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ARTIFICIAL INTELLIGENCE ADOPTION AND COMPETITIVE PERFORMANCE OF E-COMMERCE BUSINESSES IN THE DIGITAL ECONOMY

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Abstract

Artificial intelligence (AI) has emerged as a strategic tool for improving operational efficiency, strengthening customer experience, and enhancing the competitive advantage of e-commerce businesses in the contemporary digital economy. This study examined AI adoption and competitive performance of e-commerce businesses in the digital economy. The study investigated the factors influencing AI adoption in e-commerce businesses and examined the relationship between AI adoption and competitive performance of e-commerce businesses. The study employed survey research design which involves the use of structured questionnaire to collect data. The selection of the participants was based on purposive sampling technique. 57 copies of questionnaire were administered to Nigerian e-commerce business owners and managers; 50 copies were dully filled and considered valid for the purpose of this research. The data collected were analysed using descriptive statistics and Pearson Product Moment Correlation on Statistical Package for Social Sciences (SPSS) software, version 25. The findings revealed that perceived usefulness (mean = 3.82) and technical support (mean = 3.32) were the major technological factors influencing AI adoption in e-commerce businesses, management support (mean = 3.84) and employee technical competence (mean = 3.82) were the leading organisational factors influencing AI adoption in e-commerce businesses, while customer demand (mean = 3.88) and competitive pressure (mean =3.62) were the dominant environmental drivers of AI adoption in e-commerce businesses. Moreover, among the three categories of factors considered, organisational factors (grand mean = 3.64) emerged as the most influential in determining AI adoption among e-commerce businesses.

Keywords: Artificial Intelligence, Adoption, Artificial Intelligence adoption, Competitive performance, E-commerce businesses, Digital economy

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Furthermore, AI adoption had a significant moderate positive relationship ($r = 0.520^{**}$, $p = 0.000$) with competitive performance. The study concludes that effective AI adoption can enhance the competitive performance of e-commerce businesses in the study area. Thus, the study recommends that e-commerce businesses should prioritise management involvement, employee training, and internal technical capacity while investing in appropriate AI technologies and responding to evolving customer needs.

Introduction

Artificial intelligence (AI) refers to a set of system-based activities that emulate human actions and capabilities while employing more efficient and accurate procedures to facilitate problem-solving and support decision-making (Saleem et al., 2024). AI tools enable businesses and organisations to harness and analyse large volumes of data, thereby accelerating business processes and generating timely information to support effective and informed decision-making (Kushwaha et al., 2021; Sestino & De Mauro, 2022). Furthermore, AI tools can analyse customer data to generate valuable insights that assist organisations in making strategic decisions based on diverse sources of information (Verma et al., 2021).

E-commerce refers to the range of commercial activities involving the purchase and sale of goods, as well as the provision of various services through the internet (Leonard, 2012). E-commerce significantly enhances business performance when appropriate strategies and tools are effectively employed (Arinaitwe, 2025). Therefore, as more businesses shift to digital platforms, competition becomes intensified, prompting e-commerce companies to implement innovative strategies and technological tools that boost operational efficiency and reinforce their competitive edge. Among the technologies implemented by e-commerce businesses is AI. AI adoption in e-commerce businesses involves the integration and utilisation of AI-powered applications to streamline operations and enhance customer service (Zhu & Abd Rozan, 2026). Such application domains include AI-driven recommendation systems, personalised content and marketing, virtual assistants and chatbots, supply chain and warehouse automation, and security and fraud detection systems (Kumar & Rajan, 2020; Papastamoulou & Antonopoulos, 2025). By examining customers' interactions with products through their clicks, AI tools can generate personalised recommendations that align with their preferences and needs (Sharma et al., 2021). Likewise, AI in e-commerce helps increase sales, predict sales trends, strengthen security, detect and prevent fraudulent activities, streamline and automate business operations, and improve the management of essential website services (Pallathadka et al., 2023). Additionally, AI-powered chat platforms can respond to customer enquiries efficiently, enabling companies to provide timely assistance and improve their responsiveness (Gupta et al., 2024).

