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Research Paper

FinTech Adoption and Supply Chain Performance in the Egyptian E-Commerce Sector: The Moderating Role of Crisis Management Capabilities

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Abstract:
This study examines the impact of FinTech adoption on supply chain performance in the Egyptian e-commerce sector, with a focus on the moderating role of crisis management capabilities. As digital commerce grows rapidly in emerging markets, financial technologies—such as mobile payments, digital financing, and blockchain applications—have become critical for enhancing supply chain integration and financial flows. Grounded in the Technology–Organization–Environment (TOE) and Dynamic Capabilities frameworks, the study hypothesizes that FinTech adoption improves operational efficiency, responsiveness, delivery reliability, and cost performance. A quantitative design was employed using an online structured questionnaire distributed to 300 managers from different organizational functions (logistics, supply chain, IT, and operations) in Egyptian e-commerce firms. Structural equation modeling (SEM) using AMOS v.25 was applied. The findings confirmed significant positive relationships among all variables; FinTech adoption and crisis management capabilities had strong positive effects on supply chain performance. Additionally, crisis management capabilities significantly moderated the FinTech–performance relationship. The study contributes theoretically by integrating FinTech integration and crisis management into supply chain performance literature, and practically by offering insights for digital transformation, resilience, and performance enhancement in the Egyptian e-commerce industry.

Keywords: *FinTech, Supply Chain Performance, Crisis Management Capabilities, Egyptian E-Commerce Sector*

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I. Introduction

In recent years, the rapid digitalization of commerce has profoundly reshaped supply chain structures worldwide, particularly in emerging economies. The growing integration of online retail, mobile payments, and digital financial services expands e-commerce but also imposes new financial and operational challenges on firms that manage complex supply chains. Simultaneously, financial-technology (FinTech) solutions — such as digital payment systems, supply-chain finance platforms, blockchain-based transactions, and automated financial processes — have emerged as potential enablers of supply chain efficiency, liquidity management, transparency, and risk mitigation (Li et al., 2022).

Empirical and conceptual literature suggests that FinTech adoption can significantly improve firms' supply chain resilience and operational performance. For example, blockchain-enabled supply-chain finance reduces information asymmetry, enhances transparency, and lowers the risk of disruption by securing transactional data across supply-chain partners (Ren, 2025). Further, digital finance has been shown to alleviate financing constraints and strengthen supply-chain toughness (resilience) in firms, enabling them to better absorb shocks and maintain continuity under stress (Li et al., 2024).

Nonetheless, despite the growing attention to digital finance and blockchain in supply-chain management research, empirical investigations remain limited — especially in emerging-market e-commerce contexts. Much of the prior work deals with supply-chain finance or blockchain in manufacturing or large industrial firms; fewer studies explore how FinTech adoption interacts with supply-chain performance (lead

times, cost efficiency, reliability) in e-commerce firms, or how firms' internal crisis management capabilities influence these effects. This gap underscores the need for context-specific research focusing on the interplay between FinTech, supply-chain performance, and organizational risk-management capabilities.

Organizational crisis management capabilities — the internal competencies that allow firms to detect, prepare for, respond to, and recover from disruptions — are increasingly recognized as a key dynamic capability that shapes how firms benefit from digital technologies under uncertain conditions (e.g. pandemics, supply disruptions, financial instability). Firms with strong crisis-management and resilience capabilities are arguably better positioned to exploit FinTech tools to maintain liquidity, expedite payments, manage supplier relationships, and quickly restore operations when disruptions occur. Studies linking digital adoption (blockchain, AI, IoT) to supply-chain resilience under environmental or operational shocks illustrate that technological adoption alone may not suffice; institutional readiness and adaptive capacity matter significantly (Ceptureanu et al., 2025).

The present study builds on these theoretical strands by integrating the Technology–Organization–Environment (TOE) framework with the Dynamic Capabilities perspective. Under this combined lens, FinTech adoption is viewed as a technological-environmental enabler providing resources (digital finance, transparency, faster transactions), whereas crisis management capabilities constitute internal dynamic capabilities that firms must leverage to transform those resources into lasting supply-chain performance improvements — in terms of responsiveness, cost efficiency, reliability, and resilience.

Therefore, this study seeks to answer the following research questions in the context of e-commerce firms operating in Egypt: (1) To what extent does FinTech adoption enhance supply-chain performance? (2) Do crisis management capabilities directly affect supply-chain performance? (3) Do crisis management capabilities moderate the relationship between FinTech adoption and supply-chain performance, such that firms with higher crisis-management capabilities realize greater performance gains from FinTech adoption?

By empirically examining these questions using a survey of managers and supply-chain professionals and applying structural equation modeling (SEM), the study aims to contribute theoretically — by linking FinTech adoption, digital finance, and crisis resilience to supply-chain outcomes — and practically — by offering actionable insights for managers and policymakers seeking to harness FinTech and risk-management capabilities to optimize supply-chain performance in volatile and uncertain markets.

II. Literature Review

Fintech

The term FinTech refers to the use of technological innovations to deliver financial services via new business models, processes, products, or platforms. Specifically, FinTech encompasses digital payment systems, mobile banking, digital wallets, peer-to-peer lending, supply-chain finance, blockchain-based solutions, and other technology-enabled financial services (Baba et al., 2023).

FinTech—defined as the application of digital technologies to deliver financial services and solve business challenges—has reshaped global commerce by enabling rapid, secure, and data-driven financial transactions. Its adoption in e-commerce contexts can reduce payment frictions, enhance supply chain finance, and support real-time data processing, which collectively contribute to improved logistics and operational performance. Recent studies demonstrate that digital financial systems can significantly enhance supply chain efficiency through agile financial tools such as blockchain, mobile payments, and supply chain finance mechanisms (Gue & Wang, 2025).

According to a recent comprehensive literature review, FinTech is characterized by its capacity to combine traditional financial operations with advanced technologies (e.g., AI, blockchain, machine learning), thereby enabling more efficient, secure, and flexible financial services than conventional banking infrastructure (Kou & Lu, 2025).

