

Artificial Intelligence Competencies, Innovation, and Agility in E-Commerce Enterprises: A Structural Equation Modeling Approach

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Abstract:

The swift growth of digital commerce has heightened rivalry among online enterprises, necessitating the development of sophisticated technological and organizational competencies to maintain performance. This research investigates the impact of artificial intelligence (AI) competencies, firm innovativeness, and organizational agility on the performance of e-commerce businesses in El Oued, Algeria. A quantitative research design was employed to collect data via a structured survey administered to 123 e-commerce practitioners in the region. The gathered data were examined utilizing SPSS version 29 for descriptive statistics and preliminary analysis, and SmartPLS 4 for structural equation modeling to evaluate the proposed correlations. The findings demonstrate that AI competencies, and organizational agility have a significant positive effect on firm performance. However, firm innovativeness was insignificant.

The findings indicate that e-commerce enterprises that proficiently cultivate AI capabilities, promote creative practices, and sustain organizational agility are more likely to enhance operational efficiency, react to market fluctuations, and attain superior performance outcomes. This study enhances the literature by synthesizing technological and organizational skills into a cohesive framework to elucidate e-commerce business performance in a nascent digital economy. The findings offer significant insights for managers and policymakers aiming to enhance the technology preparedness and strategic competencies of e-commerce businesses in Algeria.

Keywords: AI Competencies, Firm Innovativeness, Organizational Agility, E-commerce Firm Performance, El-Oued

Jel classification Codes : M10 ; M31.

1. Introduction

E-commerce has profoundly altered the global business environment by allowing companies to broaden their market access, diminish operational obstacles, and enhance transaction efficiency via digital platforms. By utilizing internet-based technology, firms can reach wider client demographics, optimize supply chains, and deliver tailored services that improve customer happiness and retention. As a result, firm performance in the e-commerce sector—typically assessed by profitability, market share, operational efficiency, and consumer loyalty—has emerged as a primary focus for both academics and professionals (Mikalef et al., 2023). Notwithstanding the advantages presented by digital commerce, maintaining robust company performance is arduous due to fierce competition, swift technical advancements, and shifting consumer expectations. Enterprises in digital markets must continually cultivate new competencies and strategic assets to maintain competitiveness. These problems are especially pronounced in emerging economies, where inadequate technology infrastructure, logistical limitations, and legislative complications frequently obstruct the efficient development of e-commerce businesses (Badghish & Soomro, 2024).

The e-commerce business in Algeria has undergone consistent growth in recent years due to rising internet penetration, increased smartphone adoption, and the progressive advancement of digital payment technologies. The Algerian e-commerce sector has demonstrated considerable growth potential, indicating a wider transition towards online consumption and digital business. Nonetheless, despite this encouraging advancement, the viability and efficacy of numerous e-commerce enterprises continue to be precarious. Empirical evidence indicates that a significant percentage of online companies encounter difficulties in surviving their initial years of operation. Research demonstrates that over 60% of e-commerce startups fail within the initial two years due to factors including insufficient technological capabilities, ineffective logistics systems, low customer confidence in online transactions, and deficient digital strategies (BENMIR & Mesnadi, 2023; Diouani et al., 2023). The ongoing challenges underscore the necessity for a comprehensive grasp of the organizational and technological competencies that can improve the performance and long-term viability of e-commerce businesses.

Prior research on corporate success in digital and e-commerce contexts has investigated numerous technological and organizational factors. Research has emphasized the significance of big data analytics in refining organizational decision-making and augmenting business performance by allowing companies to derive important insights from extensive datasets and react adeptly to market fluctuations (Vitari & Raguseo, 2020). Other studies have examined the impact of social media technology use (SMTU) on firm performance, highlighting that effective utilization of social media platforms enhances customer relationship management capabilities and improves organizational performance outcomes (Foltean et al., 2019). Furthermore, previous studies have examined the influence of platform adoption and organizational commitment on the performance of e-commerce small and medium-sized enterprises (SMEs), indicating that firms that proficiently adopt digital platforms and allocate organizational resources to e-commerce endeavors are more inclined to attain superior performance (Ballerini et al., 2023). Although these studies offer significant insights into many technological and organizational determinants of firm performance, the current literature has