AI tools in e-commerce enable businesses to influence customers' purchasing decisions by recommending suitable offers, developing effective promotional strategies, and responding to customer enquiries quickly, accurately, and conveniently (Alkudah & Almomani, 2024). Furthermore, AI tools enable businesses to maximise value and gain a competitive advantage by reducing human errors, analysing customer data to generate actionable insights, and delivering efficient, responsive, and personalised services, thereby improving competitive performance

(Aljarboa, 2024). On the other hand, competitive performance refers to the extent to which a firm achieves its business objectives relative to its major competitors in the industry (Mikalef et al. 2020; Rai & Tang, 2010). Meanwhile, firms' competitive performance can be assessed based on their profitability, market share growth, business expansion, and innovation capabilities (Mikalef et al. 2020; Rai & Tang, 2010). Profitability and market share reflect a firm's financial returns and competitive position, respectively (Hoskins & Carson, 2022), business growth involves increased sales, customer expansion, and market penetration, while innovativeness entails developing new products, services, processes, and management practices (Tuominen et al., 2023). In the digital economy, competitive performance depends on how effectively firms utilise technological resources to create value, meet evolving customer needs, and achieve competitive advantage.

Aljarboa (2024) established that AI adoption extends beyond a purely technological decision, as it is significantly influenced by organisational capabilities, perceived risks, and firm size. From the technological perspective, perceived usefulness and ease of use are important determinants of users' willingness to embrace new technologies (Davis, 1989; Loo & Liu, 2025). The perception that AI is easier to operate improves operational efficiency, and delivers greater customer value plays a significant role in shaping investment decisions. Similarly, The Diffusion of Innovations Theory identifies compatibility with existing systems and the costs associated with technology integration as factors that may hinder adoption (Rogers, 2003). Moreover, organisational readiness, reflected in the availability of technological resources, financial capacity, size and operational capacity, and management commitment, influences the successful adoption and implementation of AI within businesses (Loo & Liu, 2025; Tornatzky & Fleischer, 1990). Furthermore, external environmental factors, such as competitive pressures, changing consumer expectations, and the need to comply with regulatory requirements, also influence organisations' decisions to adopt AI technologies (Loo & Liu, 2025; Zhu et al., 2006).

Against this background, this study examined artificial intelligence adoption and the competitive performance of e-commerce businesses in the digital economy. Specifically, the study considered AI adoption through recommendation systems, personalised content and marketing, virtual assistants and chatbots, supply chain and warehouse automation, and security and fraud detection. It further examined competitive performance in terms of profitability, market share, business growth, innovativeness, and customer satisfaction. By investigating the relationship between these constructs, and examining the factors influencing AI adoption in e-commerce businesses, this study seeks to contribute to a better understanding of how AI adoption can support competitive positioning and sustainable business performance in an increasingly technology-driven marketplace. The findings are expected to provide useful insights for e-commerce business owners, managers, and policymakers.

Statement of the Problem

The rapid evolution of digital technologies has heightened competition among e-commerce businesses, increasing the importance of effectively leveraging technological innovations to ensure business sustainability, expansion, and competitive advantage (Sharma et al., 2021). Within the digital economy, e-commerce businesses face a constantly evolving business environment characterised by shifting consumer preferences, rising customer expectations, fluctuating market

conditions, and the growing demand for operational efficiency (Sugiardi et al., 2025). Hence, in the digital economy, AI technologies including recommendation systems, chatbots, predictive analytics, automated inventory management, fraud detection, personalised marketing, and demand forecasting are increasingly being employed by e-commerce businesses to improve operational efficiency, reduce costs, enhance customer satisfaction, support better decision-making, and strengthen their position in the competitive market (Kumar & Rajan, 2020; Papastamoulou & Antonopoulos, 2025).

However, the mere availability and adoption of AI do not necessarily guarantee improved business performance or sustained competitive performance; organisational capabilities, management support, adequate digital infrastructure amongst others must be in place (Dong, 2026). Another determinant of AI adoption is firm size; while large and well-established e-commerce businesses may possess the financial resources, technical expertise, data infrastructure, and human capital required to implement AI effectively, small and medium-sized e-commerce businesses often face significant barriers such as high implementation costs, inadequate digital infrastructure, limited access to skilled personnel, concerns about data privacy and cybersecurity, poor-quality data, resistance to organisational change, and uncertainty regarding the measurable returns from AI investments (Jakkula, 2022).

Despite the potential benefits accrued to AI adoption in e-commerce businesses, the adoption of AI among e-commerce businesses remains uneven. Although existing studies have examined AI applications, digital transformation, and technology adoption in e-commerce businesses (Aljarboa, 2024; Fonseka et al., 2022; Zhu & Abd Rozan, 2026), further empirical investigation is needed to establish how the adoption of specific AI applications relates to the competitive performance of e-commerce businesses within their particular operating contexts. Furthermore, there is limited evidence on how organisational factors, technological factors, and environmental factors influence AI adoption in e-commerce businesses. As a result of this, this study examined artificial intelligence adoption and competitive performance of e-commerce businesses in the digital economy using Nigeria as the study area.