FinTech is an important element for business firms because of some reasons:

1. Enhancing Operational Efficiency and Reducing Costs: it can significantly reduce transaction costs, processing delays, and overhead associated with traditional financial operations (e.g., manual invoicing, delays in payments, paper-based processes). This efficiency gain is especially critical for firms with supply chain operations, as faster payments, automated reconciliation, and digital financial flows help streamline procurement, inventory management, and supplier coordination (Baba et al., 2025).
2. Supporting Innovation, Flexibility and New Business Models: FinTech supports innovative business models, especially for small and medium enterprises (SMEs) and micro-enterprises that may lack access to traditional banking credit or face high borrowing costs. By offering alternative financing mechanisms, peer-to-peer lending, digital credit scoring, and supply-chain finance platforms, FinTech enables access to capital and liquidity, thus promoting innovation and growth. Moreover, the flexibility inherent in FinTech (e.g., on-demand credit, digital payments, automated reconciliation) helps firms adapt rapidly to market changes, scale operations, and seize new opportunities with lower financial and administrative barrier (Kou & Lu, 2025).

3. Enhancing Accessibility and Inclusion (Especially for SMEs and Underserved Firms): FinTech expands access to financial services for firms and entrepreneurs previously excluded or underserved by traditional banking systems, due to geographical, collateral, or documentation constraints. Several studies highlight how digital financial services help SMEs and microenterprises obtain credit, manage cash flows, and operate more competitively — contributing to broader economic inclusion and firm-level empowerment. Such inclusive access supports business growth, survival, and expansion, especially in emerging and developing economies where traditional banking coverage is limited (Kaur et al., 2021).
4. Enabling Financial Innovation and Strategic Advantage: Adopting FinTech can provide firms with a strategic advantage by enabling new products and services (e.g., digital wallets, e-commerce payment options, supply-chain finance), enhancing customer experience, and differentiating firms in competitive markets. For instance, studies show that FinTech adoption supports service quality, speed, reliability, and flexibility — factors critical for firms aiming to compete and sustain in rapidly digitalizing markets (Bansod & Venice, 2023).
Wang & Cui, (2024) illustrated that Fintech has three main dimensions can be mentioned as follows:
1. Mobile and Digital Payments: Use of mobile wallets, electronic payment gateways, and digital invoicing tools.
2. Blockchain-Enabled Finance: Blockchain applications for invoice financing and payment transparency.
3. Data-Driven Financial Analytics: AI and big-data tools for credit assessment, risk management, and liquidity planning.

Supply Chain Performance

Supply chain performance refers to measurable outcomes reflecting the effectiveness and efficiency of supply chain operations, including speed, reliability, cost, and customer satisfaction (Huo et al., 2024).
Oubrahim et al., (2022) mentioned that supply chain performance refers to how effectively a supply chain operates in delivering value to end customers while optimizing resources across the entire network—from suppliers to final delivery.
Varadejsatitwong et al., (2022) stated that there are Common KPIs for Measuring Supply Chain Performance and can be mentioned in table (1):

Table (1): Common KPIs for Measuring Supply Chain Performance

Category	KPI Example	Description
Reliability	Perfect Order Fulfillment	Percentage of orders delivered on-time, in-full, damage-free, and with accurate documentation.
	On-Time In-Full (OTIF) Delivery	Measures timely and complete delivery to customers or from suppliers.
Responsiveness	Order Cycle Time	Time from customer order placement to delivery.
	Supply Chain Cycle Time	Total time to fulfill an order if inventory is unavailable.
Cost Efficiency	Total Supply Chain Costs	Costs as a percentage of sales (including inventory, transportation, etc.).
	Cash-to-Cash Cycle Time	Days between paying suppliers and receiving customer payment.
Asset Management	Inventory Turnover	How often inventory is sold and replaced in a period.
	Days Sales of Inventory (DSI)	Average days to sell inventory.

Source: Varadejsatitwong et al., (2022)

Supply chain performance has four main dimensions as stated by (Huo et al., 2024):
1. Operational Efficiency: Cycle times, order fulfilment speed, and process costs.
2. Responsiveness and Agility: Ability to adjust to demand fluctuations and market changes.
3. Reliability: Consistency in delivery and service quality.
4. Customer Satisfaction: Service quality and fulfillment accuracy.

Crisis Management Capabilities

Crisis management capabilities are organizational processes, competencies, and structures that enable firms to prepare for, respond to, and recover from adverse events that threaten operational continuity (Olsen et al., 2023).
Petitta et al., (2023) stated that Crisis management capabilities refer to the organizational resources, processes, and skills that enable an entity to anticipate, detect, respond to, and recover from crises effectively, while minimizing damage and fostering long-term resilience. These capabilities encompass a set of adaptive mechanisms that allow organizations to evaluate crisis signals, implement damage-limiting actions, and learn from disruptions.
Hu et al., (2022) illustrated that Crisis management capabilities have four main dimensions:
1. Preparedness Planning: Risk identification and systems for pre-crisis planning.

2. Response Agility: Speed and effectiveness of actions taken during disruptions.
3. Recovery Capability: Ability to restore operations and learn from disruption.
4. Communication and Coordination: Internal and external stakeholder communication during crises.

II. Hypotheses development and research model

In this section, the researchers introduce the literature with describe the hypothesized relationships among the research variables as following:

Fintech and Supply Chain Performance:

Recent advances in financial technology (FinTech) have significantly transformed supply chain structures by improving financial flows, transparency, and operational coordination among supply chain partners. FinTech applications—such as digital payments, blockchain-based finance, artificial intelligence, and data analytics—have enabled firms to integrate financial and operational processes, thereby enhancing overall supply chain performance.

Guo and Wang, (2025) examined the role of data-driven FinTech in agile supply chain systems and found that FinTech adoption improves supply chain efficiency by accelerating financial transactions, reducing operational costs, and enhancing real-time visibility across the supply chain. Their findings suggest that FinTech acts as a strategic enabler that strengthens supply chain agility and responsiveness through improved financial integration.

