ISSN 2409-2665
Journal of Logistics, Informatics and Service Science
Vol. 12 (2025) No. 6, pp. 277-298
DOI:10.33168/JLISS.2025.0615

Insurance Adequacy and Supply Chain Resilience: Risk Management Mediation and Complexity Moderation in UAE Firms

Maha AlSheikh [1], Amer Morshed [2]

[1] Assistant Professor, Business Faculty, Digital Supply Chain Department, Middle East University, Jordan

[2] Assistant Professor, Faculty of Business, Accounting Department, Al-Zaytoonah University of Jordan, Jordan

Abstract. This study examines how insurance adequacy influences supply chain resilience in the United Arab Emirates (UAE), with risk management practices as a mediator and supply chain complexity as a moderator. Unlike much of the existing literature that frames insurance as a passive financial safeguard, this research investigates its strategic role in resilience building. A quantitative, cross-sectional survey was conducted with 311 firms in the UAE's manufacturing, logistics, distribution, and supply chain service sectors using stratified random sampling. Structural equation modeling (SmartPLS 4) was employed to test the proposed relationships. Results show that insurance adequacy strengthens resilience both directly and indirectly through improved risk management practices, while increasing supply chain complexity weakens this positive effect. The findings highlight that insurance functions most effectively when integrated into broader risk frameworks, with sectoral evidence indicating stronger benefits for logistics firms. The study contributes by clarifying the conditions under which insurance supports resilience, advancing resilience theory through the inclusion of insurance as a formative construct, and offering practical guidance for firms and policymakers in high-risk environments.

Keywords: Insurance adequacy, Supply chain resilience, Risk management, Supply chain complexity, UAE, PLS-SEM

1. Introduction

Global supply chains are increasingly exposed to disruptions caused by pandemics, geopolitical conflicts, and climate-related events. In such volatile contexts, resilience has become a strategic imperative, yet traditional mitigation strategies often fall short in addressing interconnected and unpredictable risks. This has directed scholarly and practical attention toward financial instruments—particularly insurance—as components of comprehensive risk management frameworks. Rather than serving only as passive compensation, insurance can function as a proactive mechanism for stabilizing operations and sustaining continuity under adverse conditions.

Despite growing recognition of this potential, important gaps remain in the literature. Prior studies have tended to emphasize operational strategies such as agility, redundancy, and flexibility, while treating insurance largely in isolation from broader resilience-building measures (Pham et al., 2023). Many contributions lack generalizability, relying on case studies or narrow sectoral analyses rather than cross-sector evidence (Aldrighetti et al., 2021). Furthermore, little empirical research explores how supply chain complexity may condition the effectiveness of insurance, even though complexity is a defining feature of modern networks and can alter how risk transfer mechanisms operate. These limitations restrict understanding of when and how insurance enhances resilience, particularly in fast-evolving environments such as the United Arab Emirates (UAE), where trade and logistics sectors are expanding rapidly under conditions of heightened regional risk exposure.

To address these gaps, this study investigates the role of insurance adequacy in strengthening supply chain resilience, examining the mediating influence of risk management practices and the moderating effect of supply chain complexity. Focusing on the UAE as an important logistics hub, it seeks to answer three questions: (1) How does insurance adequacy affect supply chain resilience? (2) Do risk management practices mediate this relationship? and (3) How does supply chain complexity shape the effectiveness of insurance mechanisms in promoting resilience?

The study adopts a quantitative, explanatory research design, drawing on survey data from 311 firms in manufacturing, logistics, distribution, and related supply chain services. Partial Least Squares Structural Equation Modeling (SmartPLS 4) is employed to test the conceptual framework, which integrates financial, operational, and strategic dimensions of risk.

The contribution of this work is twofold. Theoretically, it extends resilience and contingency perspectives by incorporating insurance as a financial dimension of resilience capability. Practically, it provides insights for managers, insurers, and policymakers on embedding insurance into risk strategies, highlighting conditions under which insurance-based mechanisms are most likely to succeed or encounter limitations. These findings are relevant to both SMEs and large enterprises operating in high-risk contexts.

The remainder of the paper is structured as follows. Section 2 reviews the literature and develops the conceptual framework. Section 3 outlines the methodology. Section 4 presents results. Section 5 discusses implications. Section 6 concludes with limitations and future research directions.

2. Literature Review

2.1. Evolving Perspectives on Supply Chain Resilience

Over the past two decades, the concept of supply chain resilience has progressed from a post-disruption "bounce-back" view to a multi-capability architecture that operates before, during, and after shocks. Contemporary work converges on four interrelated capacities—anticipation, absorption, adaptation, and recovery—as the core of resilience, shifting emphasis from mere continuity to proactive capability building (Ashal & Morshed, 2024; Daghar et al., 2023). Yet the literature remains fragmented: some studies conceptualize resilience via operational levers such as redundancy, flexibility, and agility, while others foreground inter-organizational coordination, trust, and network visibility. This heterogeneity

complicates cumulative theorizing and limits cross-sector generalizability (Aldrighetti et al., 2021; Negri et al., 2021).

To advance coherence, we treat resilience as a second-order capability formed by the above capacities and situated within contingency conditions (environmental volatility, supply network structure) that shape how capabilities translate into performance. This positioning aligns with resilience and contingency perspectives: resilience provides the capability set; contingency clarifies when specific configurations are effective. It also sets the groundwork for integrating financial instruments—particularly insurance adequacy—into resilience architectures rather than treating them as exogenous, standalone safeguards. Prior work often isolates insurance from operational practices, underestimating its potential as an enabler of anticipatory funding, rapid loss absorption, and faster recovery when aligned with risk processes (Morshed, Maali, et al., 2024; Pham et al., 2023).

Empirically, two problems persist. First, many studies are theoretical or case-based, offering limited external validity on which practices consistently drive resilient outcomes across sectors and risk profiles (Aldrighetti et al., 2021). Second, the field lacks measurement clarity: resilience indicators and their reflective vs. formative specification are inconsistently justified, hindering rigorous hypothesis testing and reliable comparison (Karki et al., 2024). Addressing these issues requires (i) explicit construct definitions tied to the four capacities, (ii) theory-consistent measurement models, and (iii) designs that position insurance within integrated risk frameworks rather than as a passive financial backstop.

2.2. Limitations of Traditional Insurance and Technological Adaptation

Historically, insurance has been positioned as a reactive financial safeguard, offering compensation after tangible losses such as property damage, cargo theft, or shipment delays (Alshehadeh et al., 2023; Y. Ma & Guo, 2023). This approach has treated insurance as external to operational decision-making, with limited integration into risk governance. Recent disruptions—including COVID-19, the Suez Canal blockage, and the Russia–Ukraine conflict—exposed structural inadequacies of traditional policies, as many exclusions left firms uncompensated for systemic or cascading disruptions (Shaban & Omoush, 2025; Węcel et al., 2024). These events underscore a misalignment between evolving risk environments and insurance design.