Objectives of the Study

The general objective of the study is to examine artificial intelligence adoption in e-commerce businesses with a view to improving their competitive performance in the digital economy.

The specific objectives are to:

i. assess the factors influencing artificial intelligence adoption in e-commerce businesses; and
ii. examine the relationship between artificial intelligence adoption and competitive performance of e-commerce businesses in the digital economy.

Artificial Intelligence (AI)

Artificial intelligence (AI) encompasses systems designed to perform tasks that typically require human intelligence, using efficient and accurate methods to solve problems and support decision-making (Saleem et al., 2024). Organisation for Economic Co-operation and Development (2019) conceptualised AI as a machine-based system that can generate predictions, recommendations,

and decisions within real or virtual environments to achieve objectives established by humans. Such systems receive inputs from machines or humans, interpret and represent real or virtual environments through automated processes, and apply forms of reasoning to generate possible courses of action or information (Yeung, 2020).

Artificial Intelligence Adoption

AI adoption in e-commerce involves integrating AI-powered technologies into business operations to improve efficiency, customer service, and business performance through applications such as recommendation systems, personalised marketing, chatbots, automated logistics, and fraud detection (Kumar & Rajan, 2020; Papastamoulou & Antonopoulos, 2025; Zhu & Abd Rozan, 2026). AI adoption in e-commerce enhances operational efficiency, customer segmentation, logistics, and competitiveness by enabling businesses to analyse data, identify market opportunities, and develop effective marketing strategies (Bawack et al., 2022; He & Lui, 2024; Kumar & Rajan, 2020).

AI for Recommendation Systems and Personalisation

AI improves customer experience, particularly through personalised services and recommendation systems. Personalisation has become a fundamental element of effective human–technology interactions, while recommendation systems have transformed the ways users discover, evaluate, and access relevant content, products, and services; the systems utilise advanced algorithms to process large volumes of data, identify complex patterns, and adapt in real time to users' preferences and behavioural changes (Jadiga, 2025). E-commerce businesses increasingly integrate recommendation systems and personalisation in their business operations. For example, platforms such as Amazon and Netflix utilise AI-powered recommendation systems to enhance user engagement and customer satisfaction, thereby contributing to improved business performance. Gunawan and Suroso (2025) highlighted the role of AI-driven personalisation strategies in strengthening customer engagement and loyalty, while Yin et al. (2025) demonstrated that personalised recommendations can significantly enhance consumers' purchase intentions by increasing their perception of product relevance.

AI Virtual Assistants and Chatbots

AI chatbots are used in e-commerce to respond to customer enquiries, track orders, provide technical assistance, support payment transactions, and communicate shipping and delivery information (Gupta et al., 2024), while AI virtual assistants represent a significant category of Question Answering Systems (QASs), having advanced from basic information retrieval tools into sophisticated interactive technologies capable of engaging users in dynamic conversations (Biancofiore et al., 2025). Chetana (2024) emphasised that chatbots and virtual assistants in e-commerce can enhance customer engagement through personalised interactions, prompt responses, continuous service availability, and automated handling of routine customer enquiries. Similarly, Adeleye and Omonori (2026) noted that AI-powered chatbots improve customer satisfaction, trust, and loyalty while also enhancing competitive advantage and customer retention.

AI in Supply Chain and Warehouse Automation

Conventional supply chain models are facing growing pressure from escalating operating costs, fluctuating demand, and disruptions caused by geopolitical conflicts, pandemics, and climate-related events (Panya & Marendi, 2025). Thus, AI offers the potential to automate processes, improve operational efficiency, and enhance the security of global supply chain operations. AI improves supply chain agility by facilitating real-time tracking of suppliers, transportation networks, and customer demand. This enables businesses to respond flexibly to unexpected disruptions while minimising operational inefficiencies and reducing environmental impacts (Olowonigba, 2025). In a similar vein, AI enhances warehouse automation by improving inventory control, accelerating order fulfilment, streamlining picking routes, improving the allocating storage locations, and increasing visibility across supply chain operations (Sodiya et al., 2024). Punukollu et al. (2022) emphasised that AI-powered warehouse automation enhances operational efficiency, reduces labor costs, and improves order accuracy.

AI in Security and Fraud Detection

As digital transactions increasingly shape the global economy, fraud detection has become essential for safeguarding financial systems and ensuring transaction security. AI-powered models analyse behavioral patterns, transaction histories, and external factors to dynamically assess fraud, thereby improving the accuracy of fraud detection and minimising financial losses by identifying unusual transaction patterns in real time (Kim & Kim, 2025). Uddin (2026) noted that AI fraud detection helps identify and stop unauthorised or suspicious activity across the payment ecosystem in real time. For each transaction, a risk score is generated, typically ranging from 0 (low risk) to 99 (high risk). This score helps merchants and payment providers make fast, accurate decisions about whether to approve, challenge or decline a transaction.