Similarly, Li et al. (2022) provided a comprehensive framework linking FinTech-enabled supply chain finance with operational performance. Their study demonstrated that digital financial technologies facilitate smoother cash flows, reduce financing constraints for suppliers, and enhance coordination across supply chain networks, ultimately leading to superior supply chain performance.

Several studies emphasize the role of FinTech in improving supply chain finance efficiency, which serves as a critical mechanism for enhancing supply chain performance. Ali et al. (2024) explored the impact of recent FinTech trends on supply chain finance and found that technologies such as blockchain and AI significantly improve financing efficiency, reduce credit risk, and enhance supply chain resilience. These improvements directly contribute to better operational continuity and performance outcomes.

Guan et al. (2025) further confirmed that FinTech development strengthens the effectiveness of supply chain finance mechanisms, particularly for small and medium-sized enterprises (SMEs). Their empirical findings indicated that FinTech-enabled supply chain finance improves financing efficiency, liquidity access, and cost management, which in turn positively affect supply chain operational performance.

In addition, Ali et al., (2025) showed that FinTech adoption enhances supply chain optimization by reducing transaction costs, improving financial decision-making, and increasing process automation. The study concluded that digital financial systems play a vital role in aligning financial management with supply chain operations.

Beyond efficiency and cost reduction, recent literature highlights the role of FinTech in strengthening supply chain resilience, which is increasingly viewed as a key dimension of supply chain performance. Liu, Xie, and Liu (2025) found that FinTech development significantly enhances supply chain resilience by expanding access to supply chain finance and reducing financial concentration risks. Their study demonstrated that resilient supply chains exhibit higher performance levels due to their ability to withstand and recover from disruptions.
Furthermore, blockchain-based FinTech solutions have been shown to reduce disruption risks and improve trust among supply chain partners. Studies focusing on blockchain adoption indicate that increased transparency and traceability improve delivery reliability and coordination, leading to improved supply chain performance outcomes (Alkatheeri & Ahmad, 2020). Therefore, the following hypothesis can be formulated:

H1: Fintech has a positive significant effect on supply chain performance

Crisis management Capabilities and Supply Chain Performance:

In an increasingly volatile business environment, supply chains are exposed to a wide range of crises, including pandemics, economic shocks, geopolitical instability, and operational disruptions. Consequently, organizations have moved beyond traditional efficiency-oriented supply chain management toward developing crisis management capabilities that enable them to sustain performance under uncertainty (Durugbo & Al-Balushi, 2023).

Jüttner & Maklan, (2011) empirically investigated how supply chain resilience—built through crisis preparedness, flexibility, and adaptive response—affects supply chain performance during the global financial crisis. The findings demonstrate that firms with stronger crisis-related capabilities experienced less performance deterioration and recovered faster than competitors.

Scholten et al., (2014) examined mitigation and crisis planning processes as antecedents of supply chain resilience. Their findings indicate that structured crisis management practices improve delivery reliability, operational continuity, and overall supply chain performance.

Using the Resource-Based View (RBV), Brandon-Jones et al., (2014) showed that crisis response and recovery capabilities function as strategic resources that protect and enhance supply chain performance during disruptions.

Ivanov & Dolgui, (2020) demonstrated how crisis response and recovery capabilities supported by digital tools significantly improve supply chain performance during large-scale disruptions.

Across the reviewed literature, there is strong empirical and theoretical consensus that crisis management capabilities positively influence supply chain performance. These capabilities—manifested through preparedness, rapid response, recovery speed, communication, and learning—enable organizations to reduce disruption severity, maintain operational continuity, and restore performance efficiently. While many studies frame this relationship through supply chain resilience, crisis management capabilities represent the underlying mechanisms that translate organizational readiness into performance outcomes. Therefore, the following hypothesis can be formulated:

H2 Crisis management Capabilities have a positive significant effect on supply chain performance

Crisis Management Capabilities as a Moderator:

Recent advancements in financial technology (FinTech) have significantly transformed supply chain operations by improving financial flows, transparency, and coordination among supply chain partners (Guo & Wang, 2025; Li et al., 2022). FinTech applications—including digital payments, blockchain-based finance, artificial intelligence, and data analytics—enable organizations to integrate financial and operational processes, streamline cash flows, reduce transaction costs, and enhance supply chain responsiveness (Ali et al., 2024; Guan et al., 2025; Liu, Xie, & Liu, 2025). Empirical evidence consistently indicates that FinTech adoption positively affects supply chain performance by improving efficiency, operational continuity, and resilience (Alkatheeri & Ahmad, 2020; Ali et al., 2025).

However, the benefits of FinTech adoption on supply chain performance may not be uniform across all organizational contexts. In volatile and uncertain business environments, supply chains frequently face disruptions ranging from economic shocks to operational failures. Crisis management capabilities—comprising preparedness, rapid response, recovery, communication, and learning mechanisms—enable organizations to anticipate, respond to, and recover from such disruptions more effectively (Durugbo & Al-Balushi, 2023; Jüttner & Maklan, 2011; Scholten et al., 2014). Firms with stronger crisis management capabilities are better able to leverage technological innovations, such as FinTech, to enhance operational outcomes because they can mitigate disruption risks, maintain continuity, and optimize processes even under adverse conditions (Brandon-Jones et al., 2014; Ivanov & Dolgui, 2020).

From a theoretical perspective, crisis management capabilities function as a moderating factor that influences the strength of the relationship between FinTech adoption and supply chain performance. Specifically, organizations with high levels of crisis management capabilities are more likely to translate FinTech adoption into tangible improvements in operational efficiency, delivery reliability, and supply chain resilience. Conversely, in organizations with low crisis management capabilities, the positive effects of FinTech adoption may be attenuated due to an inability to effectively respond to disruptions or integrate technological solutions into operational processes.