inadequately addressed other strategic qualities that may be equally crucial in digital business contexts. The functions of Artificial Intelligence (AI) Competencies, firm innovativeness, and organizational agility are notably underexamined regarding e-commerce firm performance. The scarcity of study establishes a significant void in the existing knowledge, underscoring the necessity for additional inquiry into the impact of these capabilities on the performance and competitiveness of e-commerce enterprises.

In recent years, emerging technologies, especially artificial intelligence (AI), have substantially influenced the strategic capacities of enterprises functioning in digital settings. AI technologies empower organizations to examine extensive data sets, automate decision-making processes, enhance operational efficiency, and tailor customer experiences. These talents enhance efficiency, foster innovation, and bolster strategic responsiveness within businesses (Mikalef et al., 2023; Huang & Rust, 2020). The successful adoption of AI in enterprises mostly hinges on the cultivation of AI skills, which denote the firm's capacity to efficiently deploy AI technologies, manage data resources, and integrate intelligent systems into business processes. Despite the increasing significance of AI in digital business contexts, empirical studies investigating the correlation between AI competencies and organizational performance—especially in the e-commerce sector of emerging economies—are still relatively scarce (Nadeem et al., 2020).

Alongside technological capabilities, organizational innovation is crucial in ascertaining the performance of organizations in dynamic digital markets. Firm innovativeness denotes an organization's ability to generate and execute novel ideas, products, services, or procedures that improve its competitive standing. Innovative companies are more adept at adjusting to fluctuating market situations, launching distinct products, and generating value for clients in swiftly transforming digital environments. Previous studies indicate that businesses exhibiting greater innovativeness tend to attain superior performance outcomes due to their capacity for continuous renewal of resources and capacities (Bilgihan & Wang, 2021). Nonetheless, the correlation between organizational innovativeness and e-commerce performance remains inadequately investigated, especially in emerging digital economies where innovation capacities may be hindered by technological and institutional constraints.

Another essential characteristic impacting company success in digital markets is organizational agility, defined as a firm's capacity to swiftly perceive environmental changes and adapt adeptly to emerging opportunities and challenges. In rapidly evolving sectors like e-commerce, agility allows companies to swiftly modify their strategies, technology, and operational procedures in reaction to changing consumer preferences, technological upheavals, and competitive pressures. Agile firms possess superior capabilities to adopt new technologies, modify their business models, and sustain operational flexibility in unpredictable situations (Badghish & Soomro, 2024). Although its significance in organizational theory is acknowledged, the impact of organizational agility on the performance of e-commerce firms is still inadequately examined, especially in conjunction with technology skills like AI competences and innovation capacity.

While prior research has explored technological adoption and digital transformation across diverse settings, there is a paucity of studies that concurrently analyze the synergistic impact of AI competencies, company innovativeness, and organizational agility on performance within the e-commerce industry. The absence of coordinated study results in a substantial deficiency in the

current corpus of knowledge. Previous study predominantly concentrated on singular technology instruments or operational elements, neglecting the examination of how internal organizational capacities combine to affect performance outcomes. Addressing this deficiency is crucial in nascent digital markets like Algeria, where enterprises must cultivate strategic competencies to compete effectively in swiftly changing technical landscapes.

In response to this research gap, the present study seeks to examine the influence of AI competencies, firm innovativeness, and organizational agility on the performance of e-commerce businesses. Specifically, the study aims to answer the following research. Therefore, the researcher posts the following research questions:

- (1) To what extent do AI competencies influence the performance of e-commerce firms?
- (2) How does firm innovativeness affect the performance of e-commerce firms?
- (3) What is the impact of organizational agility on the performance of e-commerce firms?

