions, and respond to customers quickly and efficiently. Tools like automated chat support, dynamic pricing engines, and customer behaviour analytics account for this widespread offering benefits like improved efficiency, cost savings, and enhanced customer experience.^[15] Strategic planning also saw notable usage, although slightly lower at 14.4%, possibly reflecting that some service firms still rely on more traditional or human-led approaches for high-level decision-making.

[15] [Leveraging AI-Powered chatbots to enhance customer service efficiency and future opportunities](#)

Figure 6: Major Business Areas where AI is Utilised

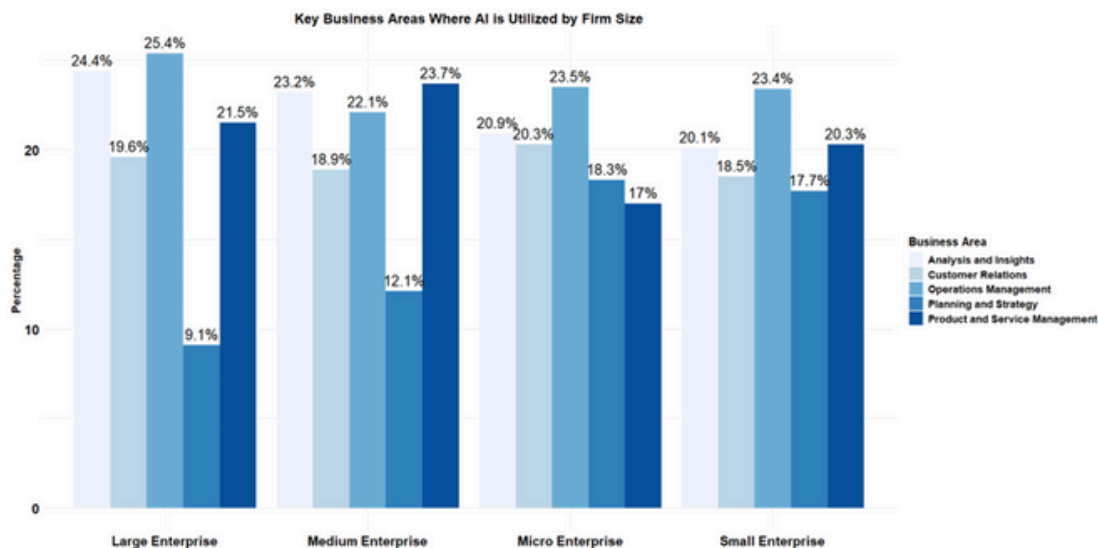


Source: CSEA Survey on State of AI, 2024.

In the industry sector, a similar multi-functional use of AI is evident. The highest concentration is in operations management (27.8%) and analysis and insights (25.3%). Usage in product and service management (21.5%) and planning and strategy (17.7%) also shows that AI is influencing not just day-to-day workflows but also shaping product design and longer-term business direction. Customer relations recorded the lowest usage in the industry (7.6%), which is not surprising given that many industrial firms are Business to Business (B2B) orientated and often deal with structured contracts rather than dynamic consumer-facing interactions.

For the agriculture sector, the numbers are smaller, but the spread reveals some encouraging trends. AI usage was reported most in operations management (26.3%) and analysis and insights (26.3%). These firms use AI to optimise planting schedules, monitor crop health, or assess soil conditions. Usage in planning and strategy (21.1%) suggests that some are integrating market forecasting or risk analysis tools into their broader business models, while lower usage was seen in product and service management (15.8%) and customer relations (10.5%) functions. (See figure 6).

Figure 7: Major Business Areas where AI is Utilised by Firm Size



Source: CSEA Survey on State of AI, 2024.

When viewed by firm size, similar patterns are observed, with AI applications across multiple business functions regardless of company size. Operations management ranks highest across most categories, from 25.4% in large enterprises, 23.4% in small enterprises and then 23.5% in micro ones. Analysis and insights also feature prominently, particularly among medium (23.2%) and large (24.4%) firms. Small and micro enterprises show a balanced usage across functions, with notable engagement in customer relations (18.5% and 20.3%, respectively). Meanwhile, larger firms exhibit higher uptake in strategic planning and product management. The spread of AI use across firm sizes shows that while scale may influence the depth of adoption, the functional priorities are strikingly aligned. (see figure 7)

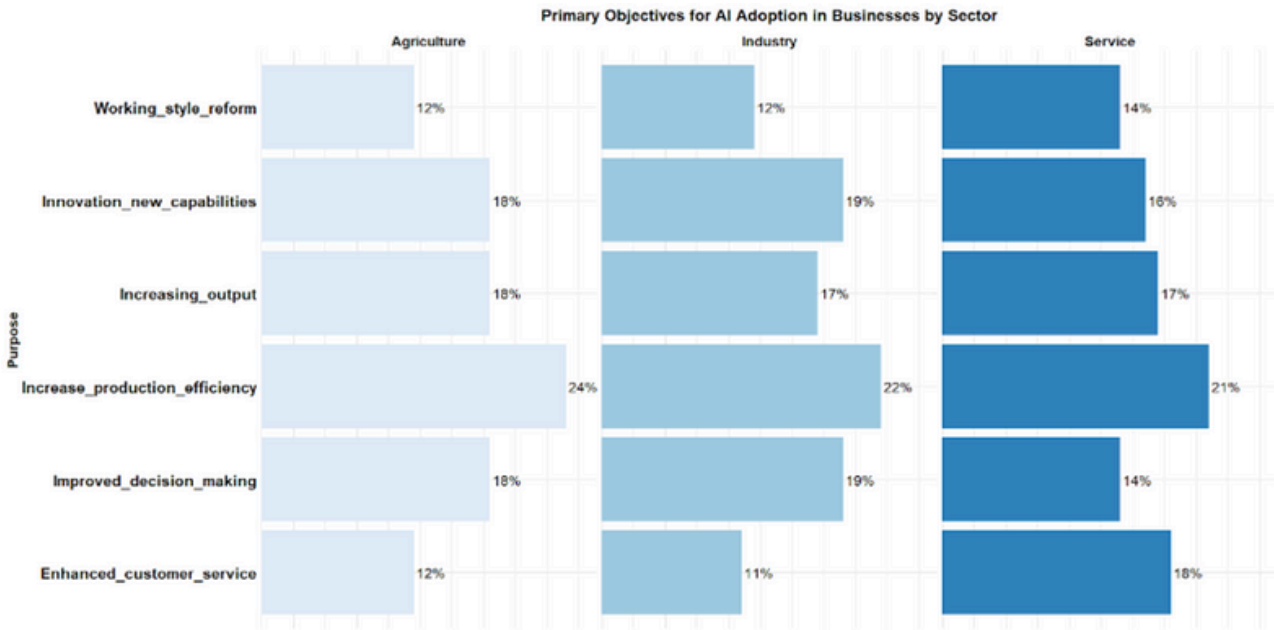
Factors driving AI Adoption Across Business Sectors

The motivations driving AI adoption among Nigerian businesses show a strong alignment with practical business needs and sector-specific challenges. One feature across all sectors is that AI is primarily being used to drive practical, performance-based outcomes in terms of more efficiency, better output, and smarter decisions. (See figure 8).

In the services sector, 21% of firms surveyed show that the major purpose of adopting AI is increasing production efficiency, next to customer service (18%) and improved decision-making (14%). This shows the focus of service firms to streamline delivery, reduce wait times, and operate leaner in the face of intense market competition and rising operational costs. Whether it is in banking, healthcare, logistics, or retail, there is a constant need to do more with less, and tools that optimise scheduling, automate repetitive tasks, or enhance internal workflows can have an immediate impact. When customer loyalty is easily lost to slow service or lack of personalisation, businesses are turning to AI to fill those performance gaps quickly.^[16]

[16] [Customer experience is everything; PwC](#)

Figure 8: Purpose of AI Adoption

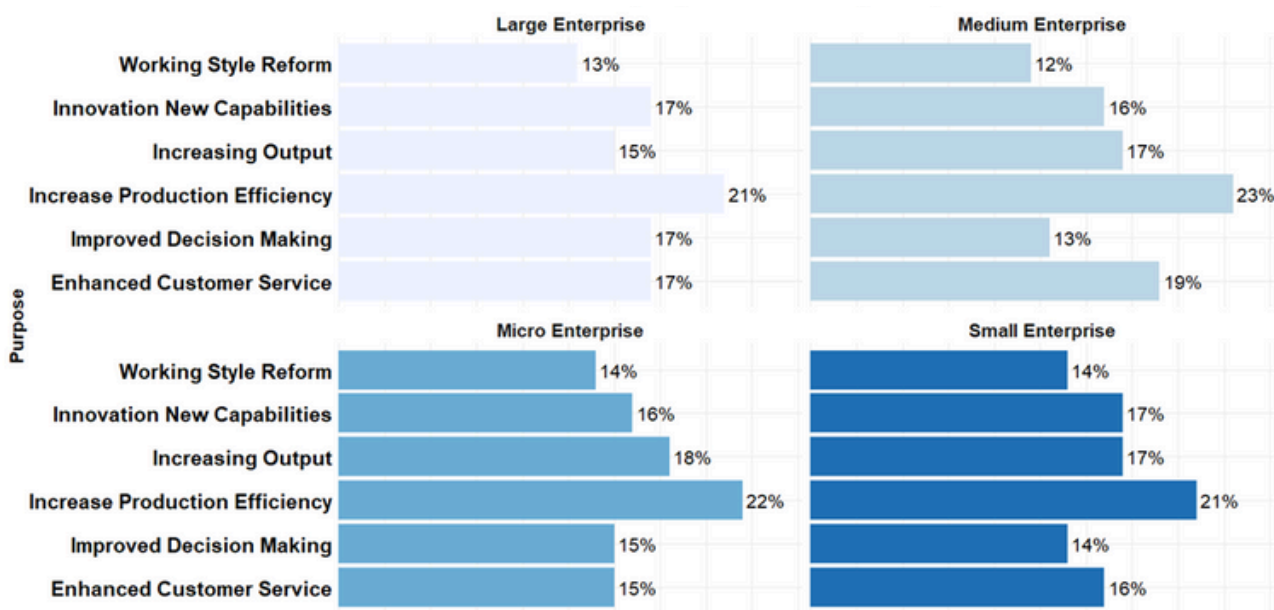


Source: CSEA Survey on State of AI, 2024.

Similar to the services sector, increasing production efficiency (22%) stood out as the highest reason for AI adoption in the industry sector, followed by improved decision-making (19%) and innovation and new capabilities (19%). These reflect the operational depth and scale at which many industrial businesses work, from manufacturing to energy to logistics. AI solutions in these spaces support tasks like supply chain coordination, equipment monitoring, and optimising production timelines.

For the agriculture sector, the leading motivation for use of AI was increasing production efficiency (24%), improved decision-making (18%), innovation (18%), and increasing output (18%). The findings reflect increased efforts to modernise this sector long plagued by inefficient traditional methods.

Figure 8: Purpose of AI Adoption



Source: CSEA Survey on State of AI, 2024.