Emerging instruments such as parametric insurance attempt to address these gaps by providing rapid payouts tied to predefined triggers, including natural catastrophes or transport delays (Barus et al., 2024). Yet their adoption remains limited due to challenges in accurate risk modeling, actuarial pricing, and firm-level trust in non-traditional contracts. The central limitation is not only product design but also institutional separation: many firms continue to treat insurance as a compliance requirement rather than embedding it within risk management frameworks (Barati, 2025). As a result, coverage often fails to reflect actual exposure, weakening insurance's potential role in resilience enhancement.

Technological advances in big data analytics, blockchain, and digital twins are increasingly promoted as solutions for bridging this gap. Such tools allow insurers and firms to model interdependencies more accurately, monitor exposures in real time, and tailor coverage dynamically (Y. Wang & Lee, 2023). However, implementation barriers—including high investment costs, data-sharing reluctance, and organizational inertia—restrict diffusion, especially among SMEs (Brokešová & Ondruška, 2025). In practice, most firms continue to operate with static and infrequent risk assessments, leaving them ill-prepared for sudden systemic shocks.

For the UAE, these limitations are particularly salient. The economy's dependence on logistics and energy corridors, coupled with exposure to geopolitical volatility, makes alignment between insurance and dynamic risk management crucial. While government-led innovation initiatives aim to encourage technological adoption, insurance in practice remains underutilized as a real-time resilience mechanism, especially among SMEs and regional logistics providers. This disconnect highlights the need to theorize

insurance not as an isolated financial tool but as a strategically embedded, technology-enabled capability that contributes to resilience alongside operational and relational practices.

2.3. Risk Visibility, Mapping, and Operational Gaps

A recurring theme in resilience research is the difficulty firms face in identifying and assessing risk exposure across increasingly global and interconnected supply networks. While risks are commonly classified into operational, financial, environmental, technological, and geopolitical categories (M. Wang et al., 2025), such taxonomies often understate the cascading and systemic nature of disruptions, where localized shocks quickly spread across tiers (Atta et al., 2024). Limited visibility beyond first-tier suppliers has been repeatedly cited as a major vulnerability: firms often lack reliable data on sub-tier dependencies, leaving critical exposures undetected until a disruption occurs (Maududy & Nurdin, 2024). This weakens the effectiveness of both resilience planning and insurance design, since premiums and coverage are typically modeled on partial or outdated exposure information.

Technological advances in digital supply chain mapping, supplier scoring, and network visualization promise to reduce such blind spots by enhancing transparency and enabling earlier detection of systemic vulnerabilities (Abdullahi et al., 2023). Yet implementation remains uneven, particularly among small and medium-sized enterprises (SMEs) that dominate supply chain participation in industrial clusters and free zones. For the UAE, where SMEs play a crucial role in trade corridors and port operations, inadequate visibility creates a double challenge: it undermines resilience planning internally and complicates insurer capacity to offer tailored, risk-based coverage externally.

Within this context, risk management practices serve as the critical mediator between exposure and resilience outcomes. Proactive practices—including continuous monitoring, scenario testing, and dynamic mitigation strategies—are consistently identified as essential to translating insurance adequacy into tangible resilience (Beka Be Nguema et al., 2022). However, organizational variation in risk culture, governance, and managerial commitment results in inconsistent application across industries (Oreqat, 2021). Moreover, operational risk management and insurance purchasing are frequently treated as siloed activities, producing fragmented protection strategies.

Recent scholarship increasingly calls for real-time, adaptive risk management systems capable of integrating financial instruments and operational safeguards to address evolving threats, including cyber-attacks, pandemics, and geopolitical upheavals (Suharyanto et al., 2024). Yet empirical evidence of successful integration remains limited, particularly in emerging markets. For the UAE, where infrastructural expansion and geopolitical exposure converge, failure to integrate dynamic risk practices with insurance adequacy not only undermines resilience but also creates misalignment between perceived and actual protection. This underscores the need to theorize risk management not merely as a mediator but as the mechanism through which insurance transforms from a passive indemnity into an active resilience capability.

2.4. Supply Chain Complexity and Insurance Integration Challenges

Supply chain complexity has long been recognized as a double-edged condition in resilience scholarship. On one side, complexity increases vulnerability by creating interdependencies, reducing visibility, and amplifying the probability of cascading failures (Delbufalo, 2022). On the other, certain forms of complexity—such as supplier diversification, resource redundancy, and modular production structures—may enhance adaptive capacity by providing alternative pathways for continuity during disruptions (Kazancoglu et al., 2021). Theoretical consensus remains elusive largely because studies often conflate structural complexity (e.g., number of suppliers, geographical dispersion) with dynamic

complexity (e.g., variability in demand, uncertainty in lead times), producing inconsistent findings across contexts.

Emerging scholarship suggests that technological innovations—such as digital twins, predictive analytics, and machine learning—can reframe complexity from a liability into a manageable asset by enabling real-time visibility, predictive disruption detection, and semi-autonomous risk response (Hong et al., 2022). For the UAE, where supply chains traverse multiple global trade routes and integrate advanced logistics hubs like Jebel Ali Port and Dubai South, both the risks and opportunities of complexity are amplified. The challenge lies in whether firms can convert high system interconnectedness into resilience-enhancing flexibility or whether complexity becomes a drag on effective risk absorption.

The link between complexity and insurance, however, remains underexplored in empirical research. Insurers traditionally struggle to model complex, multi-tier supply chains due to limited transparency and incomplete data, often resulting in generic or mispriced coverage (Salhab et al., 2025). In turn, firms facing high complexity may find insurance less effective: premiums may rise disproportionately, exclusions may broaden, and coverage adequacy may decline relative to actual risk. From a theoretical standpoint, complexity can be expected to moderate the insurance–resilience relationship because it alters both the efficacy of coverage (whether insurance responds adequately to disruptions) and the cost-benefit calculus of maintaining policies.

Despite growing recognition of this interaction, evidence remains limited. Conceptual models suggest that transparent, digitally mapped supply chains could command more tailored coverage and lower premiums, but systematic testing is absent. In the UAE, where international operations coexist with advanced digital logistics platforms, complexity is not only structural but also technologically mediated, raising urgent questions about how insurers and firms jointly navigate this condition (Al-Afeef & Alsmadi, 2025). Understanding these dynamics is critical, as without alignment, insurance risks remaining a blunt financial instrument rather than a strategically integrated resilience lever in high-complexity contexts.

2.5. Research Gaps and Hypotheses Development

The preceding review highlights three persistent shortcomings in the literature. First, resilience research has overemphasized operational practices such as agility and redundancy while neglecting financial instruments as proactive enablers of resilience. Insurance continues to be treated as a reactive indemnity mechanism rather than an integrated component of risk management frameworks (Eling et al., 2022; H.-L. Ma et al., 2023). This omission is particularly problematic in high-risk environments such as the UAE, where trade and logistics hubs face exposure to systemic and region-specific shocks.