In line with these research questions, the study pursues the following research objectives:

- (1) To examine the effect of AI competencies on the performance of e-commerce firms.
- (2) To analyze the relationship between firm innovativeness and firm performance in the e-commerce sector.
- (3) To assess the influence of organizational agility on the performance of e-commerce firms.

This study contributes to the literature by integrating AI competencies, firm innovativeness, and organizational agility into a unified framework to explain firm performance within the context of e-commerce businesses. By addressing the limited empirical evidence regarding these capabilities in emerging digital markets, the research provides new insights into the strategic factors that support business sustainability and competitiveness. From a practical perspective, the findings are expected to offer valuable guidance for managers, entrepreneurs, and policymakers seeking to strengthen the technological and organizational capabilities of e-commerce firms. Ultimately, this study aims to enhance understanding of how firms can leverage advanced technologies and adaptive organizational strategies to achieve improved performance and long-term success in the digital economy.

2. Literature Review

2.1. Artificial Intelligence Competencies and Firm Performance

Artificial intelligence (AI) competences denote an organization's capacity to proficiently develop, integrate, and employ AI-related technology, resources, and talents to enhance organizational processes and strategic decision-making. These competences generally encompass data infrastructure, analytical proficiency, technological acumen, and managerial capacity to incorporate AI into commercial processes (Mikalef et al., 2023). From a capacity standpoint, AI competencies constitute a strategic organizational asset that empowers organizations to analyze extensive data sets, automate repetitive procedures, and produce insights that facilitate innovation and enhance decision-making (Chen et al., 2022). As digital technologies are increasingly integrated into organizational operations, the cultivation of AI competencies has become a critical element for companies aiming to attain competitive advantage in dynamic marketplaces.

Firm performance denotes the degree to which an organization attains its strategic objectives and

expected results. In business research, firm performance is typically assessed using both financial and non-financial metrics, including profitability, market share, operational efficiency, innovation results, and customer happiness. In digital business contexts like e-commerce, a firm's performance is significantly affected by its capacity to utilize technical skills to optimize operational procedures, elevate customer experience, and swiftly adapt to market fluctuations.

Recent research indicate that AI competencies significantly contribute to improving firm performance. Chen et al. (2022) discovered that AI skills substantially enhance business performance by augmenting organizational innovation, AI-driven decision-making, and management processes. Their findings demonstrate that companies that adeptly incorporate AI technology into their operations are more capable of producing new solutions and enhancing strategic decision-making, ultimately resulting in improved performance outcomes. Mikalef et al. (2023) established that AI competencies bolster organizational capacities, especially in marketing and analytics, hence improving organizational performance. These competencies enable organizations to enhance their comprehension of client behavior, refine marketing strategies, and augment operational efficiency.

H1: AI competencies have a significant positive effect on firm performance.

2.2. Relationship Between Firm Innovativeness and Firm Performance

Firm innovativeness denotes an organization's ability and readiness to implement novel ideas, goods, services, processes, or business practices that enhance its competitive standing in the market. It demonstrates the company's openness to innovation and its capacity to devise and execute unique solutions that provide value for customers and stakeholders (Rubera & Kirca, 2012).

In an organizational environment, innovativeness is regarded as a multifaceted capability that includes product innovation, process innovation, strategic innovation, and behavioral innovation within companies. These characteristics delineate how firms develop new products, enhance operational processes, implement innovative strategies, and foster creative thinking throughout organizational activities (Alpay et al., 2012).

A significant amount of research indicates that corporate innovativeness favorably affects organizational performance. The Schumpeterian perspective posits that innovation facilitates the establishment of transient competitive advantages for firms, enabling them to achieve above-average profits and enhance overall firm value (Rubera & Kirca, 2012).

Empirical studies regularly demonstrate a positive correlation between innovativeness and performance outcomes. Innovativeness improves a firm's market position by facilitating the creation of new products and services that address changing client demands, thereby boosting sales growth, market share, and customer pleasure. Simultaneously, innovative capabilities enhance a firm's financial performance by facilitating optimal resource usage, reducing costs, and differentiating it from competitors.