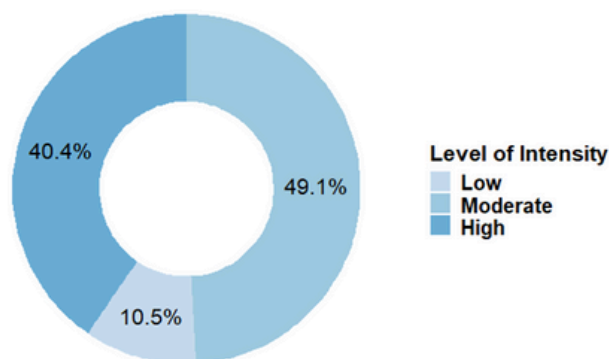
When disaggregated by firm size, the motivations for adopting AI remain broadly the same, with production efficiency as the most common reason across all firm sizes. (see figure 9)

Intensity of AI Adoption Among Businesses

Intensity of AI adoption captures the extent to which firms integrate AI into workflow either daily (high intensity), several days each week (moderate intensity), or more than a week (low intensity). For all sectors surveyed, the intensity of AI usage among Nigerian businesses falls largely within a moderate to high range, with 49.1% of firms describing their usage as moderate and 40.4% reporting high intensity. Only 10.5% of the firms surveyed indicated a low level of usage. (See figure 10). This data shows that, while many businesses may still be in the early years of adoption, they are integrating AI in a way that already plays a significant role in their operations. The dominance of moderate usage suggests that AI is often used to support ongoing processes rather than completely transform them, a sign of steady, functional integration rather than just disruption. The high percentage of firms with intense usage also points to a maturing ecosystem, especially in sectors with more advanced digital infrastructure or stronger customer and operational demands.

When the sectors are disaggregated, the data shows a similar trend for service and industrial sectors (see appendix 1), but agricultural sector shows 50% of low usage, implying that even where agricultural firms adopts AI, it is limited in usage and not being deeply embedded in everyday operations

Figure 10: Intensity of AI Usage



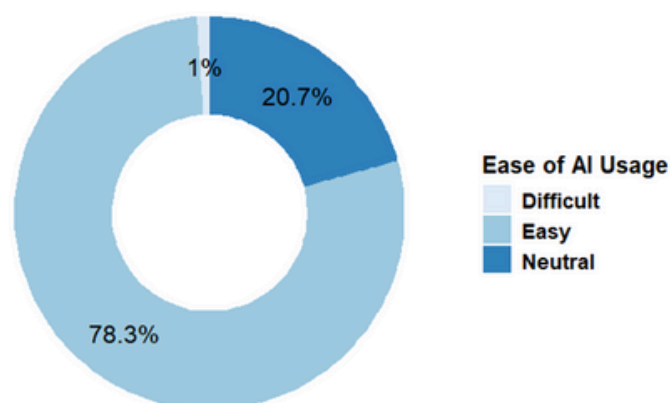
Source: CSEA Survey on State of AI, 2024.

The industrial sector shows a stronger intensity profile, with 42.9% of firms using AI at a high level and another 48.6% at a moderate level. Only 8.6% fall into the low-usage category. The services sector mirrors this as approximately half of the firms surveyed (49.7%) reported moderate usage, while 40.3% high usage and 10% had low usage

Assessing the Ease of AI Integration Across Sectors

Following the examination of how intensely AI is being used, it is equally important to understand how firms perceive the ease of usage of AI systems compared to other technologies. Adoption is not only about willingness, it also depends on whether firms find the tools practical, accessible, and manageable within their existing workflows.

Figure 11: Ease of AI Usage Compared to other Technologies



Source: CSEA Survey on State of AI, 2024.

The overall result from the data is largely positive, with most businesses (78.3%) stating that they found AI easy to use. Only a small fraction (1%) reported the process as difficult, while 20.7% held a neutral position. This signals that although AI is still relatively new to many firms, the actual process of usage has been more user-friendly than one might expect, especially in comparison to the older, more rigid systems (see figure 11).

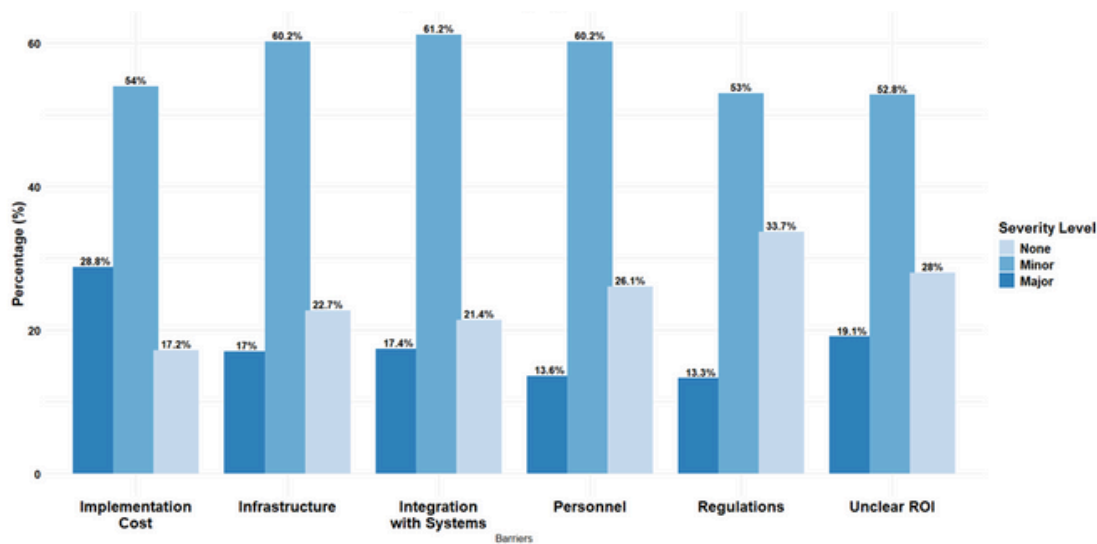
Among Agriculture firms, 66.7% of firms surveyed found AI adoption easy, 33.3% had a neutral view, and none of them found AI adoption difficult. In the industrial sector, 77.1% of firms revealed AI is easy to use, only a small group (22.9%) gave neutral responses, and none reported difficulty. About 78% of service-based firms described AI adoption to be easy, 20.3% were neutral, and only just 1% found it was difficult. (See appendix 2).

These findings imply that, across sectors, the firms surveyed do not face significant difficulty when it comes to bringing AI into their operations.

Primary Barriers to AI Adoption

Among all the firms surveyed, many perceived most barriers as either minor or not barriers at all. However, implementation cost stood out as a major constraint highlighted by 28.8% of firms. This points to the substantial capital requirement involved in acquiring and deploying technology in an economy where credit remains limited.^[18] Closely linked to this is another major barrier cited by firms: unclear return of Investment (ROI), identified by 19.1% of firms. This conveys a sense of uncertainty, as many businesses might be willing to innovate but lack confidence that the investment will yield returns, especially in a volatile economic environment where long-term planning is often disrupted by policy shifts, inflation, and unstable demand.^[19]

Figure 12: Barriers to Adopting AI in Businesses



Source: CSEA Survey on State of AI, 2024

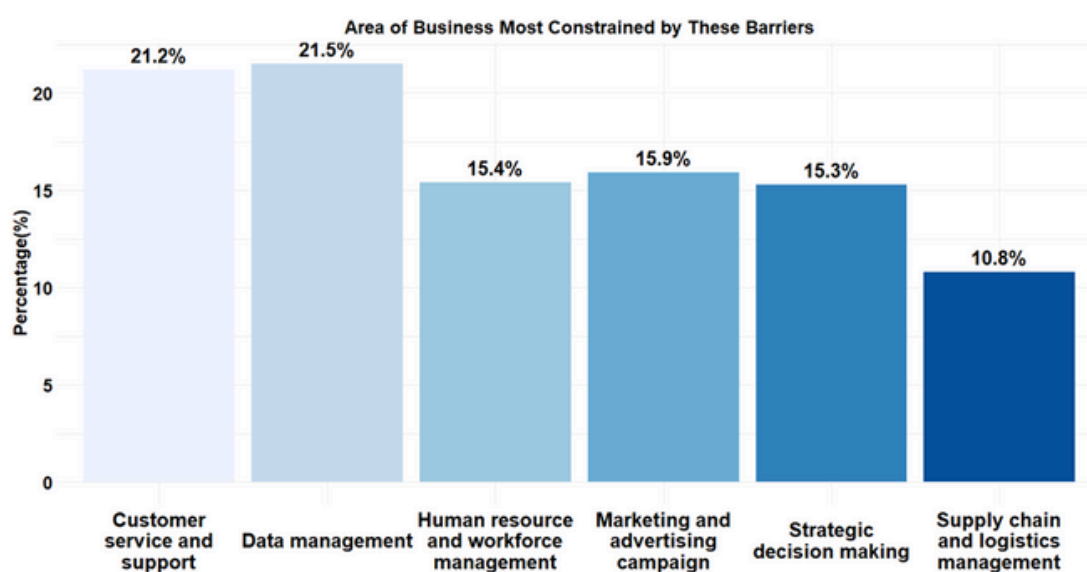
Figure 12 shows that most firms consider the barriers identified as either minor or not significant. However, in terms of barriers which the surveyed firms considered as major issues, implementation cost, unclear ROI, Integration with systems and Infrastructure had the highest frequencies.

[18] [Credit constraints and agricultural technology adoption: Evidence from Nigeria](#)
 [19] <https://www.pwc.com/us/en/tech-effect/ai-analytics/artificial-intelligence-roi.html>

Areas Affected by Barriers to AI Adoption in Firms

The survey found that no part of a firm's operations is immune to the constraints posed by the barriers of AI adoption. However, some functions are more affected than others. Data management (21.5%) and customer service and support (21.2%) are the most affected areas, suggesting that while firms may be collecting more data and interacting with customers through digital channels, they often lack the tools or systems to manage these processes efficiently.^[20] Also, human resource management, strategic decision-making, and marketing/advertising campaigns each draw between 15% and 16% of firms. Supply chain and logistics management (10.8%) was less frequent compared to other areas. The spread of responses shows that technology constraints in Nigeria are not isolated to one part of the business; they are broad-based, touching multiple areas that are critical for growth, competitiveness, and customer satisfaction (see figure 13).

Figure 13: Areas of Business Most Constrained by Barriers to Adoption



Source: CSEA Survey on State of AI, 2024

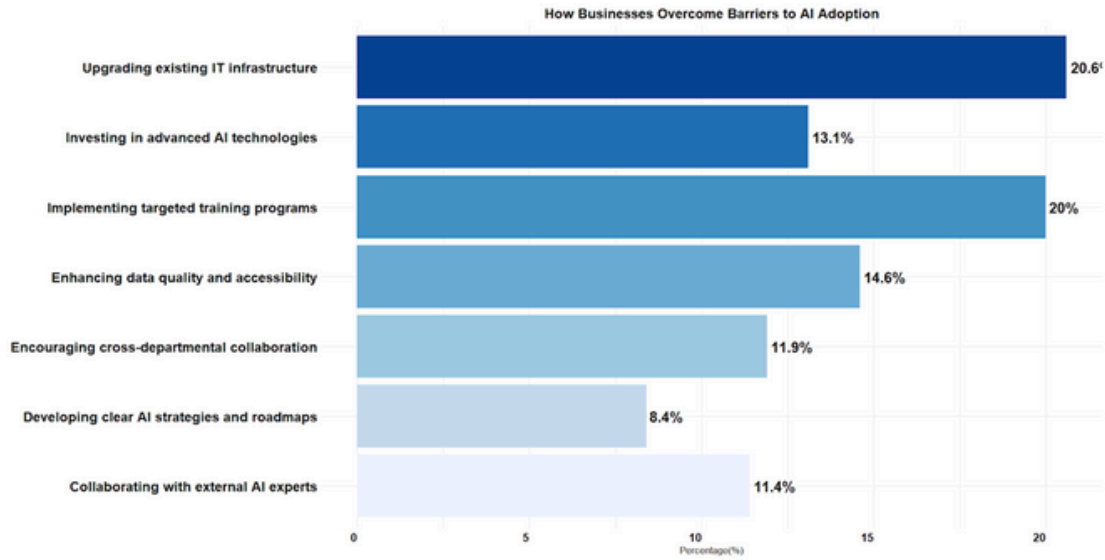
Strategies for Overcoming Barriers to AI Adoption in Firms

The survey found the most common approach to overcoming AI adoption barriers is upgrading existing IT infrastructure (20.6%), followed by implementing targeted training programmes (20%). These two responses reflect a focus on strengthening the foundation for digital adoption. Firms investment in infrastructure reflects a global trend in positioning to fully unlock AI benefits, which requires infrastructural development. Likewise, tailored training programmes are a response to increasing demand for skilled personnel, enabling companies to build internal capacity rather than relying entirely on external hires.