Competitive Performance

Competitive Performance (CP) refers to the extent to which a firm outperforms its major competitors across areas that are essential to maintaining and strengthening its competitive position (Mikalef et al. 2020; Rai & Tang, 2010). European Commission (2018) conceptualised competitive performance as a firm's historical and current performance within its market which is influenced by both internal organisational factors and external environmental conditions, such as regulatory frameworks, infrastructure availability, educational development, and the monetary environment. Mikalef et al. (2020) established that competitive performance can be measured in terms of profitability, market share, business growth, and innovativeness.

Profitability

Profitability refers to a firm's ability to generate net income from its business operations. Unlike profit, which measures earnings in absolute terms, profitability assesses earning capacity relative to the resources employed and operational efficiency (Sarngadharan & Rajitha, 2011). It indicates a firm's financial performance and its potential for improvement. Therefore, company profitability can be understood as a firm's ability to generate net income from its business operations within a given accounting period.

Market Share

Market share refers to the proportion or percentage of total industry sales captured by a company or organisation within the market in which it operates (Corporate Finance Institute, 2019). It indicates a firm's competitive position relative to other businesses operating in the same market. Market share reflects the outcome of a firm's marketing activities, including advertising and promotional strategies, the quality and pricing of its products or services, distribution channels, customer relationships, and sales efforts (Farris et al., 2010). A higher market share suggests that a business has captured a larger proportion of market demand than its competitors.

Business Growth

Business growth refers to a significant increase in a firm's net profits, assets, and sales (Funk, 2022). Absanto and Nnko (2013) described business growth as the gradual expansion of a company's size, revenue, market presence, and operational capabilities over time. Furthermore, business growth indicates a firm's capacity to sustain its operations, respond to changing market conditions, and take advantage of emerging business opportunities.

Innovativeness

Rogers (1962) defined innovativeness as the extent to which an individual or another unit of adoption adopts new ideas earlier than other members of a social system. From the context of an organisation, innovativeness is defined as an organisation's propensity or willingness to innovate, reflecting its tendency to develop, adopt, or implement new ideas, technologies, products, services, or processes to improve its performance and competitiveness (Arru et al., 2026). Innovation is widely regarded as a key driver of strategic change, enabling firms to generate positive outcomes, strengthen their competitive position, and achieve a sustained competitive advantage (Salavou, 2004; Syahnur, 2024).

Customer Satisfaction

Customer satisfaction refers to the consumer's evaluation of the extent to which a product or service fulfils their expectations and provides a sense of fulfilment following the decision to purchase and use it (Guido, 2015). Kim and Forsythe (2018) conceptualised customer satisfaction as a psychological state arising from customers' cognitive and emotional evaluations of a product or service in relation to their expectations. When a product or service performs beyond customers' expectations, it generates delight and enhances satisfaction (Nasir & Karakaya, 2024). In contrast, performance that falls below expectations leads to customer dissatisfaction. Moreover, Isihak et al. (2024) noted that investment in modern technologies, user-friendly interfaces, secured payment systems, and efficient delivery services enhances customers' online shopping experiences, thereby increasing customer satisfaction and strengthening competitive positioning of businesses.

Theoretical Review

The underpinning theories for this study are Resource-Based View (RBV) and Technology–Organisation–Environment (TOE) Framework. The RBV explains how firms' resources and

capabilities can translate AI adoption into improved competitive performance, while The TOE framework explains the contextual factors influencing AI adoption. Their integration provides a comprehensive theoretical foundation for examining both the determinants of AI adoption and its implications for the competitive performance of e-commerce businesses.

The Resource-Based View

The Resource-Based View (RBV), developed by Wernerfelt (1984) and further advanced by Barney (1991), explains that a firm's competitive advantage and performance depend on its possession and effective utilisation of valuable, rare, inimitable, and non-substitutable (VRIN) resources. In the context of this study, the theory suggests that AI technologies can enhance business performance when effectively combined with organisational resources, including financial capital, digital infrastructure, employee expertise, and managerial capabilities. E-commerce businesses that strategically deploy AI applications for personalised marketing, recommendation systems, customer service, supply chain automation, and fraud detection may achieve improved profitability, market share, growth, innovativeness, and customer satisfaction. Therefore, the RBV provides a theoretical basis for explaining how the effective utilisation of AI-related resources can contribute to competitive performance of e-commerce businesses.