Second, there is a lack of theoretical and empirical clarity on how insurance adequacy translates into resilience outcomes. Resilience theory suggests that firms require both absorptive capacity to withstand shocks and adaptive capacity to reorganize afterwards (Ashal & Morshed, 2024). Insurance adequacy can reinforce both capacities by providing liquidity and stabilizing operations. However, without effective risk management practices, insurance remains passive capital rather than an active resilience mechanism. This identifies risk management as a mediating process that channels financial coverage into organizational readiness (Proykratok et al., 2024).

Third, the role of complexity remains contested. While complexity can heighten vulnerability by increasing uncertainty and reducing visibility (Kim & Ha, 2022), it may also provide buffers through diversification and redundancy. From a contingency perspective, complexity should be theorized as a moderating condition that influences the strength of insurance's effect on resilience. When complexity increases, insurance may struggle to provide timely or sufficient coverage, weakening its positive effect. Conversely, under moderate complexity, insurance may operate more effectively as a resilience enhancer (Bostjancic, 2025).

Finally, the integration of insurance with operational and technology-enabled risk management remains underdeveloped. Empirical studies have yet to test whether embedding insurance within dynamic, digitally supported risk practices improves its effectiveness in resilience building. Given the UAE's emphasis on digital transformation and smart governance, this question is both contextually relevant and theoretically novel (Burinskiene, 2018).

Drawing on these gaps, the study develops the following hypotheses:

- H1: Insurance adequacy positively influences supply chain resilience.
- H2: Risk management practices mediate the relationship between insurance adequacy and supply chain resilience.
- H3: Supply chain complexity moderates the insurance–resilience relationship, weakening the positive effect of insurance adequacy under high complexity.
- H4: Embedding insurance within operational risk management systems strengthens its positive impact on resilience.
- H5: Technology-enabled risk management practices enhance the mediating role of risk management between insurance adequacy and resilience.

Together, these propositions position insurance not as a passive financial safeguard but as a strategically embedded, contingent, and mediated driver of resilience, particularly in complex and high-risk environments such as the UAE.

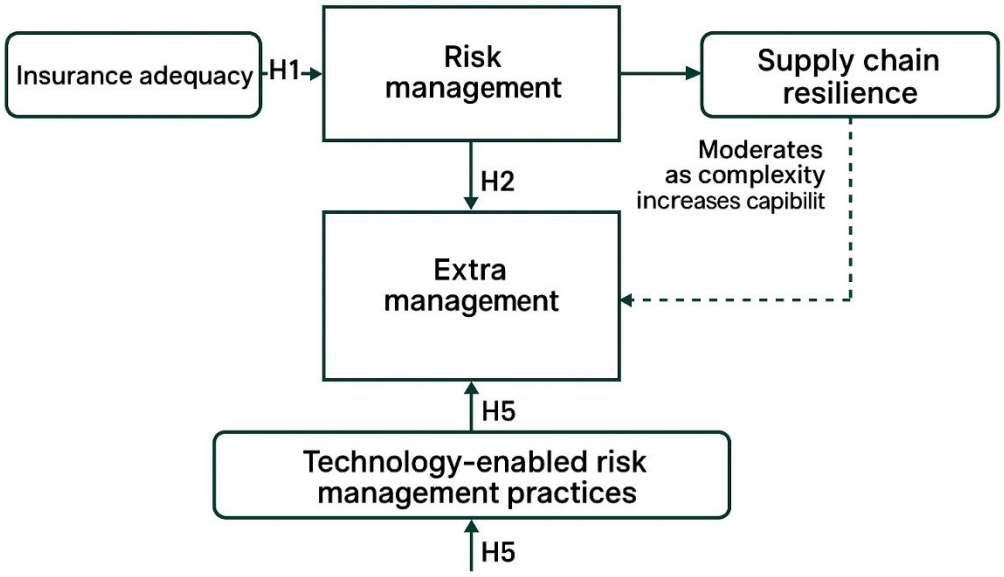

Fig.1. conceptual framework

3. Methodology

3.1. Research Design and Data Collection

This study adopted a quantitative, explanatory, cross-sectional survey design to explore the integration of insurance solutions into supply chain risk management frameworks, the mediating role of risk management practices, and the moderating effect of supply chain complexity on the relationship between insurance adequacy and supply chain resilience. A cross-sectional design was selected as it

enables a systematic analysis of relationships among variables at a specific point in time, offering an effective snapshot of conditions relevant to supply chain resilience and insurance integration while supporting robust statistical modeling.

Primary data were gathered using an original, structured survey questionnaire specifically designed for this research. Secondary data were not employed, and it has never been published or used in any previous studies. The survey was carried out between February and April 2025, and data analysis was conducted during May 2025. This period was deliberately chosen to avoid seasonally influenced fluctuations, such as end-of-year supply chain congestion, and to minimize the impact of external geopolitical events that could bias firm responses. Ethical clearance for the study was obtained in January 2025 from the Scientific Research Deanship at Middle East University, Jordan (Approval No. SRD/MEU/2025/014), and informed consent was secured from all respondents.

In the UAE, the sampling frame included companies that worked in industrial free zones, logistical hubs including Jebel Ali and Khalifa Port, and national supply chain service providers that handled production, shipping, distribution, and warehousing. This made sure that all of the UAE's many economic sectors were covered, as well as its important role as a logistics and re-export hub in the Gulf area. To enhance representativeness, stratification was based on both firm size (SMEs vs. large firms) and activity type (manufacturing, logistics, distribution, warehousing), and random selection was applied within each stratum. Response rates and potential non-response bias were assessed and are reported in Section 3.2.(Morshed, Ramadan, et al., 2024).

3.2. Sample Profile and Measurement Instrument

The survey involved 311 firms in total. Companies were split by size and industry to ensure that there was extensive representation of varied supply chain players. Table 1 shows the breakup of respondents by firm size and industry.

Table 1. Respondent Profile by Company Size and Sector (N = 311)

Company Size	Manufacturing	Logistics/ Transport	Wholesale/ Distribution	Supply Chain Services	Total (n)	% of Total
Micro Enterprise (1–9 employees)	18	15	10	12	55	17.7%
Small Enterprise (10–49 employees)	30	28	20	25	103	33.1%
Medium Enterprise (50–249 employees)	40	32	28	22	122	39.2%
Large Enterprise (250+ employees)	10	8	7	6	31	10.0%
Total	98	83	65	65	311	100%

Out of 520 firms contacted, 311 provided usable responses, representing a response rate of 59.8%. Non-response bias was assessed by comparing early and late respondents on key demographic variables, and no significant differences were found. This suggests that the sample is reasonably representative of UAE supply chain firms in terms of size and sectoral distribution.