Moreover, innovation enhances companies' capacity to sustain long-term competitiveness in evolving marketplaces. Organizations that consistently implement creative solutions are more adept at adapting to technical changes and market uncertainties. Research demonstrates that companies

exhibiting greater innovativeness attain enhanced organizational success via increased marketing efficacy, fortified competitive posture, and augmented value creation (Alpay et al., 2012).

H2: Firm innovativeness positively influences firm performance.

2.3 Relationship Between Organizational Agility and E-commerce Firm Performance

Organizational agility is the capacity of organizations to promptly detect environmental changes and respond effectively by adapting their strategies, processes, and resources. It is indicative of a company's ability to remain adaptable and flexible in environments that are both dynamic and ambiguous (Lu & Ramamurthy, 2011).

In digital markets, such as e-commerce, organizational agility has become a critical capability that enables companies to adapt to changes in consumer preferences, technological advancements, and competitive pressures. According to Tallon and Pinsonneault (2009), agile organizations are more adept at modifying their business models, incorporating new technologies, and introducing innovative services that enhance their competitiveness.

In digital and e-commerce environments, there is an increasing corpus of literature that posits that organizational agility has a positive impact on firm performance. Agile organizations can enhance both financial and non-financial performance outcomes by rapidly adapting to market changes, incorporating emergent technologies, and consistently innovating their products and services (Sambamurthy, Bharadwaj, & Grover, 2003).

Organizational agility improves firm performance by facilitating the efficient reconfiguration of resources, improved responsiveness to customer requirements, and faster decision-making. In swiftly evolving online markets, firms that exhibit greater agility are more adept at introducing new digital services, optimizing operational processes, and maintaining competitive advantages (Roberts & Grover, 2012).

In the context of e-commerce, agility enables organizations to modify their online platforms, logistics systems, and customer service operations in response to evolving consumer behavior and technological advancements. This adaptability enhances operational efficiency, customer satisfaction, and overall business performance (Lu & Ramamurthy, 2011).

Empirical studies also suggest that organizational agility enhances firm performance by allowing organizations to capitalize on technological capabilities and transform them into competitive advantages in digital markets (Lin et al., 2020).

H3: Organizational agility positively influences e-commerce firm performance.

3. Methodology

3.1. Context of Study

This study investigates the e-commerce sector in El Oued, Algeria, with a particular emphasis on the ways in which businesses leverage social media technologies, big data analytics, and artificial intelligence (AI) competencies to improve their performance and competitiveness. The research examines the technological adoption and operational practices of the local digital economy, utilizing a sample of 124 e-commerce businesses. Algeria's e-commerce sector has expanded rapidly as a result of the growing adoption of digital technologies. By 2029, the average revenue per user (ARPU) is anticipated to increase by 18.86%, reaching 219.36 U.S. dollars, while the number

of e-commerce users is expected to increase by 32.72%, reaching approximately 9.35 million (Statista, 2024a; Statista, 2024b).

3.2. Design of the Research

The relationships between AI competencies, firm innovativeness, and organizational agility and firm performance among e-commerce businesses in El Oued are the focus of this study, which employs a quantitative research design and a survey method. The responses of e-commerce practitioners were captured using a structured questionnaire that was based on validated measurement scales and measured using a five-point Likert scale (Sekaran, 2016; Churchill & Iacobucci, 2006). In accordance with the study's objective of evaluating the impact of these technologies on firm performance, the unit of analysis comprises e-commerce enterprises that operate in El Oued and employ AI competencies, big data analytics, and social media technologies. The study employed a key informant approach, which focused on senior executives—preferably business owners or managers—who had a significant understanding of their organization's technological adoption and organizational performance. In order to guarantee dependable responses, respondents were required to have a minimum of three years of experience within their firms. Approximately 30 officially registered firms and an estimated 100–150 informal vendors conducting transactions through platforms such as OuedKniss, Facebook, and Instagram comprise the target population, which encompasses both formal and informal e-commerce businesses operating in El Oued (Malhotra, 2004). In light of the absence of a comprehensive registry of e-commerce practitioners, a non-probability convenience sampling technique was implemented (Zikmund et al., 2013). Participants were chosen based on their accessibility across online marketplaces and social media platforms in the region. 123 respondents, who represented both formal and informal sectors of the local e-commerce ecosystem, participated in the survey in total.