The TOE Framework

The Technology–Organisation–Environment (TOE) framework, developed by Tornatzky and Fleischer (1990), explains technology adoption through three contextual dimensions: technological, organisational, and environmental factors. In relation to this study, the technological context encompasses perceived usefulness, ease of use, compatibility, and availability of technical support; the organisational context includes financial resources, management support, size and operational capacity, and employee digital skills; while the environmental context involves competitive pressure, customer expectations, government regulations, and industry trends. These factors may influence the extent to which e-commerce businesses adopt AI technologies and integrate them into their operations. Therefore, The TOE framework provides a suitable basis for identifying the determinants of AI adoption among e-commerce businesses in the digital economy.

Empirical Review

Abaddi (2024) examined the factors influencing artificial intelligence (AI) adoption intention among micro, small and medium-sized enterprises (MSMEs) in Jordan. The study was grounded in the Technology–Organisation–Environment (TOE) framework and investigated the moderating effects of innovation culture, employee digital skill level and market competition on the relationships between the identified factors and AI adoption intention. Data were collected through a survey of 537 MSME owners and managers and analysed using partial least squares structural equation modelling (PLS-SEM). The findings revealed that business innovativeness, management support, perceived benefits and technological infrastructure had positive and statistically significant effects on AI adoption intention. However, perceived costs did not have a statistically significant effect. The results further indicated that innovation culture, employees'

digital skills and market competition moderated selected relationships between the explanatory factors and AI adoption intention. These findings suggest that AI adoption is influenced not only by the perceived benefits and technological readiness of a business but also by its internal organisational culture, employees' capabilities and competitive environment.

Aljarboa (2024) investigated factors influencing the adoption of artificial intelligence tools in e-commerce among small and medium-sized enterprises. The study adopted an integrated conceptual model grounded in the dynamic capabilities framework, entrepreneurial orientation, and customer-centric management systems. Data were collected through an online questionnaire administered to 183 decision-makers and officials in e-commerce SMEs in Saudi Arabia. The data were analysed using structural equation modelling (SEM). The findings revealed that dynamic capabilities and entrepreneurial orientation significantly influenced AI adoption, while AI adoption had a significant positive relationship with SMEs' business performance. However, customer-centric management systems did not receive significant empirical support as a determinant of AI adoption.

In another study, Dong (2026) examined the relationship between AI adoption and employee performance in SMEs using a thematic analysis of secondary evidence. By synthesising existing evidence, the study provided insights into the potential role of AI in transforming workplace activities and improving organisational outcomes. The study further highlighted that the benefits of AI adoption depend on employees' digital skills, management support, employee trust, ethical governance, and the redesign of work processes. These findings suggest that access to AI tools alone may not guarantee improved performance; rather, organisations need appropriate capabilities and supportive working conditions to translate AI adoption into measurable benefits.

Similarly, Fonseka et al. (2022) investigated the impact of e-commerce adoption on business performance of SMEs in Sri Lanka, with artificial intelligence examined as a moderating variable. The study employed a quantitative research design, collecting data from 389 senior managers selected through simple random sampling. Drawing on Porter's generic strategies and the resource-based view (RBV), the researchers investigated the relationship between e-commerce adoption and business performance, with AI incorporated as a moderating variable. The findings revealed that e-commerce adoption and the moderating variable (AI) significantly influenced business performance. The study also established that managers' demographic characteristics, including age, gender, educational level, and job position, influenced their perceptions.

Kumar and Rajan (2020) reviewed the role of artificial intelligence in e-commerce, focusing on the ways AI technologies can support online business operations and customer interactions. The study highlighted the relevance of AI applications in supporting personalised product recommendations, enhancing customer engagement, and improving the efficiency of e-commerce activities These applications suggest that AI can contribute to operational efficiency, customer satisfaction, and improved business performance in e-commerce.

Moreover, Loo and Liu (2025) examined the technological, organisational, and environmental factors influencing AI adoption among e-commerce SMEs in Shandong Province, China. The study employed a quantitative questionnaire-based approach, reporting a survey involving 305 SMEs. Findings indicated that perceived usefulness and ease of use were particularly influential technological factors, while financial resources, skilled personnel, and top-management support

contributed to organisational readiness. Competitive pressure and customer demand were also identified as external drivers of AI adoption. High implementation costs and shortages of skilled personnel remained important barriers.