Other firms are investing directly in advanced technologies (13.1%) and taking steps to enhance data quality and accessibility (14.6%). These efforts indicate a growing trend toward technology, one where firms are not just reacting to gaps but are becoming more proactive in building capability. Access to reliable, well-structured data is particularly crucial, for businesses seeking to improve operational efficiency, make smarter decisions, or better understand customer behaviour. (see figure 14.)

[20] [The Impact of Artificial Intelligence on Business Processes](#)

Figure 14: How Businesses Overcome Barriers to AI Adoption



Source: CSEA Survey on State of AI, 2024

Also, collaboration, both internally and externally, is also emerging as a meaningful strategy. About 11.9% of firms are encouraging cross-departmental collaboration for IT training purposes, while 11.4% are partnering with external experts to fill skill or knowledge gaps. Though less common, these approaches show that companies are learning to look outward for expertise when needed. However, the relatively low percentage (8.4%) of firms that have developed clear AI strategies or roadmaps points to a broader opportunity; while many are taking tactical steps, fewer have articulated and structured long-term plans for digital integration. This broader measure is similar across different sectors, as shown in Appendix 5.

FINDINGS AND DISCUSSION

SECTION 2: Benefits, Risks and Mitigation Strategies to AI Adoption in Nigerian Firms

Key Benefits of AI Adoption in Businesses

The most reported benefits of AI adoption span key areas such as increased efficiency, enhanced decision-making, and improved service delivery.

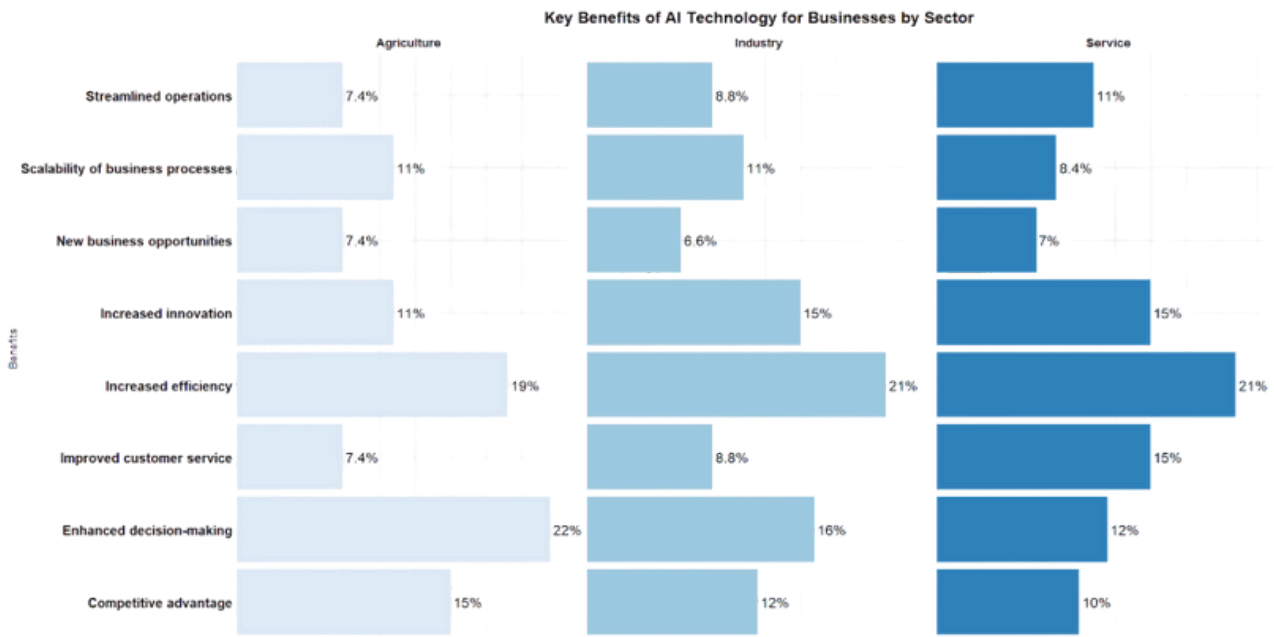
As shown in figure 15, 21% of firms in the services sector highlighted increased efficiency as the leading benefit of AI adoption, followed by improved customer service (15%), increased innovation (15%), and enhanced decision-making (12%). These responses are reflective of the competitive pressures service-orientated businesses face. The service sector demands speed, convenience, and tailored experiences for firms to thrive^[22]. AI tools are playing a crucial role by enabling firms to manage large volumes of customer data and support faster service delivery. The fact that innovation ranks highly also speaks to the evolving nature of service delivery in Nigeria, where tech-forward firms are continually exploring ways to differentiate themselves through smarter systems and new digital offerings.

In the industrial sector, the pattern is similar but slightly more evenly distributed. Efficiency again tops the list (21%), followed by enhanced decision-making (16%), increased innovation (15%), and competitive advantage (12%). The emphasis on these factors reflect the increased efforts by firms to maintain a competitive advantage.

For the agricultural sector, the benefits are like other sectors; enhanced decision-making (22%) stands out as the top benefit, trailed by increased efficiency (19%) and competitive advantage (15%). This aligns with the wider context of Nigeria's Agricultural sector;s modernisation efforts, which are leveraging digital tools to fill long-standing technological gaps in farming. For instance, AI-powered platforms are being used to analyse soil conditions, track weather patterns, or connect farmers to market data, all of which help agribusinesses make smarter choices in an otherwise unpredictable environment

[22] [Customer experience is everything: PwC](#)

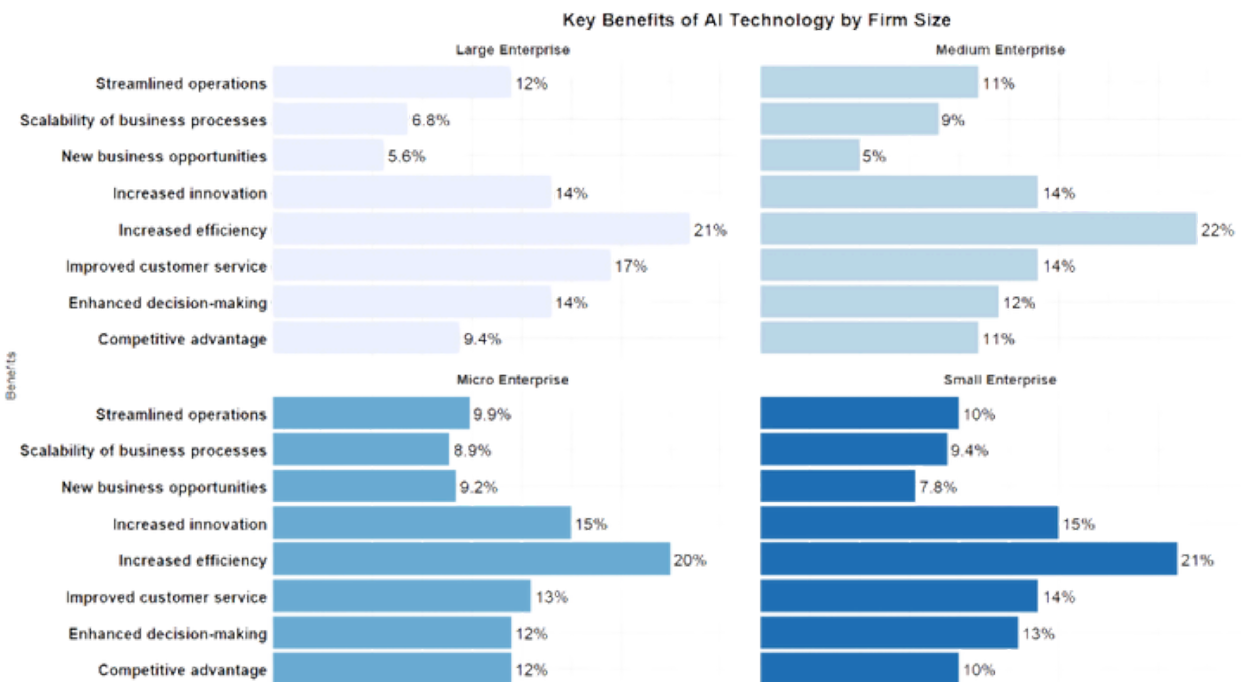
Figure 15: Benefits of AI Adoption by Sector



Source: CSEA Survey on State of AI, 2024

Figure 16 shows a similar distribution of benefits, observed when the data is examined by firm size. Across all categories - large, medium, small, and micro- increased efficiency remains the standout benefit, selected by roughly one in five businesses in each group.

Figure 16: Benefits of AI Adoption by Sector



Source: CSEA Survey on State of AI, 2024

Challenges and Risks Associated with AI Adoption By Firms

While there is increasing adoption of AI by firms, they also express concerns as to the risks posed by adoption of AI into their operations.

From Figure 17, responses from firms revealed that cost-related concerns clearly weigh heavily on businesses. Implementation costs stood out, with 29% of firms surveyed identifying it as a major concern and 38.1% reporting it as a moderate concern. This aligns with the reality that many Nigerian businesses, especially SMEs, lack the financial flexibility to invest in sophisticated AI tools or infrastructure. Also, 26.6% of firms cited maintenance cost as a major concern and 39.1% as a moderate concern. In a business climate where revenue can be unpredictable and margins are tight, recurring expenses tied to software updates, technical support, and system upkeep can quickly become unsustainable.