3.3. Measurement of Variables

The constructs used in this study were measured using previously validated scales adapted from prior literature to ensure reliability and validity. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Artificial Intelligence Competencies (AIC) (4 items) were measured using items adapted from Mikalef et al. (2023) and Chen et al. (2022), capturing the firm's ability to develop, integrate, and utilize AI technologies, data resources, and analytical capabilities in business operations and decision-making processes. Firm Innovativeness (FI) (3 items) was measured using items adapted from Wang and Ahmed (2004) and Alpay et al. (2012), reflecting the firm's tendency to support new ideas, experimentation, and the introduction of new products, processes, and strategic approaches. Organizational Agility (OA) (3 items) was measured using items adapted from Lu and Ramamurthy (2011) and Tallon and Pinsonneault (2009), capturing the firm's ability to sense environmental changes, respond quickly to market opportunities, and adjust internal processes and operations. Finally, Firm Performance (FP) (3 items) was measured using items adapted from Venkatraman and Ramanujam (1986) and Dess and Robinson (1984), which assess both financial and non-financial outcomes such as sales growth, profitability, market share, and overall business performance relative to competitors.

4. Results

4.1 Measurement Model Assessment

The measurement model was evaluated to assess the reliability and validity of the constructs before examining the structural relationships. Following the guidelines of Partial Least Squares Structural Equation Modeling (PLS-SEM), the assessment included indicator reliability, internal consistency reliability, and convergent validity (Hair et al., 2017).

Indicator reliability was assessed using factor loadings, while internal consistency reliability was evaluated using Cronbach's Alpha and Composite Reliability (CR). Convergent validity was examined using the Average Variance Extracted (AVE). According to Hair et al. (2017), indicator loadings should exceed 0.70, reliability measures should be above 0.70, and AVE values should exceed 0.50 to demonstrate acceptable reliability and convergent validity.

Table 4.1

Reliability and Convergent Validity

Construct	Indicator	Loading	Cronbach's Alpha	Composite Reliability (CR)	AVE
AI Competencies	AIC1	0.751			
	AIC2	0.755			
	AIC3	0.771	0.768	0.845	0.578
	AIC4	0.764			
Firm Innovation	FI1	0.763			
	FI2	0.830	0.725	0.845	0.645
	FI3	0.815			
Firm Performance	FP1	0.727			
	FP2	0.902	0.723	0.845	0.648
	FP3	0.775			
Organizational Agility	OA1	0.731			
	OA2	0.851	0.711	0.838	0.634
	OA3	0.802			

The results indicate that all factor loadings exceed the recommended threshold of **0.70** (Hair et al., 2017), demonstrating satisfactory indicator reliability. Cronbach's Alpha values range from 0.711 to 0.768, and Composite Reliability values range from 0.838 to 0.845, both exceeding the recommended threshold of 0.70, indicating strong internal consistency reliability. Furthermore, AVE values range from 0.578 to 0.648, exceeding the recommended threshold of 0.50, confirming adequate convergent validity.

4.2 Discriminant Validity

Discriminant validity was assessed using the **Fornell–Larcker criterion** (Fornell & Larcker, 1981). According to this criterion, the square root of the AVE for each construct should be greater than the correlations with other constructs.