Thus, integrating insights from both FinTech and supply chain resilience literature suggests that crisis management capabilities enhance the effectiveness of FinTech adoption, enabling firms to achieve superior supply chain performance under uncertain and dynamic conditions. This leads to the formulation of the following hypothesis:

H3: Crisis Management Capabilities positively moderate the relationship between FinTech adoption and supply chain performance

So that, the researchers can show the relationships between variables through research framework as shown in the following Figure1:

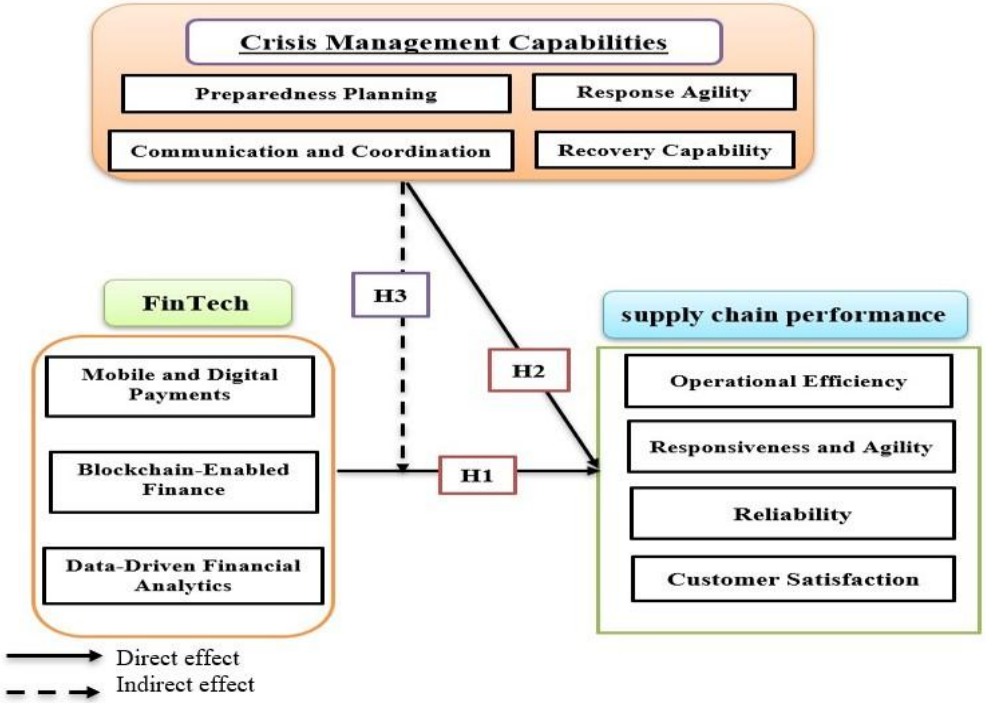

Figure 1: Proposed research framework

Sampling design

III. Methodology and measurement

The target population for this study comprises logistics, supply chain, and IT managers working in Egyptian e-commerce companies and supporting logistics firms. Considering the size of the sector—approximately 21.8 thousand e-commerce establishments in Egypt—and the presence of major platforms such as Jumia Egypt, Amazon Egypt, LC Waikiki, Watches Prime, and Yaoota, the potential pool of qualified managerial professionals is estimated at 500–1,500 respondents. The sample focuses on individuals with direct responsibility for integrating FinTech solutions, managing supply chain operations, and overseeing crisis response initiatives across e-commerce value chains in Egypt.

A stratified random sampling method will be employed to ensure that managers from different organizational functions (logistics, supply chain, IT, and operations) and various company sizes (large, medium, and small e-commerce firms) are adequately represented. Stratification will help capture diverse perspectives regarding FinTech adoption and crisis management practices. Based on the target population size, the sample size is estimated at 200–300 respondents, which provides sufficient statistical power for quantitative analysis while remaining feasible for data collection within the Egyptian e-commerce context. Participants were selected from company directories, professional networks, and LinkedIn profiles, and invitations to complete the survey and sent via email and online survey platforms." 262 forms were collected and valid for the statical analysis.

Measurement of Constructs

The measurement of constructs in this study was developed using a structured questionnaire based on previously validated scales, adapted to fit the context of Egyptian e-commerce firms. FinTech Adoption (FTA) was measured across three main dimensions: Mobile and Digital Payments, Blockchain-Enabled Finance, and Data-Driven Financial Analytics. The Mobile and Digital Payments dimension included 4 items assessing the use of mobile wallets, electronic payment gateways, and digital invoicing tools to improve financial transaction speed and accuracy. The Blockchain-Enabled Finance dimension comprised 4 items evaluating the use of blockchain technologies to enhance transparency, trust, coordination, and payment reliability across the supply chain. Data-Driven Financial Analytics was measured with 4 items examining the application of AI and big-data tools for credit assessment, risk management, liquidity planning, and data-driven financial decision-making (Guo & Wang, 2025; Li et al., 2022; Ali et al., 2024).

Supply Chain Performance (SCP) was assessed using four dimensions: Operational Efficiency, Responsiveness and Agility, Reliability, and Customer Satisfaction. Operational Efficiency included 4 items measuring cycle times, order fulfillment speed, process costs, and process optimization. Responsiveness and

Agility consisted of 4 items capturing the ability of the supply chain to adjust to demand fluctuations, market changes, and operational requirements. Reliability was measured with 4 items assessing delivery consistency and service accuracy, while Customer Satisfaction included 4 items focusing on service quality, fulfillment accuracy, and customer feedback mechanisms (Huo et al., 2024).

Crisis Management Capabilities (CMC) were evaluated using four dimensions: Preparedness Planning, Response Agility, Recovery Capability, and Communication and Coordination. Each dimension included 4 items. Preparedness Planning assessed risk identification, pre-crisis planning, and resource allocation. Response Agility measured the speed and effectiveness of actions during disruptions. Recovery Capability examined the ability to restore operations and apply lessons learned, and Communication and Coordination focused on internal and external communication and collaborative problem-solving during crises (Jüttner & Maklan, 2011; Brandon-Jones et al., 2014; Ivanov & Dolgui, 2020).