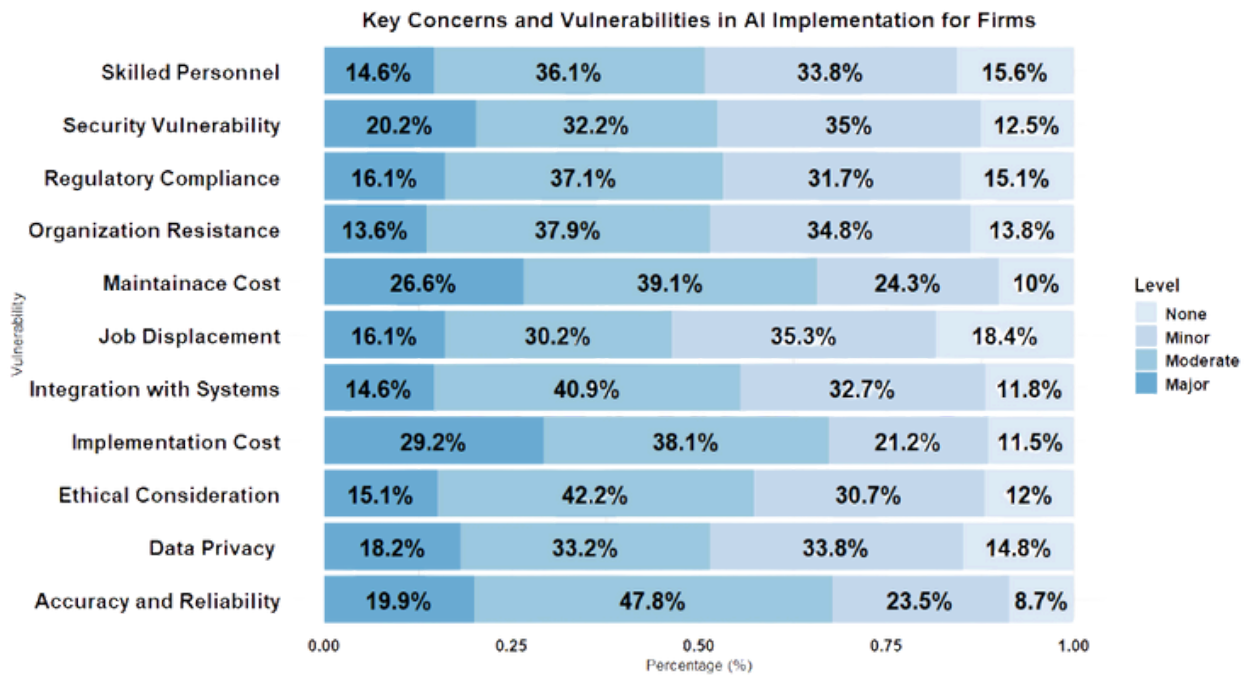
Firms also expressed concerns around accuracy, privacy, and security. Accuracy and reliability recorded 19.9%, identifying it as a major issue and another 47.8% seeing it as a moderate concern. Similarly, data privacy was a significant concern with 18.2% of businesses citing it as a major concern and 33.2% a moderate one. Reflecting a growing unease around how customer or internal data is stored and used, especially in the absence of strong regulatory enforcement. Similarly, security vulnerabilities were marked as a major concern by 20.2% of respondents, showing that fears around cyber-attacks, system breaches, and digital sabotage are rising. For businesses already operating in a high-risk economic environment, these kinds of vulnerabilities can feel like an additional layer of exposure they are not prepared for.

Other concerns revolved around people, systems, and culture. The shortage of skilled personnel was flagged as a major concern by 14.6% of respondents, with another 36.1% citing it as moderate^[23]. At the same time, integration with existing systems remains a pain point, with 14.6% citing it as a major concern and 40.9% marking it as moderate. Many firms operate with legacy systems or manual processes that do not align well with modern AI platforms, making integration both costly and technically challenging. On the cultural side, organisational resistance (13.6% major concern; 37.9% moderate) and ethical considerations (15.1% major; 42.2% moderate) were lower on the list but still relevant.

Concerns about job displacement was flagged by most firms as not being a significant issue, as only 16.1% of the firms surveyed considered it a major issue; this reflects a concern, as leaders weigh the benefits of automation against its social and human impact. These concerns are consistent across firm size, highlighting implementation costs as a major difficulty in adoption (see appendix)

[23] <https://africanmediaagency.com/africas-ai-skills-landscape-revealed-in-new-sap-report/>

Figure 17: Concerns and Vulnerabilities of AI Adoption



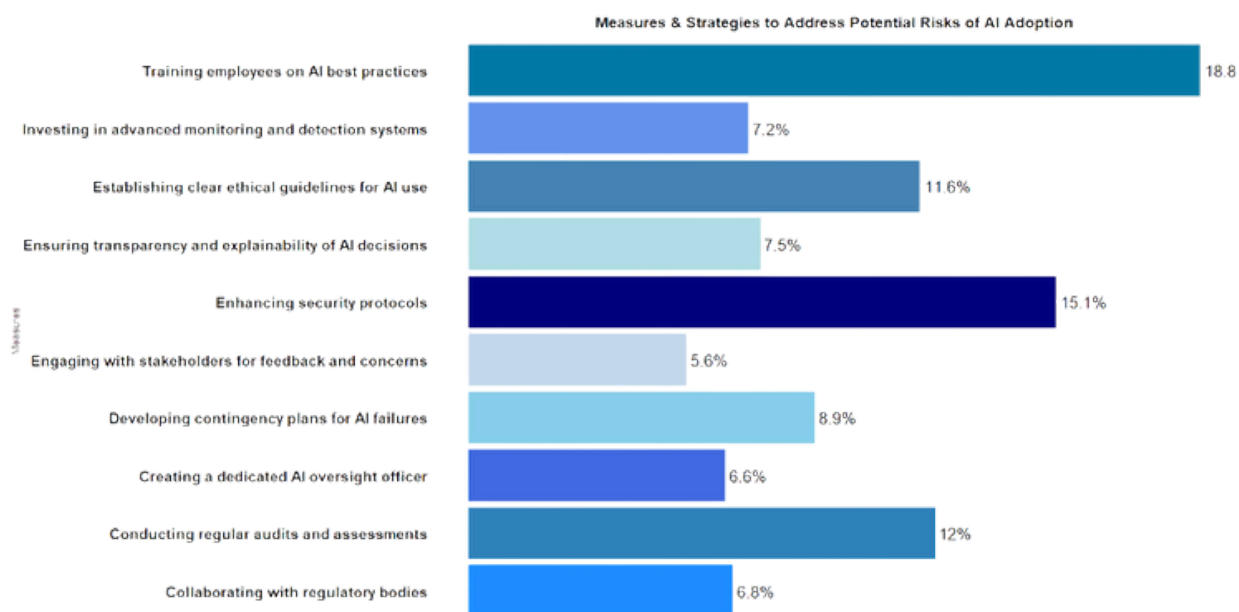
Source: CSEA Survey on State of AI, 2024

Mitigation Strategies for AI-Related Risks and Vulnerabilities

The survey reveals that employee training stands out as the most common strategy firms are using to manage the risks of AI, with 18.8% of participants indicating they adopt this approach. Also, 15.1% of firms employ enhancing security protocols, reflecting a growing concern around data breaches and cyber threats, which are becoming more frequent as more businesses digitise their operations. Other adopted mitigation strategies include conducting regular audits and assessments (12%) and establishing ethical guidelines for AI use (11.6%).

While less common, some businesses have begun to explore more structured approaches, such as having a dedicated AI oversight officer (6.6%) and collaborating with regulatory bodies (6.8%). These lower percentages posit that only a few businesses have the resources or internal structures to support such roles. Meanwhile, developing contingency plans (8.9%) and investing in monitoring systems (7.2%) indicate that some firms are preparing for possible failures or technical issues down the line. Interestingly, transparency and explainability (7.5%) and stakeholder engagement (5.6%) ranked among the least adopted strategies, which imply that many businesses are still more focused on managing internal risks rather than external perception or broader accountability. Overall, while there is a clear effort to be proactive, the spread of responses shows that businesses are still at different stages of preparedness, with most sticking to basic, practical steps they can control in-house.

Figure 18: Measure to Address Risk of Adoption



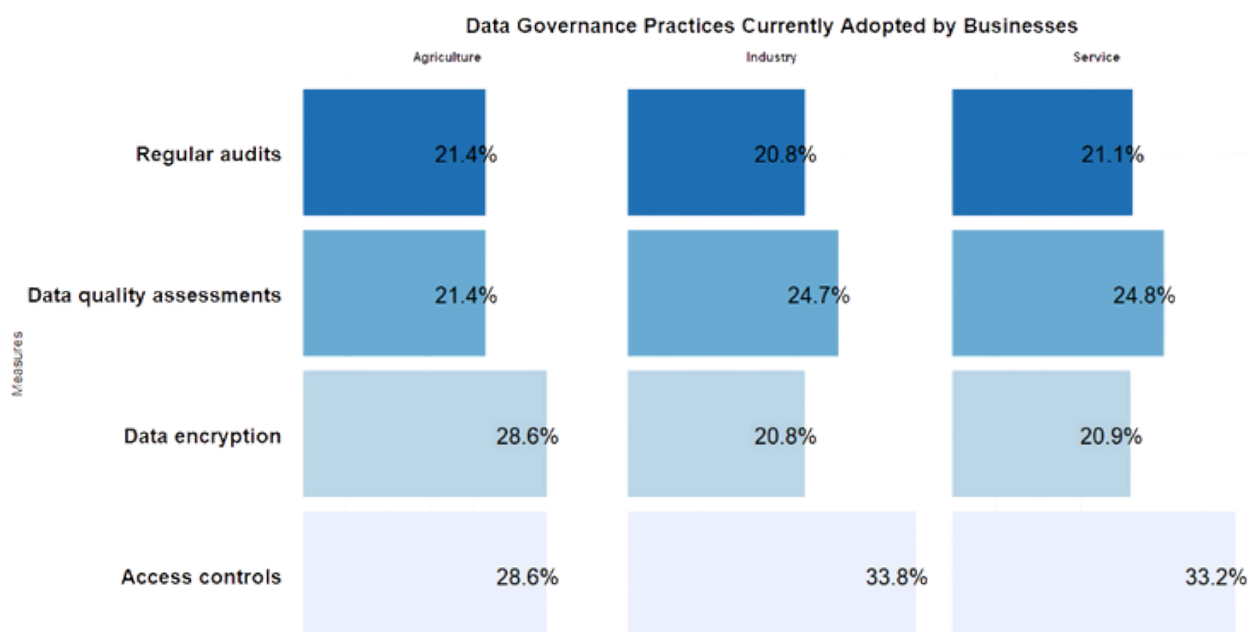
Source: CSEA Survey on State of AI, 2024

SECTION 3: AI and Data Governance

Data Governance Practices Adopted by Firms

The risks emerging from the adoption of AI by firms, such as data privacy issues, stress the need for firms to adopt data governance practices. Data governance covers policies, procedures and practices that ensure data security, quality and usability. While some businesses have started implementing key measures, the overall picture suggests that many are still focusing on basic protections rather than adopting a comprehensive governance approach. Patterns across different sectors reveal that businesses are prioritising immediate and visible safeguards, often leaving more structured and strategic data management practices underdeveloped (see Figure 19).

Figure 19: Data Governance Practices Adopted

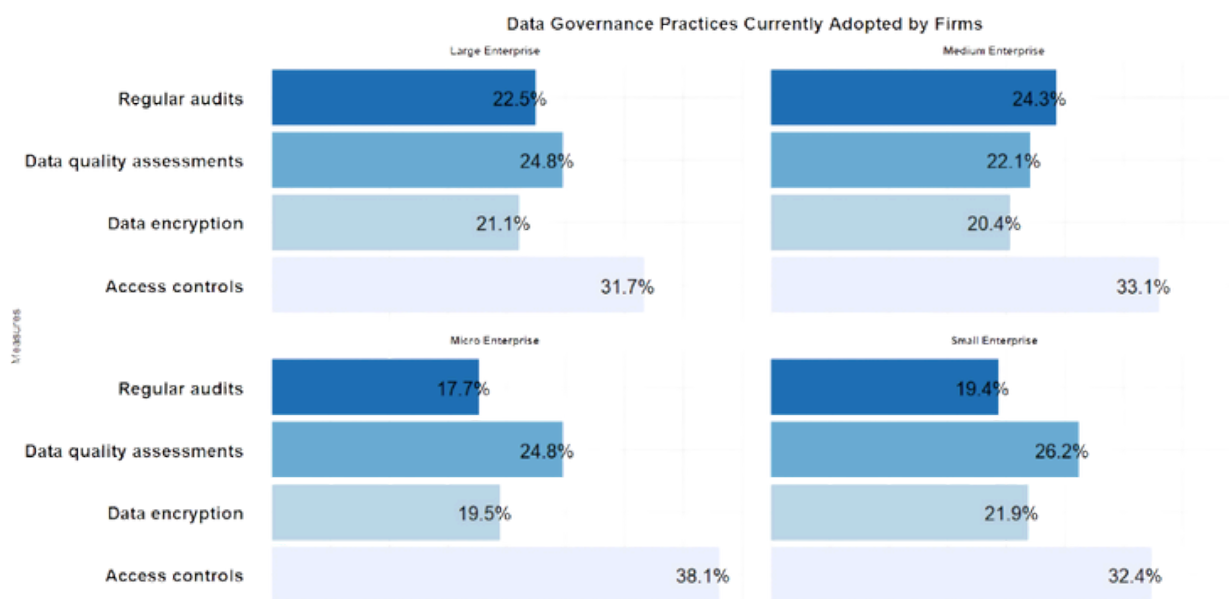


Source: CSEA Survey on State of AI, 2024

Across the agriculture, industry, and service sectors, access control stands out as the most adopted data governance measure. In agriculture, 28.6% of businesses surveyed reported implementing access controls and data encryption, while only 21.4% engaged in regular audits or data quality assessments. A similar trend appears in the industrial sector, where 33.8% reported adopting access controls, surpassing practices like audits and encryption, which were each adopted by about 20–25% of businesses. The service sector, representing a significant portion of Nigeria’s economy had the highest responses on access control (33.2%).