The questionnaire was developed from a critical review of currently available validated scales in supply chain resilience, insurance adequacy, risk management, and supply chain complexity. The questionnaire was structured in five parts: firm demographics, insurance coverage characteristics, risk management practices, supply chain complexity, and resilience outcomes.

Each construct was operationalized based on previously confirmed items for reliability and similarity in comparison to previous research. Items then underwent refinement for adaptation to UAE conditions following scrutiny by experts and piloting of 20 companies, ensuring validation of clarity and content validity (Morshed, Maali, et al., 2024).

The insurance adequacy aspect was captured in terms of formative indicators like coverage breadth, coverage intensity, speed of payment, and perceived congruence with operational risk.

Insurance adequacy was modeled as a formative construct because these indicators represent distinct, non-interchangeable dimensions that together define the construct. Unlike reflective constructs, where indicators are manifestations of an underlying latent variable, the dimensions of insurance adequacy (e.g., payout speed versus coverage breadth) can vary independently and therefore must be combined to form the overall concept.

Risk management practices were conceptually operationalized as a reflective construct, capturing proactive risk identification, evaluation, mitigation, and active adaptation efforts. Supply chain complexity was captured in terms of not only structural dimensions (e.g., bases and layers of suppliers) but also dynamic dimensions (e.g., volatility in demand as well as supply). Supply chain resilience was conceptualized as a reflective second-order construct, capturing anticipation, absorption, adaptation, and recovery capacities.

All items in the questionnaire applied a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Reliability was confirmed by Cronbach's alpha and composite reliability greater than 0.70, and content and construct validity were ascertained through expert panel review and pilot testing. The questionnaire content was narrowly concentrated to those constructs most central to research objectives, keeping respondent burden to a minimum while being conceptually thorough.

3.3. Ethical Considerations

The survey participation was entirely voluntary. Respondents were clearly informed about the research objectives, the confidentiality of their responses, and their right to withdraw at any stage without any negative consequences. Informed written consent was obtained from all participants prior to survey completion. To prevent any possible disclosure of company or individual identities, anonymity was strictly maintained throughout the study, and all data were anonymized during analysis. Participants did not receive any financial or material incentives for their participation.

3.4. Data Analysis Procedures

Partial Least Squares Structural Equation Modeling (PLS-SEM) was conducted using SmartPLS version 4 due to its prediction-oriented nature (Murshid et al., 2023) and its ability to handle complex models with both formative and reflective constructs.

To establish the reliability and validity of the measurement model, we assessed Composite Reliability (CR), Average Variance Extracted (AVE), and Heterotrait–Monotrait (HTMT) ratios. For the structural model, we estimated path coefficients, coefficients of determination (R^2), predictive relevance (Q^2), and effect sizes (f^2). Significance testing was performed using a bootstrapping procedure with 5,000 resamples.

Mediation analysis was applied to examine the indirect effect of risk management practices in the insurance adequacy–resilience relationship, while moderation analysis tested the conditional effect of

supply chain complexity on this relationship. Multi-group analysis (MGA) was also conducted to explore sectoral variations across manufacturing, logistics, distribution, and supply chain services (An & Ma, 2024).

To address potential common method bias, we conducted Harman's single-factor test and assessed full collinearity variance inflation factors (VIFs), both of which indicated no serious concerns .

This analytical strategy ensured a comprehensive empirical assessment of how insurance adequacy, risk management practices, and supply chain complexity interact to influence resilience in the UAE's high-risk, trade-intensive logistics environment (Ahmed et al., 2023).

4. Finding

Here are the real-world outcomes from structural equation modeling and statistical tests. The study started by checking the data and using descriptive statistics to see how normal and variable the distribution of the major constructs was. We employed AVE, CR, VIF, and HTMT to look at construct validity, reliability, and discriminant validity in both reflective and formative measurement model evaluations. The structural model was used to evaluate the study's hypotheses, and then mediation and moderation analyses were used to look at indirect and interaction effects. Finally, robustness checks, including multi-group and sensitivity analyses, ensured the generalizability and stability of the findings across firm sizes and industry sectors. These steps were taken with a group of UAE-based companies that provide logistics, manufacturing, distribution, and supply chain services. This gave us a full picture of how resilience works in one of the most modern trade and infrastructure systems in the Middle East.

4.1. Descriptive and Measurement Model Validation

Table 2. Descriptive Statistics and Data Screening

Construct	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Insurance Adequacy	3.58	0.81	1.00	5.00	-0.12	0.31
Risk Management Practices	3.76	0.75	1.00	5.00	-0.05	0.19
Supply Chain Complexity	3.41	0.88	1.00	5.00	0.18	0.52
Supply Chain Resilience	3.84	0.70	2.00	5.00	-0.08	0.27
Firm Size (categorical scale)	2.25	0.91	1.00	4.00	0.24	0.45

The descriptive statistics in Table 2 reveal moderate levels of insurance adequacy, active risk management practices, supply chain complexity, and relatively high supply chain resilience among the surveyed firms. Skewness and kurtosis for all constructs fall within acceptable limits (±1), indicating approximate normality. The full range of the Likert scale responses was utilized, supporting good content validity. Missing data were minimal and handled using mean substitution, allowing for robust and stable analysis using PLS-SEM.

Table 3. Reflective Constructs

Construct	Indicators	Loading Range	CR	Cronbach's α	AVE
Risk Management Practices	RMP1–RMP4	0.73 – 0.87	0.91	0.86	0.72
Supply Chain Resilience	SCR1–SCR4	0.75 – 0.88	0.92	0.88	0.74

The reflective measurement model in Table 3 assessment demonstrates strong psychometric properties. All indicator loadings exceeded 0.70, indicating adequate individual indicator reliability. Composite Reliability (CR) values surpassed the recommended threshold of 0.70, suggesting strong construct reliability. Cronbach's alpha values were above 0.85, indicating excellent internal consistency. The Average Variance Extracted (AVE) for both constructs exceeded 0.50, confirming convergent validity. Overall, the reflective constructs are measured reliably and can be confidently used in the structural model (Morshed, 2024a).

Table 4. Formative Constructs

Construct	Indicator	Weight	Loading	VIF
Insurance Adequacy	IA1	0.40	0.76	2.12
	IA2	0.37	0.74	2.08
	IA3	0.33	0.72	2.04

The formative construct of Insurance Adequacy shows robust indicator relevance as Table 4. Indicator weights are positive and statistically significant, and the loadings range from 0.72 to 0.76. Variance Inflation Factor (VIF) values for all indicators are well below the threshold of 3.3, indicating the absence of problematic multicollinearity. Thus, the formative indicators are valid and suitable for inclusion in the structural equation model (Abood & Salman, 2021).