All items were measured using a 5-point Likert scale, ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree". The questionnaire design ensures that each dimension of the three constructs is captured with four or more items (**Appendix 1**), providing sufficient reliability and validity for subsequent quantitative analysis.

Descriptive Analysis

IV. Data analysis and Results

Table 1: Summary of demographic profile of respondents

Demographic Variable	Category	Frequency	Percentage (%)
Male	Male	154	58.7%
	Female	108	41.3%
Age	25–less than 35 years	42	16%
	35–less than 45 years	89	34%
	45 years and above	131	50%
Educational Level	Bachelor's degree	104	39.7%
	Master's degree	122	46.6%
	PhD	36	13.7%
Job Position	Supply Chain Manager	74	28.2%
	Logistics Manager	43	16.4%
	Operations Manager	54	20.6%
	IT Manager	91	34.8%

The descriptive statistics presented in Table 2 provide an overview of the demographic profile of the respondents and demonstrate the adequacy and diversity of the study sample within the Egyptian e-commerce sector. The gender distribution shows that male respondents constitute 58.7% of the sample, while females represent 41.3%. This relatively balanced distribution reflects the increasing participation of women in managerial roles within logistics, supply chain, and IT functions, while still aligning with the traditionally higher male representation in these domains.

Regarding age, the results indicate that half of the respondents (50%) are aged 45 years and above, followed by those in the 35–less than 45 years category (34%). A smaller proportion of respondents (16%) fall within the 25–less than 35 years group. This age structure suggests that the sample is largely composed of senior and mid-career professionals with extensive industry experience, which is particularly relevant for assessing strategic decisions related to FinTech adoption and crisis management capabilities.

In terms of educational attainment, the findings reveal a highly educated managerial workforce. Nearly half of the respondents hold a master's degree (46.6%), while 39.7% possess a bachelor's degree, and 13.7% hold a PhD. This educational profile indicates that the respondents have strong academic and analytical backgrounds, enhancing their ability to understand, evaluate, and implement advanced FinTech solutions and sophisticated crisis management practices.

With respect to job position, the distribution reflects broad representation across key managerial functions. IT managers constitute the largest group (34.8%), followed by supply chain managers (28.2%), operations managers (20.6%), and logistics managers (16.4%). This functional diversity ensures that the study captures multiple perspectives spanning technological, operational, and strategic dimensions of e-commerce

supply chains.

Overall, the demographic characteristics indicate that the sample is well-structured, diverse, and representative of managerial decision-makers in the Egyptian e-commerce sector. The presence of experienced, well-educated respondents from different functional backgrounds provides a solid empirical foundation for analyzing the relationships between FinTech adoption, crisis management capabilities, and supply chain performance.

Measurement Model Assessment

The structural equation model was relied upon to ensure the structural validity of the scale, in addition to ensuring the validity of the model before conducting the hypothesis test, by determining the reliability of the loading factors, calculating composite reliability (CR), Alpha Cronbach coefficient (α), measuring the convergent Validity and Discriminant Validity, moreover calculating model fit indices.

Table 3: Reliability and Convergent Validity of Measurement Model

Variables	Dimensions	Items	Loading Factor	Mean	S. D	α	CR	AVE
FinTech	Mobile and Digital Payments	MDP1	0.632	4.12	0.587	0.848	0.853	0.642
		MDP2	0.587					
		MDP3	0.704					
		MDP4	0.641					
	Blockchain-Enabled Finance	BEF1	0.711	4.03	0.782	0.931	0.940	0.657
		BEF2	0.684					
		BEF3	0.661					
		BEF4	0.609					
	Data-Driven Financial Analytics	DFA1	0.656	4.08	0.626	0.826	0.821	0.594
		DFA2	0.527					
		DFA3	0.555					
		DFA4	0.681					
Crisis Management Capabilities	Preparedness Planning	PN1	0.686	4.10	0.871	0.796	0.804	0.624
		PN2	0.654					
		PN3	0.713					
		PN4	0.584					
	Response Agility	RA1	0.620	4.05	0.427	0.806	0.811	0.702
		RA2	0.585					
		RA3	0.714					
		RA4	0.687					
	Recovery Capability	RC1	0.710	4.14	0.622	0.818	0.821	0.614
		RC2	0.751					
		RC3	0.698					
		RC4	0.708					
	Communication and Coordination	CMR1	0.716	4.01	0.352	0.920	0.926	0.684
		CMR2	0.724					
		CMR3	0.714					
		CMR4	0.707					
Supply Chain Performance	Operational Efficiency	OE1	0.686	4.09	0.587	0.821	0.829	0.587
		OE2	0.652					
		OE3	0.621					
		OE4	0.666					
	Responsiveness and Agility	RNA1	0.524	3.94	0.924	0.788	0.791	0.602
		RNA2	0.601					
		RNA3	0.624					
		RNA4	0.520					
	Reliability	RB1	0.718	3.91	0.730	0.807	0.811	0.541
		RB2	0.746					
		RB3	0.737					
		RB4	0.652					
	Customer Satisfaction	CS1	0.733	4.11	0.620	0.811	0.817	0.627
		CS2	0.652					
		CS3	0.597					
		CS4	0.717					

Table 3 presents the results of the measurement model assessment, indicating satisfactory reliability and convergent validity for all constructs. All factor loadings exceed the acceptable threshold of 0.50, supporting indicator reliability. Cronbach's alpha and composite reliability (CR) values for all dimensions are above 0.70, confirming strong internal consistency as a confirmation with (Hair et al., 2014).

Furthermore, the average variance extracted (AVE) values exceed 0.50 across all constructs, providing evidence of convergent validity. The mean scores suggest relatively high levels of FinTech adoption, crisis management capabilities, and supply chain performance among Egyptian e-commerce firms. Overall, these results confirm that the measurement model is robust and suitable for subsequent structural model analysis. Moreover, the researchers estimated the correlations between variables (Appendix 2).