The consistent preference for access control across all sectors demonstrates a practical response to immediate risks. In an environment where cyber threats, fraud, and data breaches are increasingly common, many Nigerian businesses prioritise measures that can quickly limit exposure to external threats. As digital transformation deepens, especially under growing regulatory and competitive pressures, firms will need to expand their data governance efforts beyond access controls to ensure their data remains a true asset rather than a potential liability.

Figure 20: Data Governance Practice Adopted by Firm Size



Source: CSEA Survey on State of AI, 2024

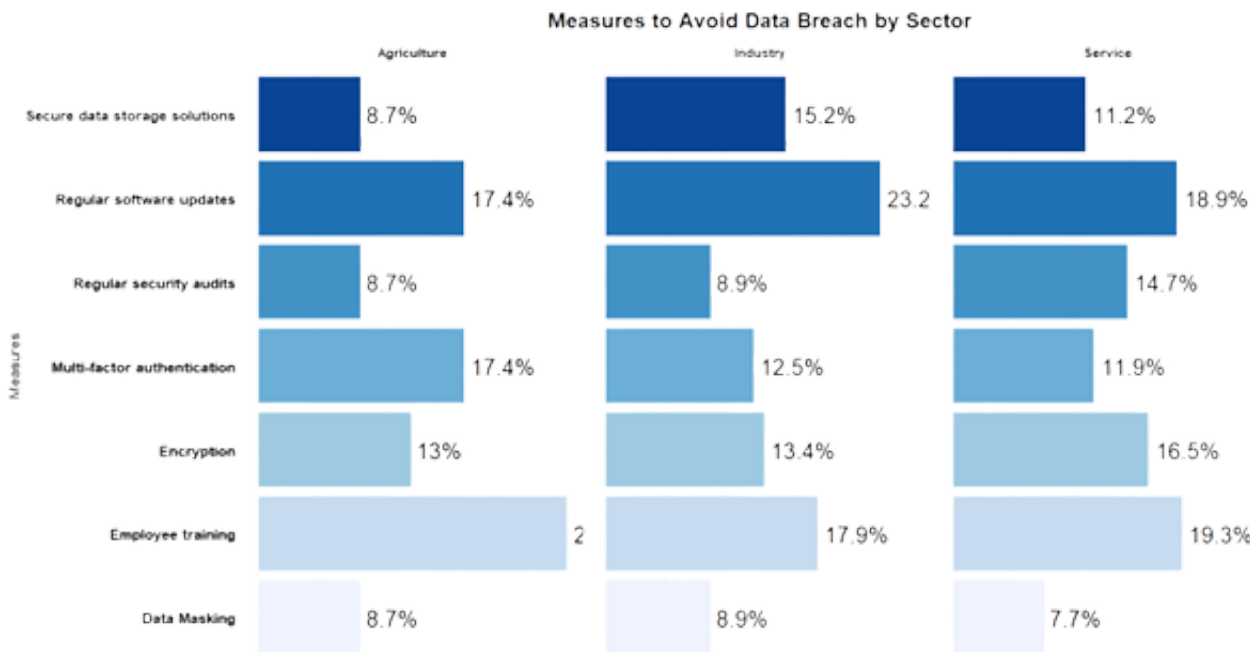
When viewed by firm size, the preference for access control remains consistent, emerging as the most widely adopted data governance practice across all categories. It accounts for over 30% of responses from large (31.7%), medium (33.1%), and small enterprises (32.4%), and rises even higher among micro enterprises at 38.1%. This emphasis implies a shared concern around external data breaches and the need to restrict unauthorised access, particularly critical for firms operating in volatile or low-trust environments. Other practices such as data encryption, audits, and data quality assessments are present but remain secondary, typically hovering between 20% and 25% across sizes.

Measures to Avoid Data Breaches

Efforts to prevent data breaches among Nigerian firms show a growing but uneven adoption of key security practices. Employee training was the most common measure adopted across the sectors. In the agriculture sector, 26.1% of firms surveyed indicated that they implement employee training programmes to mitigate data breaches, exceeding technical solutions like multi-factor authentication (17.4%), regular software updates (17.4%), and encryption (13%). In the industrial sector, regular software updates (23.2%) and then employee training (17.9%) are the most prominent measures, while in the service sector, employee training (19.3%) and regular software updates (18.9%) also led the adopted measures, leaving technical practices like data masking and secure data storage less used (see figure 21).

The strong focus on employee training is both logical and practical within the Nigerian context. Many businesses recognise that human error remains one of the biggest vulnerabilities to data security. With phishing attacks, insider threats, and accidental breaches still prevalent, training employees to recognise and prevent threats offers a cost-effective and scalable way to strengthen defences, especially for businesses that may lack the resources to implement complex technical solutions. However, the relatively lower rates of adoption for measures like multi-factor authentication, encryption, and secure storage solutions highlight gaps that could expose organisations to significant risks, particularly as cyberattacks become more sophisticated.

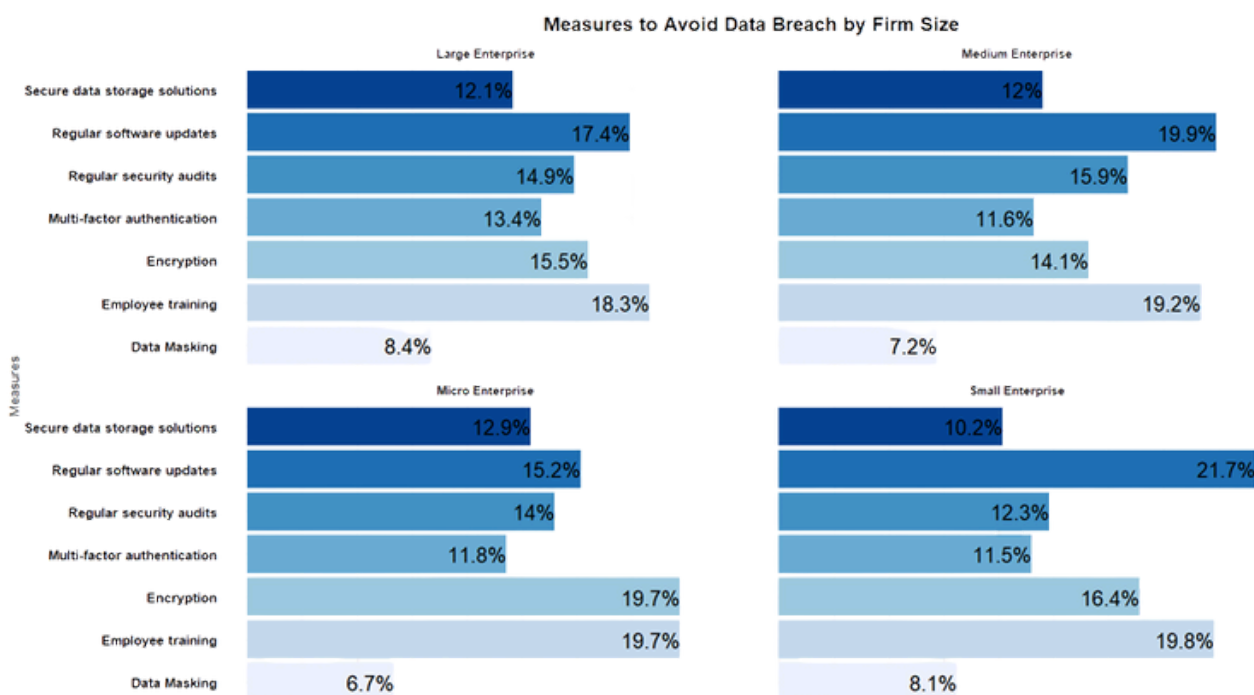
Figure 21: Measures Adopted to Avoid Data Breach



Source: CSEA Survey on State of AI, 2024

As Figure 22 shows, when disaggregated by firm size, the pattern of prioritising employee training remains consistent. Regular software updates also feature prominently, especially among small (21.7%) and medium-sized firms (19.9%). In contrast, more technical or resource-intensive practices, such as multi-factor authentication, secure data storage, and encryption, show more moderate measures, generally falling between 11% and 16% across firm sizes. Data masking remains the least adopted, particularly among micro and medium enterprises. As digital risks continue to evolve, scaling up both human-focused and technical safeguards will be critical for building more resilient systems. (see figure 22)

Figure 22: Measures Adopted to Avoid Data Breach By Firm Size



Source: CSEA Survey on State of AI, 2024

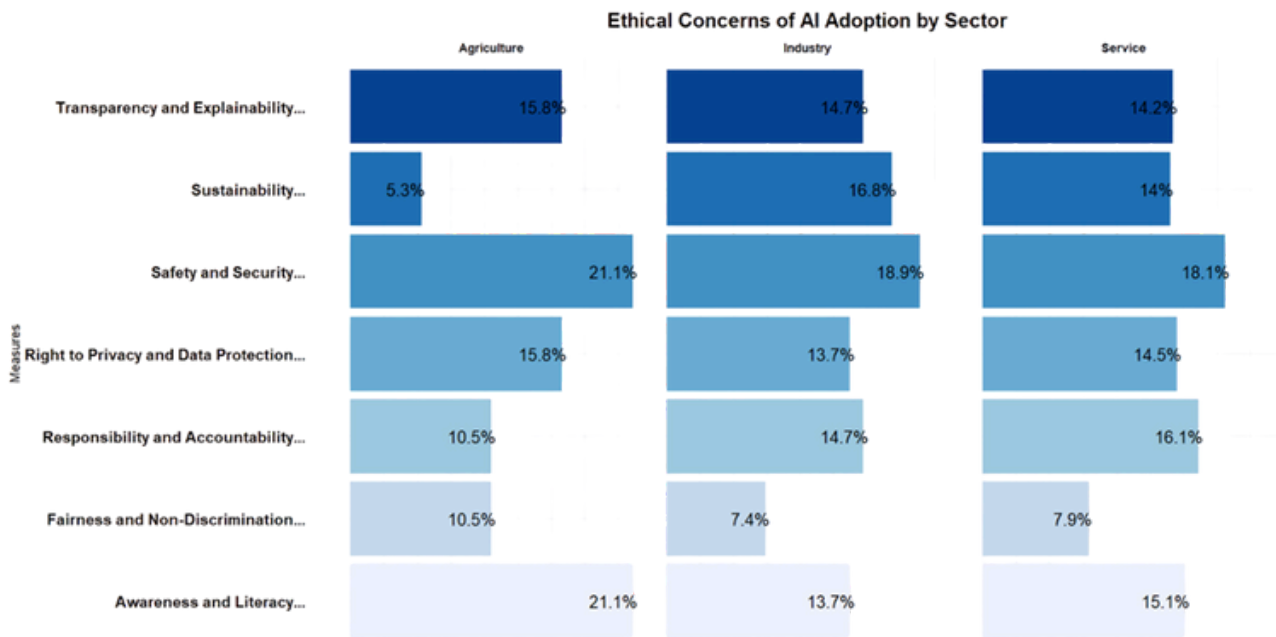
Ethical Concerns About AI Adoption

Ethical considerations surrounding AI adoption are gradually gaining attention among Nigerian firms, though the level of focus varies across sectors. The findings indicate that while businesses are aware of key ethical risks, concerns are spread across different dimensions.