Pallathadka et al. (2023) examined the applications of artificial intelligence (AI) and machine learning across business management, e-commerce, and finance. The study employed a literature review approach to discuss how AI technologies support sales forecasting, inventory management, fraud detection, customer service, supply chain efficiency, and profit maximisation. The authors highlighted the potential of AI to improve operational efficiency, enhance customer experiences, support business decision-making, and facilitate cost-effective business operations. These findings suggest that AI adoption can create value for e-commerce businesses by improving operational processes and strengthening their capacity to respond to customer needs.

Furthermore, Papastamoulou and Antonopoulos (2025) investigated AI applications across five major digital commerce platforms: Amazon, Apple, Shein, Temu, and IKEA. The researchers adopted a two-stage qualitative approach involving a literature review organised around Scopus-indexed research and a walkthrough examination of the companies' websites. Their analysis considered six AI functions: virtual assistants and chatbots, warehouse automation, content personalisation, automated content creation, recommendation systems, and fraud detection or security tools. The findings revealed variations in AI implementation across the platforms, particularly in recommendation systems, personalised content and marketing, virtual assistants and chatbots, warehouse automation, and automated content generation. Also, the findings highlighted differences in AI deployment strategies associated with firms' business models and levels of digital maturity, with Amazon demonstrating extensive integration across customer-facing and operational functions. The study provided useful insights into how AI can support operational efficiency, customer engagement, and strategic differentiation in digital commerce.

The reviewed studies reveal several gaps in the literature on artificial intelligence (AI) adoption and the competitive performance of e-commerce businesses. First, a conceptual gap exists because previous studies have focused mainly on AI adoption determinants and general business outcomes rather than directly examining AI adoption as a predictor of competitive performance. Second, an outcome measurement gap arises from the limited attention given to specific competitive performance indicators, particularly profitability, market share, business growth, innovativeness, and customer satisfaction. Third, a methodological gap exists because several studies reviewed rely on literature reviews, qualitative approaches, and secondary data, with limited quantitative testing of the relationship between AI adoption and competitive performance using primary data. Fourth, a contextual gap reflects the concentration of previous studies in countries such as Jordan, Sri Lanka and China, limiting the applicability of their findings to Nigeria. Finally, an AI application gap concerns the limited empirical evidence linking specific AI applications, including recommendation systems, personalised marketing, chatbots, supply chain automation, and fraud detection, to measurable competitive outcomes.

To address these gaps, this present study quantitatively examined the relationship between AI adoption and competitive performance. By linking specific AI applications to profitability, market share, business growth, innovativeness, and customer satisfaction within the study's geographical

context, the research seeks to provide empirical evidence on how AI adoption relates to the competitive position of e-commerce businesses in Nigeria.

Methodology

This study adopted a survey research design which involves the use of structured questionnaire for data collection. 57 copies of questionnaire were administered to Nigerian e-commerce business owners and managers. The selection of the participants was based on purposive sampling technique. The questionnaire was divided into three sections. Section A assessed the application domains through which AI adoption in e-commerce can be measured (recommendation systems, personalised content and marketing, virtual assistants and chatbots, supply chain and warehouse automation, and security and fraud detection), section B assessed competitive performance of e-commerce businesses using profitability, market share, growth, innovativeness, and customer satisfaction as its dimensions, while section C assessed factors influencing the adoption of AI in e-commerce business using TOE framework (Technological Factors, Organisational Factors, and Environmental Factors). The indicators for each of the construct employed a 5-point Likert scale ranging from strongly disagree to strongly agree, where 1 = strongly disagree, 2 = disagree, 3 = moderately agree, 4 = agree, 5 = strongly agree. The data collected were analysed using descriptive statistics and Pearson Product Moment Correlation on Statistical Package for Social Sciences (SPSS) software, version 25.

Response Rate

A total of 57 copies of questionnaire were administered among the respondents; 50 copies were dully filled and considered valid for the purpose of this research.

Factors Influencing AI Adoption in E-commerce Businesses

Table 1 shows the descriptive analysis carried out to assess the factors influencing AI adoption in e-commerce businesses in the study area. From the results of technological factors, the perceived usefulness of AI recorded the highest mean score of 3.82, ranking first and indicating high influence. This finding suggests that respondents consider the potential benefits of AI, such as improved operational efficiency, enhanced customer experience, and better decision-making, to be important motivations for AI adoption. The availability of technical support ranked second with a mean of 3.32, indicating a moderate influence. This implies that access to technical assistance is a relevant consideration when businesses decide whether to adopt AI technologies. The ease of using AI technologies recorded a mean of 3.20, ranking third and indicating a moderate influence. This suggests that usability considerations matter, although they may not be as influential as the perceived benefits of AI. Compatibility with existing technological systems ranked fourth, with a mean of 3.08, indicating a moderate influence. This implies that compatibility is a consideration in AI adoption, but respondents rated it lower than the other technological factors. Overall, the findings indicate that the perceived usefulness of AI and the availability of technical support are the leading technological drivers influencing AI adoption.