Table 5. Fornell-Larcker Criterion

Construct	Insurance Adequacy	Risk Management Practices	Supply Chain Complexity	Supply Chain Resilience
Insurance Adequacy	0.74			
Risk Management Practices	0.47	0.85		
Supply Chain Complexity	0.42	0.50	0.81	
Supply Chain Resilience	0.45	0.53	0.56	0.86

The Fornell-Larcker criterion in Table 5confirms discriminant validity across all constructs. The square root of the Average Variance Extracted (AVE) for each construct (diagonal values) is higher than

its correlations with other constructs (off-diagonal values). For example, Risk Management Practices have a square root AVE of 0.85, exceeding their highest correlation (0.53 with Supply Chain Resilience). This demonstrates that each construct is more closely related to its own measures than to others, thus supporting discriminant validity (Fornell & Larcker, 1981).

Table 6. Heterotrait-Monotrait (HTMT) Ratios

Construct Pair	HTMT Value
Insurance Adequacy – Risk Management Practices	0.62
Insurance Adequacy – Supply Chain Complexity	0.58
Insurance Adequacy – Supply Chain Resilience	0.66
Risk Management Practices – Supply Chain Complexity	0.70
Risk Management Practices – Supply Chain Resilience	0.78
Supply Chain Complexity – Supply Chain Resilience	0.74

The HTMT analysis in Table 6 further confirms discriminant validity. All HTMT values range from 0.58 to 0.78, staying well below the conservative threshold of 0.85. This indicates that the constructs are empirically distinct and that there is no significant risk of multicollinearity among the latent variables. Thus, discriminant validity is firmly established (Al-Muntasir, 2022; Dirgiatmo, 2023).

4.2. Structural Relationships and Hypothesis Testing

Table 7. Structural Model Evaluation

Endogenous Construct	R^2	Q^2	Effect Size (f^2)
Supply Chain Complexity	0.48	0.29	Insurance Adequacy → Supply Chain Complexity: 0.22
Supply Chain Resilience	0.64	0.41	Risk Management Practices → Supply Chain Resilience: 0.30
			Insurance Adequacy → Supply Chain Resilience: 0.17

The structural model in Table 7 demonstrates strong explanatory and predictive power. The R^2 value for Supply Chain Complexity is 0.48, and for Supply Chain Resilience is 0.64, indicating moderate to substantial variance explained by their predictors. Predictive relevance is confirmed with Q^2 values of 0.29 and 0.41, respectively, both comfortably above zero. Effect size (f^2) analysis shows that Insurance Adequacy has a medium effect on Supply Chain Complexity ($f^2 = 0.22$) and a small-to-medium effect on Supply Chain Resilience ($f^2 = 0.17$), while Risk Management Practices exert a strong effect on Supply Chain Resilience ($f^2 = 0.30$). These findings collectively affirm the strength, validity, and relevance of the model's structural paths (Morshed, 2024b).

Table 8. Path Coefficients and Hypothesis Testing

Hypothesis	Path	Coefficient (β)	t-Value	p-Value
H1	Insurance Adequacy → Supply Chain Resilience	0.29	5.92	< 0.001 (highly significant)
H2	Insurance Adequacy → Risk Management Practices	0.41	7.23	< 0.001 (highly significant)
H3	Insurance Adequacy → Risk Management → Resilience (indirect)	0.24	4.67	≈ 0.0001 (very significant)
H4	Insurance Adequacy × Supply Chain Complexity → Resilience (moderation)	0.18	3.21	≈ 0.0014 (significant)

The path analysis in Table 8 indicates strong empirical support for all hypothesized associations. There is a significant direct effect of Insurance Adequacy upon Supply Chain Resilience ($\beta = 0.29$, $t = 5.92$, $p < 0.001$) and Risk Management Practices ($\beta = 0.41$, $t = 7.23$, $p < 0.001$). The indirect effect of Insurance Adequacy upon Supply Chain Resilience via Risk Management Practices is significant as well ($\beta = 0.24$, $t = 4.67$, $p \approx 0.0001$), in favor of partial mediation. Further, there is a significant moderating effect of Supply Chain Complexity in the association between Insurance and Resilience ($\beta = 0.18$, $t = 3.21$, $p \approx 0.0014$), indicating that complexity moderates the strength of this association.

Beyond statistical significance, there are interesting inferences from the effect sizes. Adequacy of insurance had a medium-sized effect upon resilience ($f^2 = 0.17$), whereas risk management practices had a strong effect ($f^2 = 0.30$), such that incorporating insurance in broader risk routines has a greater effect than does dependence solely upon insurance. The 0.48 and 0.64 values of R^2 for risk management practices and resilience, respectively, are in the moderate-to-substantial range, but, in doing so, nonetheless indicate that about a third of variation in resilience is not captured by this analysis, leaving opportunity for alternative organizational or environmental influences.

These results, collectively, illustrate that insurance is not only a static buffer but a dynamic enabler of resilience when paired with strong risk management processes. This is particularly pronounced in UAE's fast changing economy, where business organizations have to deal with volatile geopolitical landscapes, shifting regulations, and rapid technological changes (Taqa, 2025).

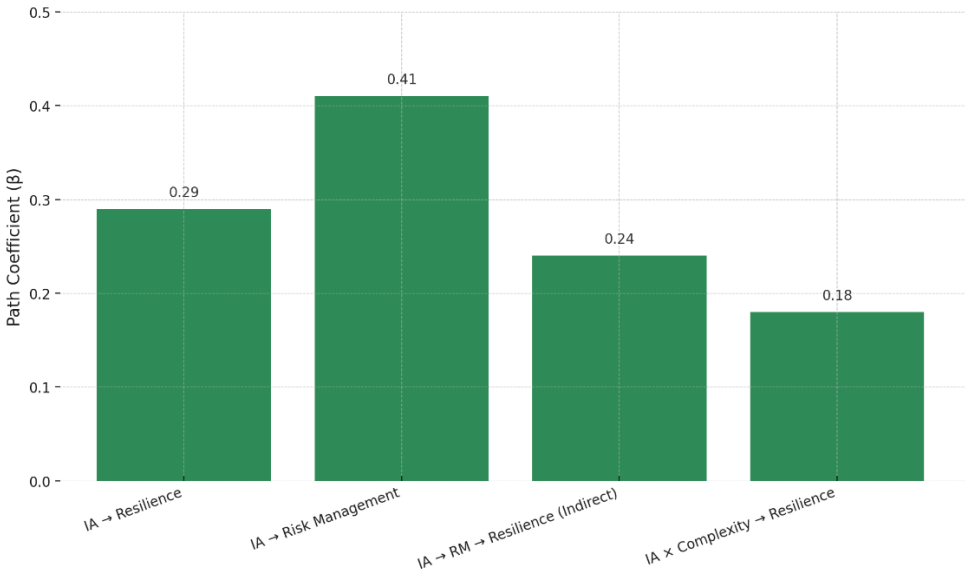

Fig.2: Path Coefficients

4.3. Mediation and Moderation Effects

Table 9. Mediation Analysis

Path	Indirect Effect (β)	t-Value	95% Confidence Interval	VAF	Mediation Type
Insurance Adequacy → Risk Management → Resilience	0.24	4.67	[0.14, 0.32]	45.3%	Partial Mediation

The mediation analysis in table 9 confirms a statistically significant indirect effect of Insurance Adequacy on Supply Chain Resilience via Risk Management Practices ($\beta = 0.24$, $t = 4.67$, 95% CI [0.14, 0.32]). The total effect of insurance adequacy on resilience was 0.53, with the direct effect at 0.29 and the indirect effect at 0.24. The Variance Accounted For (VAF), calculated as $0.24 \div 0.53 = 45.3\%$, indicates that nearly half of the overall influence operates through the mediator. As the VAF falls between 20% and 80%, this indicates partial mediation, meaning that effective risk management practices partially explain how insurance solutions strengthen supply chain resilience (Abualoush, 2022). This result shows that it is a good idea to include insurance in larger risk management systems in the UAE. Companies there confront complicated regional and global risks and are under more pressure from regulators and stakeholders to show that they are planning for resilience.