Table 4: Results of discriminant validity by Fornell-Larcker criterion

Variables	Fintech	CMC	Supply Chain Performance
Fintech	**0.871**		
CMC	0.642	**0.743**	
Supply Chain Performance	0.711	0.601	**0.725**

Discriminant validity refers to the extent to which each variable differs from other variables. It is measured by the square root of AVE. Its value for each variable must be greater than its association with other variables (Hair et al., 2016). As shown in table 4, the square rote of AVE for each variable is greater than the associations of other variables, which indicates a high consistency of the scale as a whole.

Table 5: Model Fit Indices

Indices	Symbol	Acceptance Index	Result
Goodness of fit index	GFI	> 0.90	0.931
Root mean square residual	RMR	The closer to zero	0.031
Comparative fit index	CFI	> 0.95	0.972
Tucker-Lewis	TLI	> 0.95	0.964
Root mean square error of approximation	RMSEA	> 0.08	0.053

The goodness-of-fit indices presented in Table (X) demonstrate that the proposed measurement model exhibits an excellent fit with the observed data. The Goodness of Fit Index (GFI = 0.931) exceeds the recommended threshold of 0.90, while the Root Mean Square Residual (RMR = 0.031) is close to zero, indicating minimal residual discrepancies. Furthermore, the incremental fit indices show strong support for the model, as both the Comparative Fit Index (CFI = 0.972) and the Tucker–Lewis Index (TLI = 0.964) surpass the stringent cutoff value of 0.95, confirming a substantial improvement over the baseline model. Additionally, the Root Mean Square Error of Approximation (RMSEA = 0.053) falls well below the acceptable limit of 0.08, indicating a parsimonious and well-specified model. Collectively, these findings provide robust empirical evidence for the adequacy of the measurement model and justify proceeding with structural model testing.

Hypotheses Tests:

Table 6: Results of Hypotheses Testing

Hypotheses	**PathCoff**	**P-Value**	**f^2**	**Result**
Direct effect				
H1a: Fintech ⟶ Operational Efficiency	0.341**	0.000	0.38	supported
H1b: Fintech ⟶ Responsiveness and Agility	0.286**	0.004	0.28	supported
H1c: Fintech ⟶ Reliability	0.327**	0.000	0.22	supported
H1d: Fintech ⟶ Customer Satisfaction	0.253**	0.000	0.18	supported
H2a: CMC ⟶ Operational Efficiency	0.191*	0.027	0.16	supported
H2b: CMC ⟶ Responsiveness and Agility	0.229**	0.000	0.39	supported
H2c: CMC ⟶ Reliability	0.301**	0.00	0.31	supported
H2d: CMC ⟶ Customer Satisfaction	0.263**	0.00	0.29	supported
Indirect effect				
H3a: Fintech × CMC ⟶ Operational Efficiency	0.242**	0.000	0.27	supported
H3b: Fintech × CMC ⟶ Responsiveness and Agility	0.211**	0.000	0.20	supported
H3c: Fintech × CMC ⟶ Reliability	0.335**	0.000	0.19	supported
H3d: Fintech × CMC ⟶ Customer Satisfaction	0.361**	0.000	0.25	supported

*Significant at 0.05, **Significant at 0.00

The structural model results presented in Table (6) provide strong empirical support for the proposed hypotheses concerning supply chain performance. The findings indicate that FinTech adoption exerts a significant and positive effect on all dimensions of supply chain performance, namely operational efficiency ($\beta = 0.341$, $p < 0.001$), responsiveness and agility ($\beta = 0.286$, $p < 0.01$), reliability ($\beta = 0.327$, $p < 0.001$), and customer satisfaction ($\beta = 0.253$, $p < 0.001$). The corresponding effect size values (f^2) range from moderate to

large, highlighting the substantial role of FinTech in enhancing the efficiency, flexibility, and reliability of supply chain operations.

In parallel, Crisis Management Capabilities (CMC) demonstrate statistically significant and positive effects on all dimensions of supply chain performance. The strongest effects are observed for responsiveness and agility ($\beta = 0.229$, $p < 0.001$; $f^2 = 0.39$) and reliability ($\beta = 0.301$, $p < 0.001$; $f^2 = 0.31$), suggesting that effective crisis preparedness and response capabilities enable supply chains to maintain continuity, adapt rapidly to disruptions, and sustain service quality during turbulent conditions.

Moreover, the moderating effects analysis reveals that CMC significantly strengthens the relationship between FinTech and supply chain performance. The interaction terms (FinTech × CMC) are positive and statistically significant across all supply chain performance dimensions, indicating that the positive effect of FinTech on supply chain efficiency, agility, reliability, and customer satisfaction becomes more pronounced when organizations possess strong crisis management capabilities. Collectively, these results underscore the complementary and synergistic roles of FinTech and CMC in driving superior supply chain performance.

V. Discussion

The results of this study provide robust empirical evidence supporting the hypothesized relationships between FinTech adoption, crisis management capabilities (CMC), and supply chain performance (SCP) in the Egyptian e-commerce sector. By integrating the Technology–Organization–Environment (TOE) framework with the Dynamic Capabilities perspective, the findings highlight how FinTech serves as a technological enabler that enhances operational and financial flows, while CMC acts as an internal moderator that amplifies these benefits under volatile conditions. Below, we discuss each hypothesis in relation to the existing literature, emphasizing theoretical alignments, contextual insights, and novel contributions.

The structural model confirms that FinTech adoption positively influences all four dimensions of SCP: operational efficiency ($\beta = 0.341$, $p < 0.001$), responsiveness and agility ($\beta = 0.286$, $p < 0.01$), reliability ($\beta = 0.327$, $p < 0.001$), and customer satisfaction ($\beta = 0.253$, $p < 0.001$). These effects are moderate to large (f^2 ranging from 0.18 to 0.38), underscoring FinTech's role in streamlining financial transactions, reducing costs, and improving visibility.