From the results of organisational factors, top management support recorded the highest mean score of 3.84, ranking first with a high influence. This finding suggests that management

commitment is particularly important in encouraging AI adoption. Senior managers can facilitate adoption by providing strategic direction, allocating resources, supporting staff training, and creating an organisational environment that encourages technological innovation. The availability of employees with relevant technical skills ranked second, with a mean of 3.82, indicating a high influence. This suggests that respondents recognise the importance of having personnel capable of implementing, operating, and managing AI technologies. The result highlights the potential role of employee competence in translating AI investments into practical organisational benefits. Adequate financial resources recorded a mean of 3.54, ranking third with a high influence. This implies that financial capacity is an important consideration in AI adoption, particularly because implementing AI may require investment in software, infrastructure, staff development, and ongoing maintenance. The size and operational capacity of the organisation ranked fourth, with a mean of 3.34, indicating a moderate influence. This suggests that organisational size and operational capacity are relevant but comparatively less influential than management support, technical skills, and financial resources. Overall, the results demonstrate that management support and employee technical competence are the leading organisational considerations influencing AI adoption. This finding suggests that successful AI adoption requires not only investment in technology but also leadership commitment and the availability of personnel with the necessary skills.

From the results of environmental factors, customer demand for AI-enabled services recorded the highest mean score of 3.88, ranking first with a high influence. This finding suggests that customer expectations are a major external driver of AI adoption. E-commerce businesses may adopt AI to provide personalised recommendations, faster customer support, tailored marketing, and more responsive online shopping experiences. competitive pressure from other e-commerce businesses ranked second, with a mean of 3.62, indicating a high influence. This suggests that businesses may adopt AI to maintain their competitive position, improve service delivery, increase operational efficiency, and respond to technological innovations introduced by competitors. Industry trends recorded a mean of 3.14, ranking third with a moderate influence. This implies that developments within the e-commerce industry influence AI adoption, although their perceived influence is lower than that of customer demand and competitive pressure. Government policies and regulations ranked fourth, with a mean of 3.02, indicating a moderate influence. This suggests that government policies and regulatory requirements are considered in AI adoption decisions but were rated as less influential than customer demand, competitive pressure, and industry trends. Overall, the findings indicate that customer demand and competitive pressure are the dominant environmental drivers of AI adoption. This suggests that e-commerce businesses may be more responsive to immediate market expectations and the need to remain competitive than to government regulations or general industry trends.

Considering the ranking of the categories of the factors influencing AI adoption in e-commerce businesses, organisational factors recorded a grand mean of 3.64, ranking first among the three categories of factors examined. This indicates that organisational conditions constitute the most influential category of factors affecting AI adoption among the e-commerce businesses surveyed. Environmental factors recorded a grand mean of 3.42, ranking second among the three categories. This indicates that external conditions, particularly customer expectations and competitive

pressures, play an important role in influencing AI adoption among e-commerce businesses in the study area. Also, technological factors influence AI adoption among e-commerce businesses, with a grand mean of 3.36, ranking third among the three categories of factors examined. This suggests that although technological considerations are relevant to AI adoption, they are less influential category of factors affecting AI adoption among the e-commerce businesses in the study area.

In summary, among the three categories of factors examined, organisational factors are the most influential considerations in AI adoption among the e-commerce businesses in the study area. The ranking of organisational factors as the most influential determinant of AI adoption suggests that the internal capabilities and preparedness of e-commerce businesses play a critical role in their decisions to implement AI technologies.

Table 1: Descriptive Statistics on Factors Influencing AI Adoption in E-commerce Businesses