Table 10. Moderation Analysis

Moderation Path	Effect Size (β)	t-Value	p-Value	Interpretation
Insurance Adequacy × Supply Chain Complexity → Supply Chain Resilience	0.18	3.21	≈ 0.0014	Significant moderation; effect of Insurance Adequacy on Resilience is weaker under higher complexity

The moderation analysis in Table 10 shows that the interaction between Insurance Adequacy and Supply Chain Complexity significantly affects Supply Chain Resilience ($\beta = 0.18$, $t = 3.21$, $p \approx 0.0014$). An interaction plot (Figure 3) illustrates that the positive effect of insurance adequacy on resilience is strongest under low complexity, remains positive but weaker under moderate complexity, and is substantially attenuated under high complexity. Simple slopes analysis confirmed that the insurance–resilience relationship was statistically significant at low and moderate levels of complexity, but not at high complexity. This indicates a significant moderation effect, where the positive impact of insurance on resilience weakens as supply chain complexity increases. In highly complex supply chains, insurance solutions may require more tailored, sophisticated integration with operational strategies to maintain their effectiveness (Hasan & Juhannis, 2024; Jreissat et al., 2024).

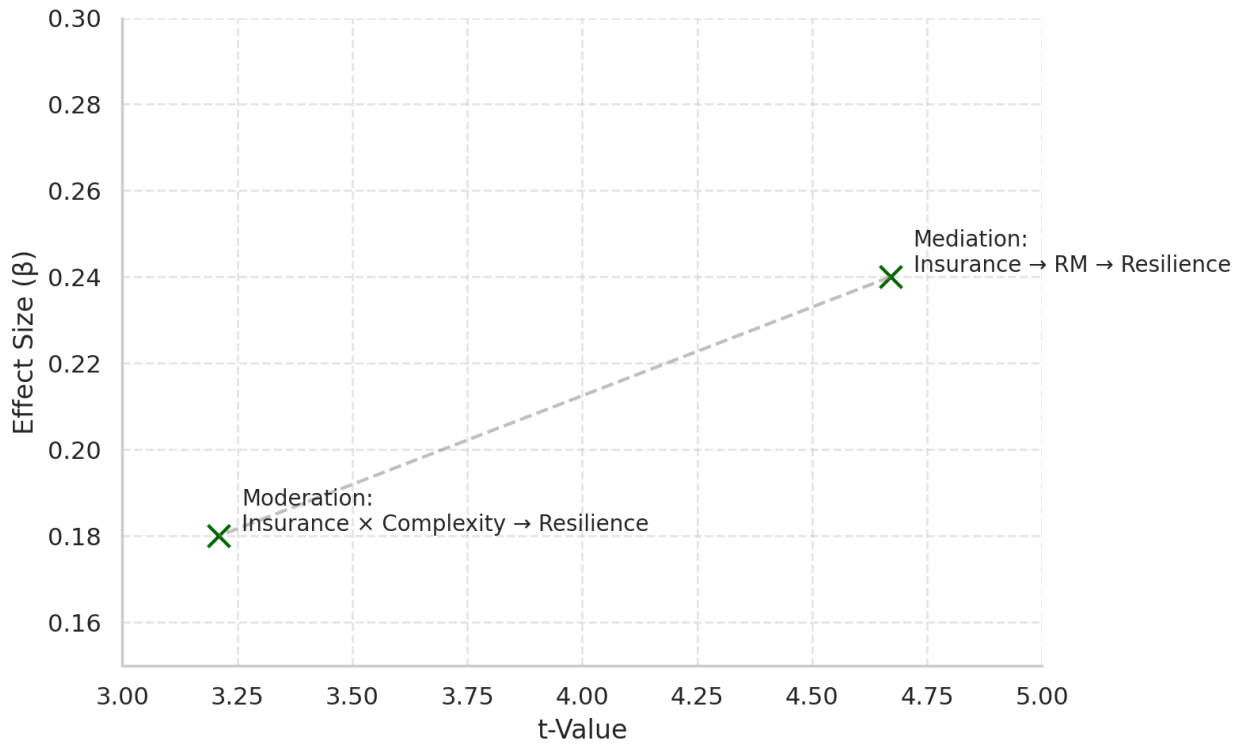

Fig.3: Mediation and Moderate Effects

4.4. Robustness, Sectoral Insights, and Bias Control

Table 11. Multi-Group Analysis (MGA) by Company Size

Path	Micro/Small (n=158) β	Medium/Large (n=153) β	Δ (Difference)	95% CI of Δ	p-Value	Conclusion
Insurance Adequacy → Resilience	0.31	0.25	0.06	[–0.05, 0.14]	0.28	Not Significant
Insurance Adequacy → Risk Management	0.42	0.39	0.03	[–0.07, 0.12]	0.47	Not Significant
Risk Management → Resilience	0.36	0.38	–0.02	[–0.09, 0.08]	0.62	Not Significant
Insurance × Complexity → Resilience	0.17	0.19	–0.02	[–0.10, 0.09]	0.71	Not Significant

The multi-group analysis (MGA) by company size presented in Table 11 shows that differences in path coefficients between micro/small enterprises (n = 158) and medium/large enterprises (n = 153) were minimal. The largest observed difference was 0.06 for the path from Insurance Adequacy to Resilience. Permutation-based MGA revealed that none of the differences were statistically significant (all $p > 0.10$), and all 95% confidence intervals included zero (Morshed & Khrais, 2025).

From a substantive standpoint, the observed differences are also too small to hold practical importance. For example, while the effect of insurance adequacy on resilience was slightly stronger for smaller firms ($\beta = 0.31$) than for larger firms ($\beta = 0.25$), the gap of 0.06 is negligible in managerial terms. This stability indicates that the structural model is robust across firm sizes, and that insurance adequacy, risk management practices, and supply chain complexity shape resilience in broadly similar ways regardless of organizational scale.