This aligns with prior studies in emerging markets, such as Guo and Wang (2025), who found that data-driven FinTech enhances supply chain agility through real-time financial integration, leading to faster order cycles and lower operational costs. Similarly, Li et al. (2022) demonstrated that FinTech-enabled supply chain finance reduces financing constraints, improving efficiency and reliability in globalized networks. In the Egyptian context, where e-commerce faces challenges like payment frictions and liquidity issues, these findings extend Ali et al. (2024) and Guan et al. (2025), who emphasized FinTech's impact on SME financing efficiency and resilience. However, our study uniquely quantifies these effects across SCP dimensions in an e-commerce-specific setting, revealing stronger impacts on operational efficiency and reliability compared to customer satisfaction, possibly due to FinTech's backend focus on processes rather than direct customer interfaces. This supports Liu, Xie, and Liu (2025), who linked FinTech to resilience via reduced financial risks, but adds nuance by showing dimension-specific variations in an emerging economy like Egypt.

CMC exhibits significant positive effects on SCP dimensions, with the strongest on responsiveness and agility ($\beta = 0.229$, $p < 0.001$; $f^2 = 0.39$) and reliability ($\beta = 0.301$, $p < 0.001$; $f^2 = 0.31$), followed by operational efficiency ($\beta = 0.191$, $p < 0.05$; $f^2 = 0.16$) and customer satisfaction ($\beta = 0.263$, $p < 0.001$; $f^2 = 0.29$). This suggests that firms with robust preparedness, response, recovery, and coordination mechanisms can better maintain continuity during disruptions.

These results resonate with the supply chain resilience literature, such as Jüttner and Maklan (2011), who showed that crisis preparedness mitigates performance declines during financial crises, and Scholten et al. (2014), who linked mitigation processes to improved delivery reliability. Drawing from the Resource-Based View (RBV), our findings align with Brandon-Jones et al. (2014), portraying CMC as strategic resources that enhance robustness. In a digital context, Ivanov and Dolgui (2020) emphasized digital-supported crisis capabilities for operational continuity, which our study extends to e-commerce by demonstrating CMC's direct role in agility amid Egypt's volatile market (e.g., economic instability, supply disruptions). Unlike prior work focused on manufacturing (Durugbo & Al-Balushi, 2023), our results highlight CMC's broader applicability to e-commerce, where agility and customer satisfaction are critical, thus bridging gaps in emerging-market research.

The interaction terms (FinTech × CMC) are positive and significant across all SCP dimensions: operational efficiency ($\beta = 0.242$, $p < 0.001$; $f^2 = 0.27$), responsiveness and agility ($\beta = 0.211$, $p < 0.001$; $f^2 = 0.20$), reliability ($\beta = 0.335$, $p < 0.001$; $f^2 = 0.19$), and customer satisfaction ($\beta = 0.361$, $p < 0.001$; $f^2 = 0.25$).

This indicates that CMC amplifies FinTech's benefits, with the strongest moderation on customer satisfaction and reliability.

Theoretically, this supports the Dynamic Capabilities framework, where CMC enables firms to reconfigure FinTech resources for superior outcomes (Ceptureanu et al., 2025). It extends Guo and Wang (2025) and Li et al. (2022) by showing that FinTech's efficiency gains are contingent on crisis readiness, aligning with Liu et al. (2025), who noted FinTech's resilience-enhancing role but overlooked moderation. In contrast to Ali et al. (2025), who focused on direct FinTech-SCP links, our findings reveal that in disruption-prone environments like Egypt, weak CMC attenuates FinTech benefits, while strong CMC maximizes them—e.g., blockchain transparency aids recovery only with effective coordination (Alkatheeri & Ahmad, 2024). This moderation effect is novel in e-commerce literature, addressing gaps in volatile markets (Li et al., 2024) and emphasizing synergistic integration of technology and capabilities.

Overall, the discussion reveals that while FinTech drives SCP improvements, its full potential in Egypt's e-commerce sector depends on complementary CMC, contributing to TOE and Dynamic Capabilities theories by contextualizing them in emerging digital commerce.

VI. Conclusion

This study empirically demonstrates that FinTech adoption significantly enhances supply chain performance in the Egyptian e-commerce sector, with positive effects on operational efficiency, responsiveness, reliability, and customer satisfaction. Crisis management capabilities not only directly improve SCP but also positively moderate the FinTech-SCP relationship, amplifying benefits for firms with strong preparedness and adaptive mechanisms. Grounded in TOE and Dynamic Capabilities frameworks, the findings from 262 managerial respondents, analyzed via SEM, confirm all hypotheses and highlight the synergistic interplay between digital finance and organizational resilience.

Theoretically, this research integrates FinTech, crisis management, and SCP in an underexplored emerging-market context, extending prior literature by quantifying dimension-specific impacts and moderation effects. Practically, it underscores the need for Egyptian e-commerce firms to invest in both FinTech tools and CMC to achieve resilient, high-performing supply chains amid volatility. Ultimately, this study advances understanding of digital transformation in supply chains, offering a foundation for sustainable growth in dynamic environments.

VII. Implications

Theoretical Implications:

This study enriches the supply chain management literature by integrating FinTech adoption within the TOE framework and CMC under Dynamic Capabilities, providing a nuanced model for how technological enablers interact with internal competencies to drive performance. It addresses gaps in emerging-market research (e.g., Li et al., 2022; Guo & Wang, 2025) by empirically validating moderation effects, thus advancing theories on resilience in digital contexts. The dimension-level analysis (e.g., stronger effects on reliability) offers granular insights, encouraging future models to disaggregate SCP constructs.

Practical Implications:

For e-commerce managers in Egypt, the findings advocate prioritizing FinTech investments (e.g., blockchain, digital payments) alongside CMC development (e.g., training in response agility and recovery). Firms like Jumia and Amazon Egypt can leverage these to reduce costs, enhance agility, and mitigate disruptions, improving competitiveness. Policymakers should promote FinTech infrastructure (e.g., regulatory support for digital finance) and incentives for crisis training, fostering sector-wide resilience. SMEs, often underserved, can use these insights to access supply chain finance, boosting inclusion and performance.