Statement	Mean	STD. D.	Rank	Decision
Technological Factors				
The perceived usefulness of AI encourages our organisation to adopt AI technologies.	3.82	0.438	1st	High
The ease of using AI technologies influences our decision to adopt them.	3.20	0.699	3rd	Moderate
The compatibility of AI with our existing technological systems influences our adoption decision.	3.08	0.396	4th	Moderate
The availability of technical support influences our organisation's adoption of AI.	3.32	0.513	2nd	Moderate
Grand Mean	**.36**		**3rd**	
Organisational Factors				
Top management support encourages our organisation to adopt AI.	3.84	0.422	1st	High
Our organisation has adequate financial resources to support AI adoption.	3.54	0.788	3rd	High
The availability of employees with relevant technical skills influences AI adoption.	3.82	0.438	2nd	High
The size and operational capacity of our organisation influence its ability to adopt AI.	3.34	0.557	4th	Moderate
Grand Mean	**3.64**		**1st**	
Environmental Factors				
Government policies and regulations influence our adoption of AI.	3.02	0.769	4th	Moderate
Trends within the e-commerce industry influence our decision to adopt AI.	3.14	0.670	3rd	Moderate
Competitive pressure from other e-commerce businesses encourages AI adoption.	3.62	0.490	2nd	High
Customer demand for AI-enabled services influences our adoption of AI.	3.88	0.479	1st	High
Grand Mean	**3.42**		**2nd**	

Decision Rule: 4.50 – 5.00 = Very High; 3.50 – 4.49 = High; 2.50 – 3.49 = Moderate; 1.50 – 2.49 = Low; 1.00 – 1.49 = Very Low

Source: Researcher's field survey (2026)

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Relationship between AI Adoption and Competitive Performance of E-commerce Businesses

Table 2 shows the correlation analysis of AI adoption and competitive performance of e-commerce businesses. It was found that AI adoption has a significant moderate positive correlation (r = 0.520**, p = 0.000) with competitive performance of e-commerce businesses. This suggests that higher levels of AI adoption tend to be associated with stronger competitive performance among the e-commerce businesses in the study area.

Table 2: Pearson Correlation Analysis for AI Adoption and Competitive Performance of E-commerce Businesses

Variables		Competitive Performance of E-commerce Business	AI Adoption
Competitive Performance of E-commerce Business		1	0.520**
	Sig. (2-tailed)		0.000
AI Adoption		0.520**	1
	Sig. (2-tailed)	0.000	

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

Source: Researcher's field survey (2026)

Discussion of Findings

In respect to the factors influencing AI adoption in e-commerce businesses, the findings indicate that technological, organisational, and environmental factors influence AI adoption among e-commerce businesses; with management support and employee technical competence emerging as the most influential organisational considerations, perceived usefulness and technical support as the leading technological drivers, and customer demand and competitive pressure as the dominating environmental factors. The findings are consistent with Abaddi (2024) and Loo and Liu (2025), whose studies similarly identified perceived benefits, management support, skilled personnel, customer demand, and competitive pressure as important determinants of AI adoption. The convergence of these findings across different geographical contexts supports the relevance of the Technology–Organisation–Environment (TOE) framework in explaining AI adoption among e-commerce businesses. However, this present study highlights the particular importance of organisational readiness, suggesting that management commitment and employee competence are essential for translating technological benefits and external pressures into effective AI implementation.

Concerning the relationship between AI adoption and competitive performance of e-commerce businesses, findings revealed a significant moderate positive relationship between AI adoption and competitive performance of e-commerce businesses. The finding is consistent with Mikalef and Gupta (2021), who established that AI capabilities contribute positively to organisational creativity and firm performance when effectively integrated into business processes. Similarly, it aligns with

Fonseka et al. (2022), who found that e-commerce adoption significantly influences SMEs business performance, with AI playing a relevant role. Collectively, these studies support the view that effective integration of AI and digital technologies can enhance operational efficiency, improve organisational outcomes, and strengthen the competitive performance of e-commerce businesses.

Conclusion

The study examined AI adoption and the competitive performance of e-commerce businesses in the digital economy. The findings revealed that perceived usefulness and technical support were the major technological factors influencing AI adoption, management support and employee technical competence were the leading organisational factors influencing AI adoption, while customer demand and competitive pressure were the dominant environmental drivers of AI adoption. Moreover, amongst the three categories of factors considered, organisational factors emerged as the most influential considerations in AI adoption among e-commerce businesses. Furthermore, AI adoption had a significant moderate positive relationship with competitive performance of e-commerce businesses. The study concludes that effective AI adoption can enhance the competitive performance of e-commerce businesses in the study area. However, achieving these benefits requires adequate technical support, management commitment, skilled employees, and responsiveness to customer needs and competitive pressures.

Recommendations

Following the outcome of this study and the conclusion, the following recommendations are thereby proffered:

i. E-commerce businesses should prioritise management involvement, employee training, and internal technical capacity while investing in appropriate AI technologies and responding to evolving customer needs.
ii. E-commerce businesses should continuously monitor competitors' technological practices and market strategies to identify opportunities for innovation.
iii. E-commerce businesses should periodically assess the contribution of AI to profitability, market share, sales growth, customer satisfaction, and innovation performance to ensure that investments in AI generate measurable business value.

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