Table 4.2

Fornell–Larcker Criterion

Construct	AI Competencies	Firm Innovation	Firm Performance	Organizational Agility
AI Competencies	0.760			
Firm Innovation	0.580	0.803		
Firm Performance	0.614	0.448	0.805	
Organizational Agility	0.400	0.246	0.475	0.796

The diagonal values represent the square root of AVE. As shown in Table 4.2, the square root of AVE for each construct is greater than its correlations with other constructs, indicating adequate discriminant validity (Fornell & Larcker, 1981).

HTMT Ratio

The Heterotrait–Monotrait ratio (HTMT) was also used to further evaluate discriminant validity. According to Henseler et al. (2015), HTMT values should be below 0.90. The results show that HTMT values range from 0.355 to 0.815, which are below the recommended threshold. Therefore, discriminant validity is confirmed.

Cross Loadings

Cross-loadings were also examined to confirm discriminant validity. According to Hair et al. (2017), each indicator should load higher on its associated construct than on other constructs. The results indicate that all indicators load highest on their respective constructs, confirming the discriminant validity of the measurement model.

4.3 Structural Model Assessment

After confirming the adequacy of the measurement model, the structural model was evaluated to test the proposed hypotheses.

Multicollinearity (VIF)

Multicollinearity was examined using the Variance Inflation Factor (VIF). According to Hair et al. (2017), VIF values should be below 5.0 to indicate that multicollinearity is not a concern. The results show that VIF values range between 1.191 and 1.685, which are well below the recommended threshold. Therefore, multicollinearity does not pose a problem in the model.

Coefficient of Determination (R²) and Predictive Relevance (Q²)

The explanatory power of the model was evaluated using the coefficient of determination (R²). According to Hair et al. (2017), R² values of 0.25, 0.50, and 0.75 can be considered weak,

moderate, and substantial, respectively. The results indicate that Firm Performance has an R^2 value of 0.451, suggesting a moderate level of explanatory power.

The predictive relevance of the model was also assessed using the Stone–Geisser Q^2 value. According to Hair et al. (2017), Q^2 values greater than zero indicate predictive relevance. The obtained Q^2 value of 0.29 confirms that the model has adequate predictive capability.

Effect Size (f^2)

The effect size (f^2) was calculated to evaluate the contribution of each exogenous construct to the R^2 value of the endogenous variable. According to Cohen (1988), f^2 values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. The results show that AI competencies have a medium effect size ($f^2 = 0.198$), organizational agility has a small effect ($f^2 = 0.112$), and firm innovation has a very small effect ($f^2 = 0.022$).

4.4 Hypothesis Testing

The hypotheses were tested using the bootstrapping procedure in SmartPLS, which evaluates the significance of the path coefficients through t-statistics and p-values (Hair et al., 2017).

Table 4.3

Hypothesis Testing Results

Hypothesis	Relationship	β	T-value	P-value	Result
H1	AI Competencies → Firm Performance	0.428	3.722	0.000	Supported
H2	Firm Innovation → Firm Performance	0.134	1.135	0.257	Not Supported
H3	Organizational Agility → Firm Performance	0.271	2.557	0.011	Supported

The results indicate that AI competencies have a positive and statistically significant effect on firm performance ($\beta = 0.428$, $p < 0.001$), supporting H1. Similarly, organizational agility has a significant positive effect on firm performance ($\beta = 0.271$, $p = 0.011$), supporting H3. However, firm innovation does not have a statistically significant effect on firm performance ($\beta = 0.134$, $p = 0.257$), and therefore H2 is not supported.

5. Discussion and Conclusion

This study aimed to examine the influence of artificial intelligence (AI) competencies, firm innovativeness, and organizational agility on the performance of e-commerce firms operating in El Oued, Algeria. Using a structural equation modeling approach, the findings reveal that AI competencies and organizational agility have significant positive effects on firm performance, while firm innovativeness does not demonstrate a statistically significant direct impact on performance.