VIII. Limitations and Suggestions

Limitations: Despite its contributions, this study has limitations. First, the cross-sectional design limits causal inferences; longitudinal data could better capture dynamic effects over time. Second, the sample (n=262) is confined to Egyptian e-commerce, potentially limiting generalizability to other sectors or countries with differing economic contexts. Third, self-reported survey data may introduce common method bias, though procedural remedies (e.g., anonymity) were employed. Fourth, while SEM provides robust analysis, unmeasured variables (e.g., firm size, external regulations) could influence results. Finally, the focus on managerial perspectives overlooks frontline employee views.

Suggestions for Future Research: Future studies should adopt longitudinal or mixed-methods designs to track

FinTech and CMC impacts over time, including pre- and post-disruption scenarios. Comparative research across emerging markets (e.g., Egypt vs. India) could test contextual variations. Incorporating objective performance metrics (e.g., actual KPIs) alongside surveys would enhance validity. Exploring additional moderators (e.g., organizational culture, AI integration) or mediators (e.g., supply chain resilience) could extend the model. Finally, qualitative case studies on specific FinTech tools (e.g., blockchain in crises) would provide deeper practical insights.

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Appendix (1): Questionnaire items

Variables	Dimensions	Code	Items	Source
FinTech	Mobile and Digital Payments	MDP1	Our company effectively uses mobile wallets for supply chain financial transactions.	Guo & Wang (2025); Li et al. (2022); Ali et al. (2024)
		MDP2	Electronic payment gateways are fully integrated into our operational processes.	
		MDP3	Digital invoicing tools improve the speed and accuracy of our financial operations.	
		MDP4	Mobile and digital payments reduce errors and delays in financial transactions.	
	Blockchain-Enabled Finance	BEF1	Blockchain technology is used to improve transparency in invoice financing.	
		BEF2	Blockchain adoption strengthens trust among supply chain partners.	
		BEF3	Blockchain ensures accurate tracking of financial transactions.	
		BEF4	Blockchain applications improve coordination and payment reliability across the supply chain.	
	Data-Driven Financial Analytics	DFA1	AI and big-data tools are used for assessing supplier credit risk.	
		DFA2	FinTech analytics improve liquidity planning across the supply chain.	
		DFA3	Data-driven insights support better financial decision making.	
		DFA4	Financial analytics enhance risk management and proactive supply chain planning	
Crisis Management Capabilities	Preparedness Planning	PN1	Our company identifies potential risks and develops pre-crisis plans.	Brandon-Jones et al. (2014); Ivanov & Dolgui (2020)
		PN2	Risk assessment and mitigation procedures are regularly conducted.	
		PN3	We maintain updated contingency plans for potential disruptions.	
		PN4	Resources are allocated in advance to prepare for possible crises.	
	Response Agility	RA1	We can respond quickly to supply chain disruptions.	
		RA2	Crisis response actions are executed efficiently under time pressure.	
		RA3	Teams are empowered to make fast decisions during emergencies.	
		RA4	Rapid action is taken to minimize operational impact during crises.	
	Recovery Capability	RC1	Our organization restores supply chain operations effectively after disruptions.	
		RC2	Lessons learned from past crises are applied to improve future performance.	
		RC3	Recovery strategies are updated based on previous disruption experiences.	
		RC4	Operations are restored with minimal impact on service levels.	
	Communication and Coordination	CMR1	Our organization restores supply chain operations effectively after disruptions.	
		CMR2	Lessons learned from past crises are applied to improve future performance.	
		CMR3	Recovery strategies are updated based on previous disruption experiences.	
		CMR4	Operations are restored with minimal impact on service levels.	
Supply Chain Performance	Operational Efficiency	OE1	Our supply chain achieves high efficiency in cycle times and process completion.	Huo et al., 2024
		OE2	Order fulfillment is completed promptly and cost-effectively.	
		OE3	Operational costs are minimized without compromising performance.	
		OE4	Our processes are optimized to reduce waste and increase productivity.	
	Responsiveness and Agility	RNA1	The supply chain quickly adjusts to demand fluctuations.	
		RNA2	We respond effectively to market changes and unexpected disruptions.	
		RNA3	Our supply chain can rapidly adapt to new operational requirements.	
		RNA4	Decision-making processes support fast responses to	

			changing customer needs	
	Reliability	RB1	Deliveries are consistently made on time.	
		RB2	Service quality is reliable across all supply chain operations.	
		RB3	Our supply chain maintains accuracy in orders and shipments.	
		RB4	We minimize errors and inconsistencies in supply chain processes	
	Customer Satisfaction	CS1	Customer service quality meets or exceeds expectations.	
		CS2	Orders are fulfilled accurately and completely.	
		CS3	Customers are satisfied with our delivery timelines.	
		CS4	Feedback mechanisms are used to improve customer experience.	

Appendix (2): Correlation Matrix

Variables	MDP	BEF	DFA	PN	RA	RC	CMR	OE	RNA	RB	CS
MDP	1										
BEF	0.657**	1									
DFA	0.594**	0.642**	1								
PN	0.624**	0.706**	0.655**	1							
RA	0.702**	0.541**	0.593**	0.549**	1						
RC	0.614**	0.616**	0.651**	0.626**	0.588**	1					
CMR	0.684**	0.687**	0.553**	0.711**	0.641**	0.607**	1				
OE	0.587**	0.701**	0.482**	0.685**	0.669**	0.618**	0.660**	1			
RNA	0.602**	0.722**	0.521**	0.672**	0.576**	0.626**	0.690**	0.654**	1		
RB	0.541**	0.652**	0.666**	0.734**	0.700**	0.568**	0.741**	0.683**	0.644**	1	
CS	0.627**	0.714**	0.708**	0.680**	0.719**	0.705**	0.698**	0.717**	0.721**	0.627**	1

**significant at 0.01