Across the three sectors, safety and security emerged as the major ethical concern. In agriculture, 21.1% of firms surveyed cited safety and security issues as a major concern, with awareness and literacy representing 21.1%. Transparency, right to privacy, and fairness had slightly lower percentages. Similarly, in the industrial sector, safety and security (18.9%) topped the list, with sustainability (16.8%) also ranking relatively high, an indication that industries are starting to think about the long-term environmental and operational impacts of AI systems. In the service sector, safety and security again led at 18.1%, followed by concerns around privacy (14.5%) and responsibility (16.1%).

Overall, the findings show that Nigerian firms are increasingly integrating the ethical dimensions of AI adoption. Immediate risks like security breaches and lack of user understanding are at the forefront, while deeper systemic issues like bias, accountability, and long-term sustainability, though present, attract comparatively less attention. As AI adoption scales, there is a growing need for firms to embed a more balanced and forward-looking ethical framework into their AI strategies.

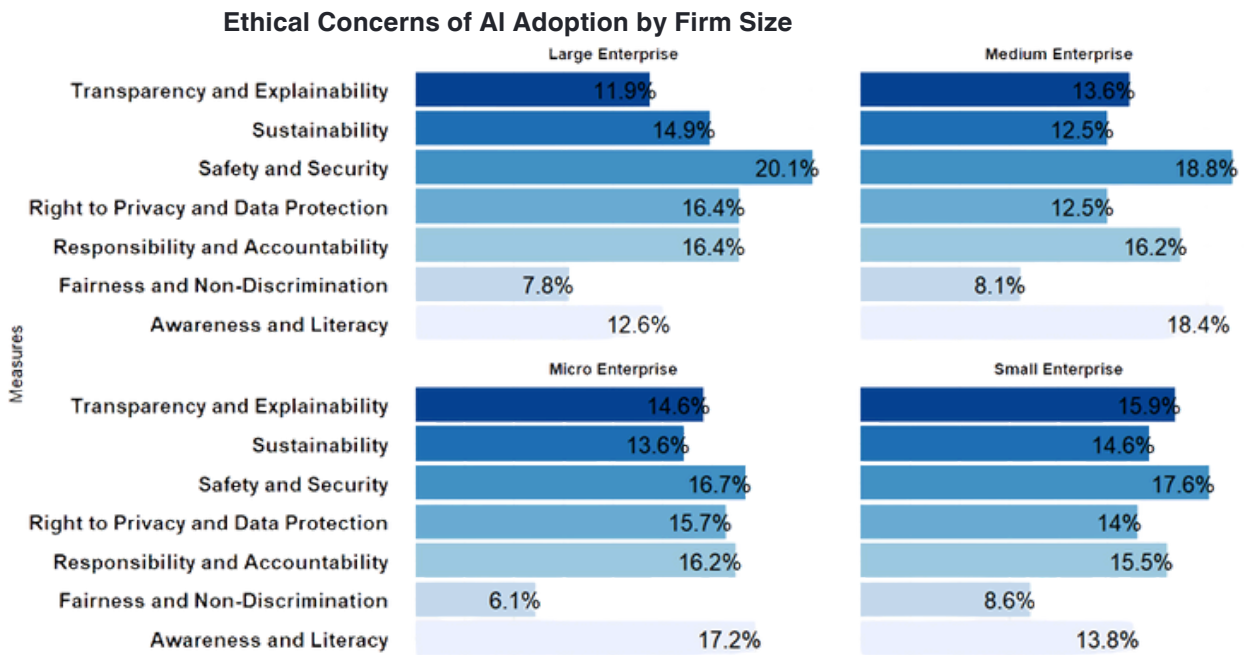
Figure 23: Ethical Concerns of AI Adoption



Source: CSEA Survey on State of AI, 2024

Disaggregating the data by firm size reveals a similar trend. Across all firm categories, safety and security consistently rank as the top concern except for micro enterprises, where awareness and literacy are the biggest concerns (17.2). Responsibility and accountability, along with privacy and data protection, follow closely, especially among larger firms, where organisational complexity may raise more questions about compliance and liability. Concerns like fairness, sustainability, and transparency appear less dominant across all sizes, each generally below 15%.

Figure 24: Ethical Concerns of AI Adoption by Firm Size



Source: CSEA Survey on State of AI, 2024

Measure Implemented due to Ethical Consideration

While there is a clear recognition of the importance of ethics in AI adoption, the level of implementation differs significantly. Generally, service-orientated firms showed the highest level of commitment to ethical practices, likely reflecting the sector's closer engagement with consumers and greater regulatory exposure.

Figure 25: Measures Adopted due to Ethical Consideration

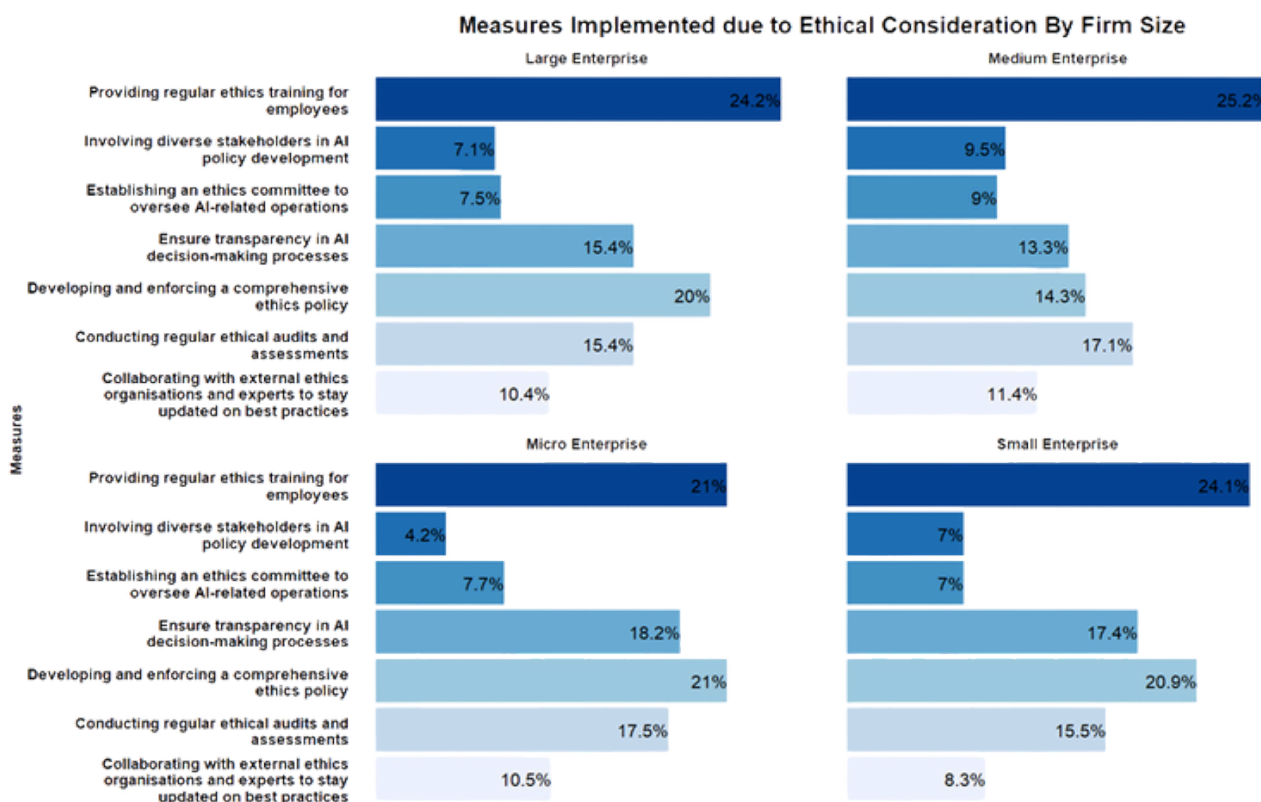


Source: CSEA Survey on State of AI, 2024

In the agricultural sector, providing regular ethics training for employees was the most reported measure, adopted by about 23.5% of businesses surveyed in this sector. Other measures, like conducting ethical audits or ensuring transparency in AI decision-making, were implemented by 17.6% of firms surveyed. In the industrial sector, ensuring transparency in AI decision-making (21.5%) and enforcing comprehensive ethics policies (19.4%) emerged as the most adopted practices. The relatively high attention to transparency signals the sector's need to maintain credibility with clients, regulators, and international partners, especially in export-driven or highly mechanised industries. However, measures that require deeper organisational restructuring, like establishing ethics committees (5.4%) or involving diverse stakeholders in policy development (7.5%), were less frequently adopted.

For the services sector, providing regular ethics training (24.5%) and developing comprehensive policies (19.4%) led the pack. Conducting ethical audits (16.3%) and ensuring transparency in AI decision-making (15.5%) were also relatively common. These patterns explain that firms in the service sector operate in highly competitive environments where ethical breaches can quickly erode customer loyalty and invite regulatory sanctions. Yet, despite this proactive stance, deeper collaborative efforts like working with external ethics organisations (9.5%) and stakeholder involvement (7%) were still on the lower side, perhaps due to cost considerations or a general underdevelopment of independent ethics support frameworks in Nigeria.

Figure 26: Measures Adopted due to Ethical Consideration by Firm Size



Source: CSEA Survey on State of AI, 2024

When analysed by firm size, the implementation of ethical measures shows a similar pattern to the sectoral breakdown, foundational actions such as providing regular ethics training and developing comprehensive policies are the most widely adopted across all categories. (see figure 26).

CONCLUSION AND POLICY RECOMMENDATION



The study investigates the extent of adoption of AI by firms in Nigeria across different sectors, especially the agricultural, industrial, and services sectors. The findings from the study reveal that while Nigerian businesses are increasingly interested in using advanced digital tools (AI) to improve efficiency and competitiveness in their daily operations, many face significant obstacles to turn their interest into effecting change. Most firms are no longer at the awareness stage; they are already experimenting with new technologies, but progress remains uneven due to challenges like high costs, limited infrastructure, and a lack of practical support. These issues are especially pressing for small and mid-sized businesses, which make up a large share of the economy but often lack the resources to navigate complex digital transitions on their own. To support meaningful and responsible use of digital tools across sectors, there is a need for focused and practical policy measures that resonate with the real conditions businesses operate in. This could entail investing in business-relevant training, encouraging low-risk collaboration models, making it easier to share resources and manage costs, and promoting clear, easy-to-use guidance on issues like ethics, security, and data management. The recommendations that follow are built around these needs, aiming to create a more enabling environment where businesses can adopt digital solutions in ways that are sustainable, secure, and aligned with their goals.