The results contribute to the growing body of research on digital capabilities and organizational performance in emerging digital economies. While prior studies have highlighted the importance of

technological and organizational capabilities for firm success, many have examined these factors independently or within developed economies. By integrating AI competencies, innovativeness, and agility within a single framework, this study provides new empirical insights into how these capabilities operate within the context of e-commerce firms in Algeria.

The findings indicate that AI competencies represent the most influential factor affecting firm performance, as reflected by the significant path coefficient and the largest effect size among the predictors. This result is consistent with previous studies emphasizing the strategic importance of AI capabilities in enhancing business outcomes (Mikalef et al., 2023; Chen et al., 2022). In the context of e-commerce firms in El Oued, organizations that effectively adopt and integrate AI technologies can improve their ability to analyze large datasets, automate operational processes, personalize customer interactions, and support data-driven decision-making. These capabilities enhance operational efficiency and enable firms to respond more effectively to changing market conditions.

The study also finds that organizational agility positively and significantly influences firm performance. This finding supports previous literature suggesting that agile organizations are better positioned to respond quickly to environmental changes and market dynamics (Lu & Ramamurthy, 2011; Roberts & Grover, 2012). In the rapidly evolving e-commerce environment, firms that can quickly adjust their strategies, reconfigure resources, and adopt new technologies are more capable of maintaining competitiveness and improving performance outcomes. For e-commerce firms operating in developing digital markets such as El Oued, organizational agility becomes particularly important in navigating uncertainties related to technology adoption, logistics challenges, and changing consumer behavior.

However, the results indicate that firm innovativeness does not have a statistically significant direct effect on firm performance in this study. This finding differs from some previous research that suggests a strong positive relationship between innovativeness and firm performance (Rubera & Kirca, 2012). One possible explanation is that innovation activities in emerging digital markets may require time and complementary technological capabilities before translating into measurable performance outcomes. In the context of small and medium-sized e-commerce firms in El Oued, innovation efforts may still be at an early stage and may not yet produce immediate financial or operational benefits. This suggests that innovation alone may not directly improve firm performance unless it is supported by strong technological infrastructure and digital competencies.

From a theoretical perspective, this study contributes to the literature by demonstrating that technological capabilities and adaptive organizational capabilities play different roles in shaping firm performance in digital markets. The findings highlight the dominant role of AI competencies as a technological resource while emphasizing the importance of organizational agility as a dynamic capability that enables firms to effectively leverage technological resources.

From a practical perspective, the findings provide important implications for managers and policymakers. For managers of e-commerce firms, the results suggest that investing in AI competencies and strengthening organizational agility should be strategic priorities for improving firm performance. Firms should focus on developing data analytics capabilities, integrating AI technologies into business operations, and fostering flexible organizational structures that allow rapid responses to market changes. Although innovation remains important for long-term

competitiveness, the results indicate that its direct impact on performance may depend on the presence of other supporting capabilities such as technological infrastructure and managerial expertise.

For policymakers, the findings highlight the importance of supporting digital transformation initiatives that strengthen the technological capabilities of e-commerce firms. Government programs that promote digital literacy, technology training, and access to advanced technologies could help businesses enhance their AI competencies and overall competitiveness in the digital economy.

Despite its contributions, this study has several limitations. First, the research employed a convenience sampling technique and focused on a single geographic region, which may limit the generalizability of the findings to other contexts. Second, the study used cross-sectional data, which restricts the ability to examine causal relationships or changes over time. Future research could extend this work by using longitudinal data, expanding the study to other regions or industries, and incorporating additional variables such as digital leadership, platform capabilities, or supply chain integration.

In conclusion, this study highlights the critical role of AI competencies and organizational agility in enhancing the performance of e-commerce firms in Algeria's emerging digital economy. While firm innovativeness remains an important organizational capability, the results suggest that technological capabilities and adaptive organizational processes play a more immediate role in shaping firm performance in the e-commerce sector. By strengthening AI capabilities and fostering agile organizational practices, e-commerce firms can improve their ability to compete and grow in rapidly evolving digital markets.

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