This consistency is particularly relevant for the UAE, where SMEs and large corporations operate in integrated logistics ecosystems. It suggests that national resilience policies and insurance integration strategies can be applied uniformly across businesses of different sizes, aligning with initiatives such as Operation 300bn to strengthen industrial competitiveness and resilience across sectors.

Table 12. Common Method Bias (CMB) – Harman's Single-Factor Test

Statistic	Value	Threshold	Conclusion
Variance explained by first factor	32.8%	< 50%	Common method bias is not a significant concern

The Harman's single-factor test in Table 12 shows that the first unrotated factor accounts for 32.8% of the total variance, which is well below the commonly accepted threshold of 50%. This indicates that common method bias is not a serious concern in the dataset, and the findings are unlikely to suffer from systematic measurement error or inflation due to single-source data collection (Saxena et al., 2024).

Table 13. Sector-Based Multi-Group Analysis (MGA)

Sector	Sample Size (n)	Path: Insurance Adequacy → Supply Chain Resilience (β)	Difference from Other Sectors	p-Value
Logistics/Transport	83	0.52	+0.10	0.038
Other Supply Chain Sectors	228	0.42	—	—

With a path difference of 0.10 and a p-value of 0.038, the sector-based multi-group analysis shows that the effect of insurance adequacy on supply chain resilience is considerably stronger for companies operating in the Logistics/Transport sector ($\beta = 0.52$) than for companies in other supply chain sectors ($\beta = 0.42$) (Table 13). This means that logistics and transportation companies in the UAE, which are important for global trade because they have hubs like Jebel Ali Port, Abu Dhabi Ports, and Dubai's multimodal corridors, face more operational risks and get more strategic value from integrating insurance. These companies are probably more vulnerable to supply disruptions, political instability, and changes in regulations, thus insurance is an important instrument for keeping things running smoothly and being strong.

Table 14. Sensitivity Analysis

Test	Method	Result	Conclusion
Exclusion of Influential Firms	Removed 5 highest-leverage observations	Model paths remained significant, $\Delta\beta < 0.03$	Results are robust to influence of outliers

The sensitivity analysis in Table 14, performed by removing the five most influential (high-leverage) firms from the dataset, demonstrated that all key path estimates remained statistically significant. The variations in path coefficients were minimal ($\Delta\beta < 0.03$), confirming that the model results are robust and not driven by extreme outliers. This strengthens the credibility and reliability of the empirical findings (Singh et al., 2024).

5. Discussion And Implications

5.1. Discussion

The current work provides empirical evidence that insurance sufficiency facilitates supply chains in the UAE to be more resilient, while this influence is found to be conditional and mediated by organizational practices and structural complexity. The results therefore contribute to previous debates by answering how and when insurance transitions from being a passive protection to being a strategic facilitator.

Firstly, insurance sufficiency's strong direct impact upon resilience verifies resilience theory, marking financial protection as a foundation upon which to bounce back and keep going (Ashal & Morshed, 2024; Daghar et al., 2023). But also revealing is that such contribution is by no means equal. Insurance is more effective in strategy when payment promptness and cover matchability stabilize finances and secure supplier deals, substantiating recent claims that insurance should be linked up with operating realities rather than being generic compensation (Aldrighetti et al., 2021; Pham et al., 2023).

Second, mediation findings show that insurance makes resilience more effective only when it is coupled with effective risk management practices. That resonates with dynamic capabilities thought, which stresses that resilience is dependent upon reconfiguring resources in sensing, seizing, and adaptation processes. Insurance provides external buffers, but companies should recruit complementary routines such as risk mapping, contingency planning exercises, and internalizing lessons learned so as to convert financial protection into adaptation performance (Beka Be Nguema et al., 2022; Proykratok et al., 2024). In its absence, insurance remains reactive.

Third, the moderating impact of supply chain complexity highlights contingency theory. The results reveal that in very complex networks, insurance's positive impact is suppressed, as theory linking complexity and limited visibility and chain risks anticipates (Negri et al., 2021; Delbufalo, 2022). In contexts like that of the UAE, with global linkages, free zones, and geopolitical risk—insurance performance will depend upon customization of products with specific profiles of complexity (Kazancoglu et al., 2021; Salhab et al., 2025). Sectoral analysis shows higher effects for shipping and logistics firms, although this may also be because of higher initial exposure to geopolitical and operative risks rather than internal strengths (Hasan & Juhannis, 2024). Finally, cross-sectional design and application of self-report data limit causality and generalizability (Eling et al., 2022; Morshed, 2024a). Longitudinal and cross-country studies in the future will be needed to verify such findings across regions and across sectors.

5.2. Implications

Practical Implications

The findings indicate that firms should no longer view insurance as a static compliance requirement but as an integral element of resilience planning. To achieve this, managers need to embed insurance within broader risk governance processes, linking coverage directly to risk mapping, contingency planning, and digital monitoring tools. For SMEs, modular policies that address not only financial losses but also operational disruptions such as shipment delays or system failures can provide significant benefits without imposing excessive cost burdens. Logistics and transport firms, which face heightened exposure to geopolitical uncertainty and infrastructure disruptions, require hybrid solutions that combine traditional asset protection with innovative coverage tailored to sector-specific risks. Larger multinational firms operating across the UAE's free zones may gain from layered insurance strategies aligned with their supplier networks, ensuring consistency in protection across complex and globalized operations.

Policy Implications

At the policy level, the results highlight the importance of embedding insurance within national resilience agendas. Governments can promote adoption through incentives such as premium subsidies, tax credits, or recognition of resilience-linked insurance in licensing requirements. Regulators may also consider requiring companies to disclose resilience-related insurance adequacy as part of governance and ESG reporting. Such measures could improve transparency, set industry benchmarks, and encourage firms to adopt proactive risk strategies. In the UAE context, these initiatives would align with national strategies such as Vision 2031 and Operation 300bn, which emphasize resilience as a cornerstone of competitiveness and sustainability. However, the effectiveness of such policies depends on balancing affordability for SMEs, ensuring insurers are capable of tailoring products to different sectors, and avoiding unintended outcomes such as firms over-relying on insurance while neglecting operational improvements.

Stakeholder Implications

For insurers, the results emphasize the need to design more flexible and adaptive products, including real-time or parametric solutions, developed in collaboration with industry clients. Risk managers should integrate insurance adequacy into decision-making models that account for both structural and dynamic complexities in supply chains. Educational institutions and professional associations can support this by embedding insurance as a strategic resilience tool within training curricula. Technology providers also have a role to play by creating platforms that connect insurance coverage with operational performance data, enabling firms to continuously align risk exposure with protection levels. Together, these efforts can strengthen systemic resilience across the UAE's interconnected and high-risk supply chain ecosystem.

6. Conclusion

This study provides strong empirical evidence that insurance adequacy enhances supply chain resilience in complex and high-risk environments such as the UAE. By integrating insurance into broader operational risk management frameworks, firms can better anticipate, absorb, and adapt to disruptions. The study also shows that insurance has a bigger effect when it is backed up by organized risk management procedures and lessened by the complexity of the supply chain. These new concepts turn insurance from a passive tool to protect your money into a strategic asset that helps you build resilience.