1. Government Establish a National Digital Infrastructure Backbone for AI Enablement

One of the most significant structural barriers to AI adoption in Nigeria is the lack of foundational digital infrastructure, particularly for businesses operating outside major urban centres. Many businesses in Nigeria are not struggling with a willingness to adopt AI; they are struggling with how. The findings show that the biggest barriers are not resistance but implementation cost, uncertain returns, and infrastructure limitations. Most firms fall into the moderate usage category, meaning they are past the awareness stage and already using AI in practical ways, but only to a limited extent.

Challenges such as unstable electricity, low broadband penetration, limited access to affordable cloud services, and inadequate data storage capacity significantly hinder the ability of firms, especially MSMEs, to deploy AI technologies effectively. To address this, the Federal Government, through relevant MDAs such as the Ministry of Communications, NITDA, etc., should develop a National AI-Ready Infrastructure Strategy. This strategy should prioritise expanding reliable broadband and power access to key economic clusters, including agricultural zones, industrial parks, and tech hubs. A national or regional push that supports small to mid-sized firms in upgrading basic IT infrastructure and accessing shared digital resources (like cloud-based platforms or analytics tools) would help sustain and deepen this momentum. Sector-specific resource hubs (e.g., for fintech, agtech, and logistics) could serve as practical access points for tailored tools, technical guidance, and pooled services.

It should also include the development of secure, locally hosted cloud infrastructure to support domestic AI deployment and reduce reliance on foreign servers, thereby strengthening data sovereignty. These investments would not only facilitate AI experimentation and adoption across sectors but also enhance Nigeria's attractiveness as a destination for technology innovation and data-intensive services.

2. Strengthen Capacity for AI Adoption Through Practical, Role-Specific Training and Industry-Led Partnerships

Firms must constantly strengthen the capacity of their workers for effective AI adoption. However, the training programmes should go beyond digital literacy or coding bootcamps. Findings from this study show that few companies are applying AI across various business functions, from customer service and product development to operations and decision-making. However[1], many struggle with integrating these new skills. To address this, staff at all levels and work functions can be trained on how to apply AI tools that are directly relevant to their roles. Sector-specific business associations and trade groups can play a key role by co-developing practical, role-focused training tailored to real business challenges, rather than relying on generic technical instruction. Although some firms are already offering AI training, it often remains too broad or overly technical. These trainings should be simplified and specifically focus on real-world scenarios aligned with industry-specific needs, such as protecting customer data in finance or ensuring accurate forecasting in agriculture. Industry associations and professional bodies should help design short, hands-on modules covering data handling, ethical use, and system oversight.

3. Enhance Awareness and Provide Practical Toolkits to Help Businesses Implement Responsible AI and Data Governance

One of the common features from this study is that many Nigerian businesses recognise the importance of responsible AI use and data governance; however, they lack the practical guidance and structured tools needed to implement these principles effectively. The main problem is that global frameworks are abstract or technical to implement, especially for SMEs operating in resource-constrained environments. To address this, policymakers, in collaboration with industry associations, digital experts, and regulators[1], should develop and disseminate simple, business-friendly toolkits that combine responsible AI principles with actionable data governance steps.

These toolkits should be sector-specific and cover essential areas such as data privacy, user consent, algorithmic transparency, internal accountability, and risk management. Guidance should be phased, starting with basic internal policies and the designation of data roles and progressing toward audits or compliance self-checks. To encourage uptake, these resources should be introduced as flexible guides rather than rigid mandates and be paired with incentives such as public recognition, reduced inspection frequency, or preferential access to funding for firms demonstrating best practice data usage and management. This dual approach, combining clarity with encouragement, will make it easier for Nigerian businesses to adopt AI ethically and manage data responsibly without being overwhelmed.

4. Reduce Cost Barriers through an AI Acceleration Grant Scheme for MSMEs

The high upfront cost of AI adoption remains a major deterrent, particularly for MSMEs. To address this, it is important for the government, in collaboration with agencies like BOI, NITDA, and SMEDAN, to establish an AI Acceleration Grant Scheme. Provide eligible firms with subsidised access to AI tools, data integration services, and digital advisory support. This grant should be performance-based and linked to clearly defined use cases, such as inventory optimisation, automated customer service, or credit scoring. In addition, tax credits or cost-sharing incentives could be offered to firms investing in AI-related hardware, software, or training. By lowering the initial financial barrier, the scheme would de-risk experimentation and create a pathway toward scalable use.

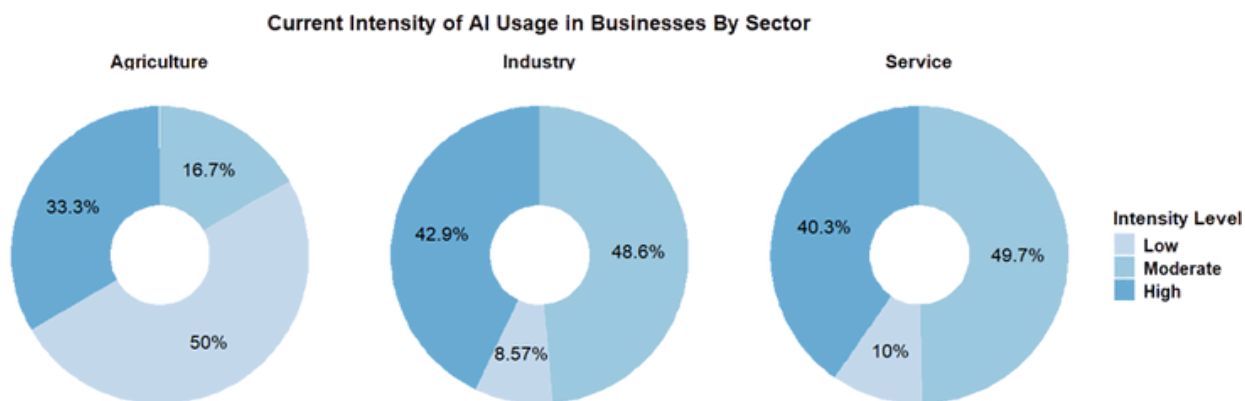
5. Create an AI ROI Demonstration Program to Provide Evidence and Confidence

Many firms hesitate to scale AI solutions[1] due to uncertainty around their return on investment. To address[2] this, the government and industry players should coordinate a National AI ROI Demonstration Program, selecting a representative sample of firms across sectors to pilot practical AI deployments and publicly track results. These projects should be rigorously monitored for cost-effectiveness, operational impact, and lessons learnt. Findings should be published as a series of AI case studies showing real-world business value. These results would provide Nigerian firms with evidence-based benchmarks to assess the potential ROI of AI tools and reduce the perception that AI is experimental or risky.

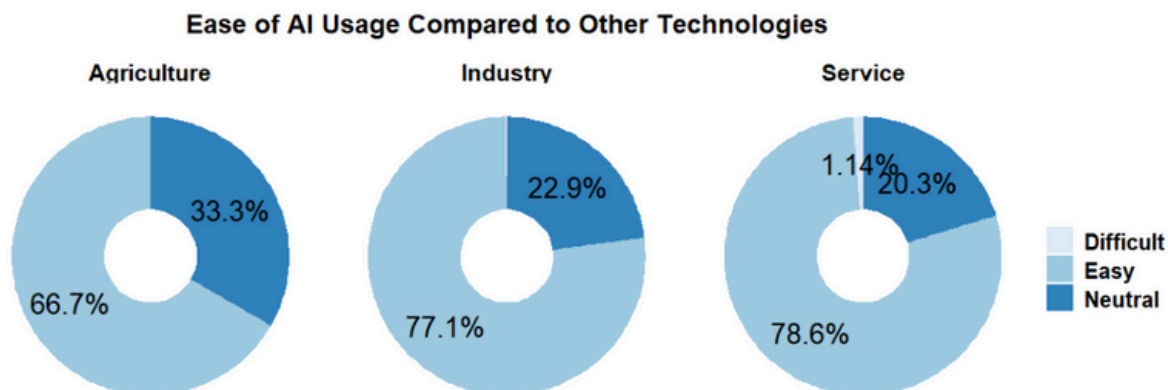
APPENDIX

Appendix 1: Intensity of AI Usage Across Sectors

This chart shows the reported intensity of AI usage among firms in the agriculture, industry, and services sectors. In the agriculture sector, 50% of firms reported low usage, 33.3% high usage, and 16.7% moderate usage. In the industry sector, 48.6% of firms indicated moderate usage, 42.9% high usage, and 8.57% low usage. Within the services sector, 49.7% reported moderate usage, 40.3% high usage, and 10% low usage.



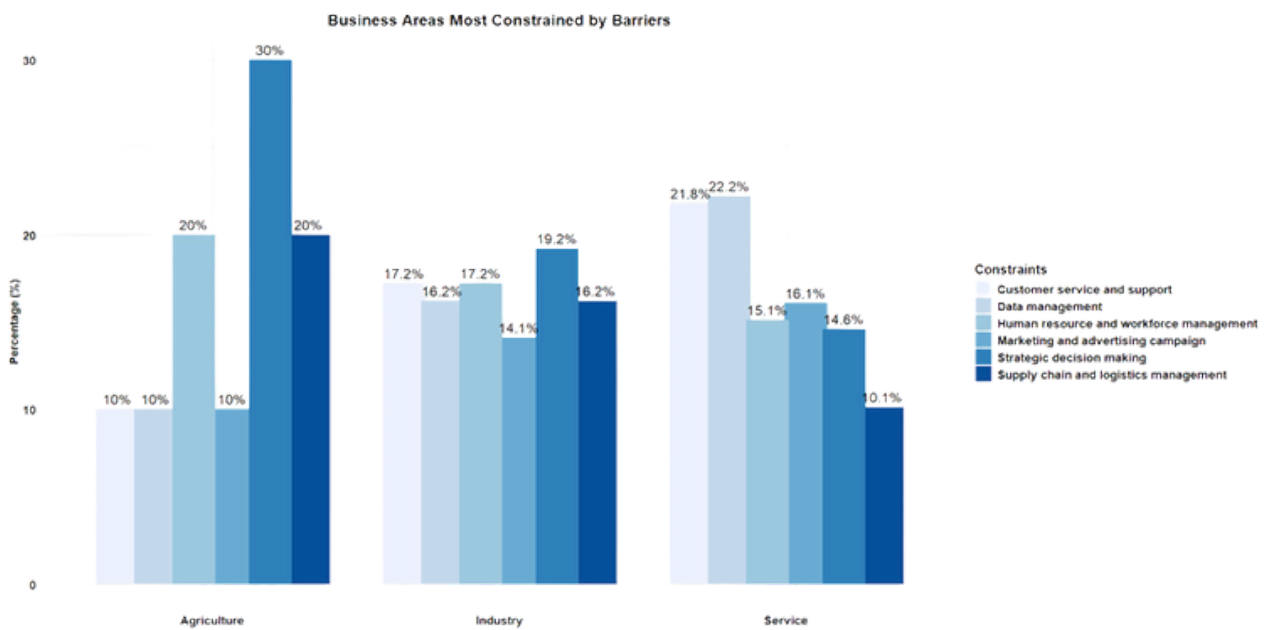
Appendix 2: Ease of AI Use Across Sectors



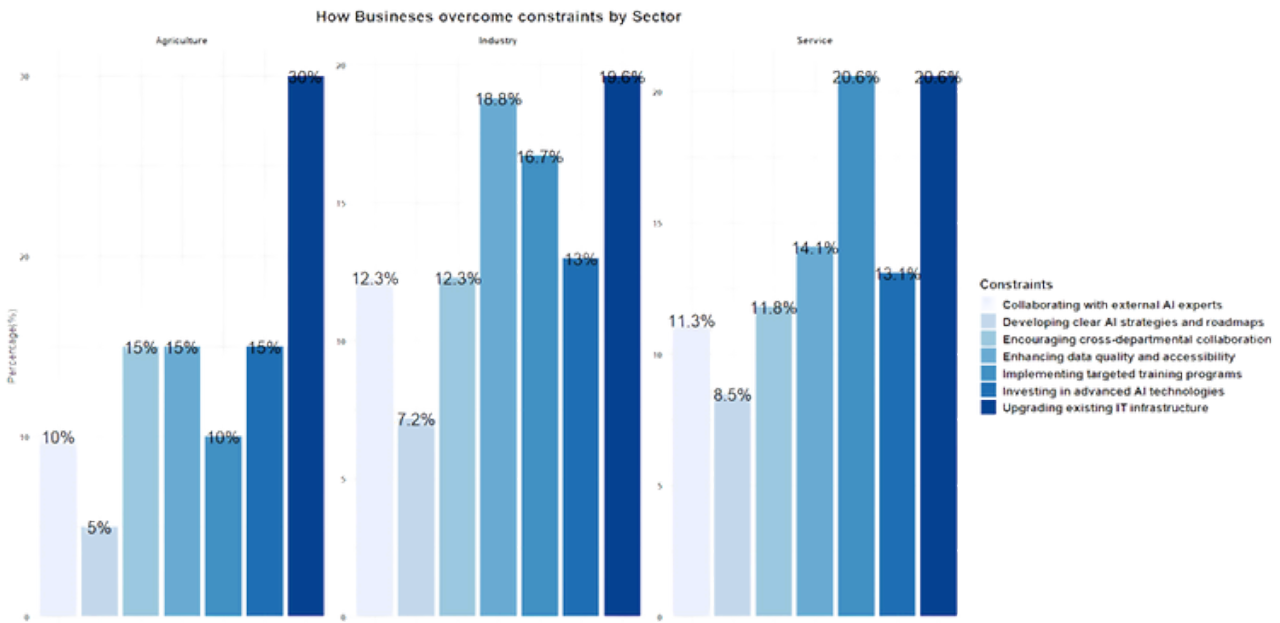
Appendix 3: Primary Barriers of AI Adoption by Firm Size



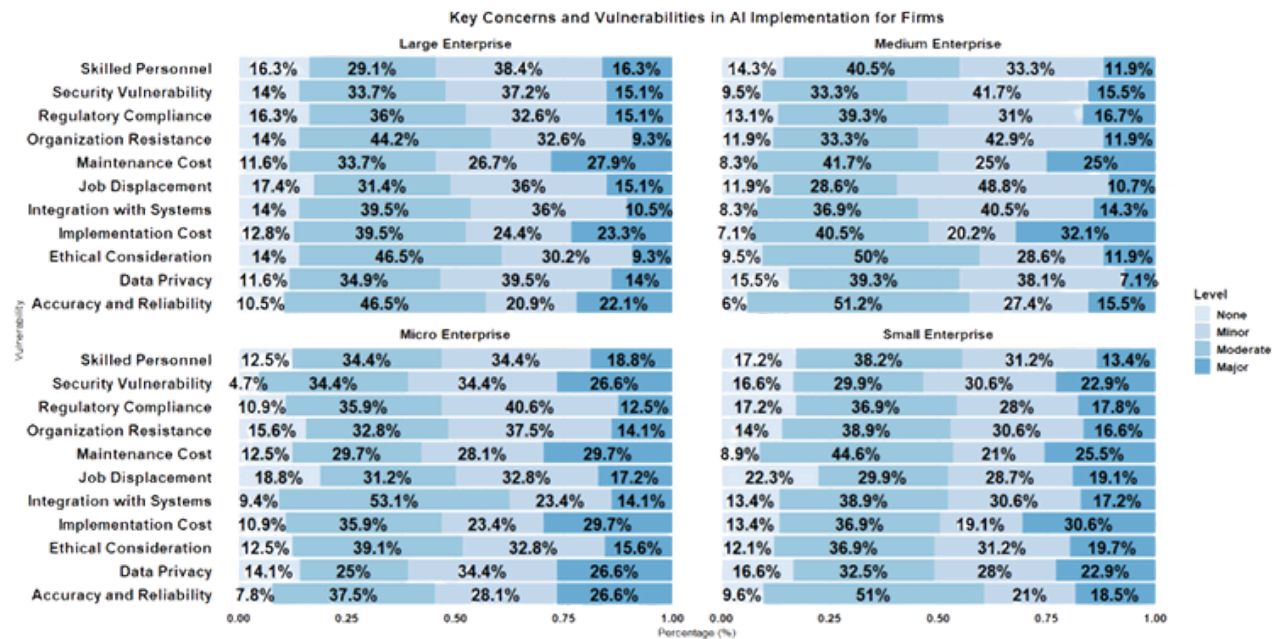
Appendix 4: Area of Business most constrained by Barriers



Appendix 5: How Business overcome constraints by Sector



Appendix 6: Concerns and Vulnerabilities of AI Adoption



REFERENCES AND FURTHER READING

Abraham, R., Schneider, J., & vom Brocke, J. (2019). Data governance: a Conceptual framework, Structured review, and Research Agenda. *International Journal of Information Management*, 49(2), 424–438. <https://doi.org/10.1016/j.ijinfomgt.2019.07.008>

Adzenga, J.I. and Dalap, S.L. (2023). Agricultural Technology Transfer in Nigeria: A Review of the Challenges and Prospects in the Contemporary Times. *Journal of Agricultural Extension*, 28(1), pp.21–29. doi:<https://doi.org/10.4314/jae.v28i1.4s>.

Al-Ruithe, M., Benkhelifa, E., & Hameed, K. (2018). A Systematic Literature Review of Data Governance and Cloud Data Governance. *Personal and Ubiquitous Computing*, 23(1). <https://doi.org/10.1007/s00779-017-1104-3>

Balana, B. and Oyeyemi, M. (2020). Credit constraints and agricultural technology adoption: Evidence from Nigeria. *RePEc: Research Papers in Economics*. doi:<https://doi.org/10.2499/p15738coll2.133937>.

Bharadiya, J. (2023). The Impact of Artificial Intelligence on Business Processes. *European journal of technology*, [online] 7(2), pp.15–25. doi:<https://doi.org/10.47672/ejt.1488>.

Chete, L.N., Adeoti, J.O., Adeyinka, F.M. and Ogundele, O. (2014). Industrial development and growth in Nigeria: Lessons and challenges. [online] Available at: https://www.brookings.edu/wp-content/uploads/2016/07/L2C_WP8_Chete-et-al-1.pdf.

Eli-Chukwu, N.C. (2019). Applications of Artificial Intelligence in Agriculture: A Review. *Engineering, Technology & Applied Science Research*, [online] 9(4), pp.4377–4383. Available at: <https://etasr.com/index.php/ETASR/article/view/2756>.

High-Level Expert Group on Artificial Intelligence. (2018). A definition of AI: Main capabilities and disciplines. European Commission. https://ec.europa.eu/futurium/en/system/files/ged/ai_hleg_definition_of_ai_18_december_1.pdf

IDC. (2021). Data Excellence in Healthcare: The Role of Connected Content (Doc. #US48389021). Hyland. <https://www.hyland.com/-/media/Project/Hyland/HylandV2DotCom/pdfs-gated/Data-Excellence-in-Healthcare-The-Role-of-Connected-Content.pdf>

International Monetary Fund (IMF). (n.d.). Artificial Intelligence Preparedness Index (AI-PI) [Interactive data tool]. https://www.imf.org/external/datamapper/AI_PI@AIPI/ADVEC/EME/LIC

International Monetary Fund. (2023). AI Preparedness Index 2023. https://www.imf.org/external/datamapper/AI_PI@AIPI/ADVEC/EME/LIC

International Telecommunication Union. (2018). The impact of artificial intelligence on the work of governments (Issue Paper No. 1). https://www.itu.int/dms_pub/itu-s/opb/gen/S-GEN-ISSUEPAPER-2018-1-PDF-E.pdf

Oghenekevwe, E. (2024). Exploring The Paradoxes Of Data Governance: Challenges And Opportunities In US Smes. IOSR Journal of Economics and Finance, 15(6), pp.38–45. doi:<https://doi.org/10.9790/5933-1506023845>.

Ogunleye, I. (2021). Artificial Intelligence for Economic Development in Nigeria [online] Available at: https://citrispolicylab.org/wp-content/uploads/2021/12/Artificial-Intelligence-for-Economic-Development-in-Nigeria_Ifejesu-Ogunleye.pdf.

Otto, B. (2011). Organizing Data Governance: Findings from the Telecommunications Industry and Consequences for Large Service Providers. Communications of the Association for Information Systems, 29, pp-pp. <https://doi.org/10.17705/1CAIS.02903>

Oxford Insights & International Development Research Centre (IDRC). (2022). Government AI readiness index 2022. United Nations Industrial Development Organization (UNIDO). https://www.unido.org/sites/default/files/files/2023-01/Government_AI_Readiness_2022_FV.pdf

Oxford Insights. (2023). Government AI Readiness Index 2023. <https://oxfordinsights.com/wp-content/uploads/2023/12/2023-Government-AI-Readiness-Index-2.pdf>

PwC. (2017). Sizing the prize: What's the real value of AI for your business and how can you capitalise? PricewaterhouseCoopers. <https://www.pwc.com/gx/en/issues/artificial-intelligence/publications/artificial-intelligence-study.html>

PwC (2020). Customer Experience Is Everything. [online] PwC. Available at: <https://www.pwc.com/us/en/services/consulting/library/consumer-intelligence-series/future-of-customer-experience.html>.

Rao, A. (2021). Solving AI's ROI problem. It's not that easy. [online] PwC. Available at: <https://www.pwc.com/us/en/tech-effect/ai-analytics/artificial-intelligence-roi.html>.

Rashid, A.B. and Kausik, A.K. (2024). AI Revolutionizing Industries Worldwide: a Comprehensive Overview of Its Diverse Applications. Hybrid Advances, [online] 7(100277), pp.100277–100277. doi:<https://doi.org/10.1016/j.hybadv.2024.100277>.

Rashid, A.B. and Kausik, A.K. (2024). AI Revolutionizing Industries Worldwide: a Comprehensive Overview of Its Diverse Applications. Hybrid Advances, [online] 7(100277), pp.100277–100277. doi:<https://doi.org/10.1016/j.hybadv.2024.100277>.

Reinsel, D., Gantz, J., & Rydning, J. (2017). Data Age 2025: The Evolution of Data to Life-Critical Don't Focus on Big Data; Focus on the Data That's Big Sponsored by Seagate The Evolution of Data to Life-Critical Don't Focus on Big Data; Focus on the Data That's Big. <https://www.seagate.com/www-content/our-story/trends/files/Seagate-WP-DataAge2025-March-2017.pdf>

Sadik, M. (2024). Corporate talent management, digital technologies and the future of work. Core.ac.uk. [online] doi:oi:<https://orca.cardiff.ac.uk/168851>.

Segui, L.-S. (2025). Africa's AI skills landscape revealed in new SAP report. [online] African Media Agency. Available at: <https://africanmediaagency.com/africas-ai-skills-landscape-revealed-in-new-sap-report/> [Accessed 1 Jul. 2025].

Uzoka, A., Cadet, E. and Ojukwu, P.U. (2024). Leveraging AI-Powered chatbots to enhance customer service efficiency and future opportunities in automated support. Computer Science & IT Research Journal, [online] 5(10), pp.2485–2510. doi:<https://doi.org/10.51594/csitrj.v5i10.1676>.