While the study is context-specific and based on cross-sectional data, these features do not limit its strength but rather reflect a deliberate design suited to capturing a critical snapshot of resilience dynamics in under-researched, high-risk settings. The UAE focus addresses a strategic research gap in

Gulf-based logistics economies, and the use of rigorous methods—including PLS-SEM and robust validation procedures—ensures the reliability and generalizability of the findings within similar contexts.

The study makes a valuable contribution by addressing the underexplored intersection of insurance, risk management, and complexity in supply chain resilience literature. It introduces a nuanced, empirically validated model showing how insurance can act as a formative, strategic factor—shaped by coverage design, payout efficiency, and contextual fit. This integration enriches existing theory and provides a foundation for rethinking the role of financial instruments in resilience strategies, particularly in emerging innovation-driven economies like the UAE.

Based on the findings, the study offers the following practical recommendations:

- **Firms** should treat insurance not as an external compliance requirement but as an integral part of their internal risk management systems. Aligning insurance with operational risks improves readiness and recovery.
- **Insurers** should develop sector-specific products that account for complexity and volatility, especially for logistics and transport firms exposed to geopolitical and operational disruptions.
- **Policymakers** should promote the integration of insurance into national resilience frameworks by offering incentives, encouraging risk audits, and including insurance indicators in ESG or corporate disclosure standards.
- **Risk professionals and consultants** should adopt holistic models that link insurance design with operational KPIs and complexity levels, using technology to enhance alignment and adaptability.

To build on this research, future studies could adopt longitudinal designs to explore how insurance effectiveness evolves during different stages of disruption. Comparative analyses across countries with varying economic and institutional conditions could test the model's applicability in broader contexts. Additionally, qualitative studies could investigate how firms operationalize integrated insurance strategies in real-time, especially with the aid of digital tools such as AI and blockchain in risk monitoring. This kind of work would help us learn more about how to use strategic insurance in economies that are going through a digital transformation, like the UAE, where resilience is both a national policy goal and a business necessity.

Acknowledgements

The authors gratefully acknowledge their respective institutions—Middle East University and Al-Zaytoonah University of Jordan—for providing academic support and an enabling research environment. No external funding or third-party assistance was involved in this study

References

Abdullahi, H. O., Mohamed, I. H., Gele, A. O. M., & Kafi, A. (2023). The role of technology in transforming agricultural supply chain management: Systematic literature review. *Journal of Logistics, Informatics and Service Science*, *11*(1).

Abood, H. G., & Salman, G. A. (2021). Utilizing Variance Inflation Factor for Electricity Demand Forecasting. In S. Mohapatro & J. Kimball (Eds.), *Proceedings of Symposium on Power Electronic and Renewable Energy Systems Control* (Vol. 616, pp. 365–375). Springer Singapore. https://doi.org/10.1007/978-981-16-1978-6_32

Abualoush, S. H. (2022). The effect of absorptive capacity on innovation: The mediator role of human capital, telecommunications companies (Orange, Zain and Umnia) in Jordan. *International Journal of Business Information Systems*, *40*(1), 39–59.

Ahmed, A. K., Nahar, H. M., & Manajrah, M. M. N. (2023). Effect of social media on shaping the agenda of the communicator in the Jordanian TV channels. *Middle East Journal of Communication studies*, *3*(2), 3.

Al-Afeef, M. A., & Alsmadi, A. A. (2025). Digital empowerment: Unraveling the impact of digital literacy on financial mastery. *Discover Sustainability*, *6*(1), 311.

Aldrighetti, R., Battini, D., Ivanov, D., & Zennaro, I. (2021). Costs of resilience and disruptions in supply chain network design models: A review and future research directions. *International Journal of Production Economics*, *235*, 108103.

Al-Muntasir, M. (2022). The phenomenon of information flow from traditional and new media about the corona pandemic from the perspective of newly graduated media professionals in Yemen. *Middle East Journal of Communication studies*, *2*(2), 1.

Alshehadeh, A., Elrefae, G., Belarbi, A., Qasim, A., & Al-Khawaja, H. (2023). The impact of business intelligence tools on sustaining financial report quality in Jordanian commercial banks. *Uncertain Supply Chain Management*, *11*(4), 1667–1676.

An, D., & Ma, C. (2024). A model of factors influencing learning outcomes based on artificial intelligence: Perspectives of Chinese university students. *Journal of Logistics, Informatics and Service Science*, *11*(1), 405–415.

Ashal, N., & Morshed, A. (2024). Balancing data-driven insights and human judgment in supply chain management: The role of business intelligence, big data analytics, and artificial intelligence. *Journal of Infrastructure, Policy and Development*, *8*(6), 3941.

Atta, A. A. B., Shehdeh, M., Othman, M. D., Ahmad, A. B., Hamdan, M., & Ali, B. J. (2024). Risk management compliance of financial technology firms operating in Jordan. *Journal of Logistics, Informatics and Service Science*, *11*(2), 251–265.

Barati, S. (2025). A system dynamics approach for leveraging blockchain technology to enhance demand forecasting in supply chain management. *Supply Chain Analytics*, *10*, 100115.

Barus, I. S. L., Lasniroha, T., & Bayunitri, B. I. (2024). Navigating the digital financial landscape: The role of financial literacy and digital payment behaviorin shaping financial management among generation Z student. *Journal of Logistics, Informatics and Service Science*, *11*(7), 302–323.

Beka Be Nguema, J.-N., Bi, G., Akenroye, T. O., & El Baz, J. (2022). The effects of supply chain finance on organizational performance: A moderated and mediated model. *Supply Chain Management: An International Journal*, *27*(1), 113–127.

Bostjancic, K. (2025). Insurance sector navigating a significant price-risk adjustment. *Business Economics*, *60*(1), 34–43. https://doi.org/10.1057/s11369-025-00387-5

Brokešová, Z., & Ondruška, T. (2025). Internal Controls and Insurance in Industry 5.0. In *Business Challenges and Opportunities in the Era of Industry 5.0* (pp. 195–213). Emerald Publishing Limited. https://www.emerald.com/insight/content/doi/10.1108/978-1-83549-676-320251011/full/html

Burinskiene, A. (2018). New challenges for supply chain: Electronic invoicing and its use perspective. *Journal of Logistics, Informatics and Service Science*, *5*(1), 31–42.

Daghar, A., Alinaghian, L., & Turner, N. (2023). The role of cognitive capital in supply chain resilience: An investigation during the COVID-19 pandemic. *Supply Chain Management: An International Journal*, *28*(3), 576–597.

Delbufalo, E. (2022). Disentangling the multifaceted effects of supply base complexity on supply chain agility and resilience. *International Journal of Physical Distribution & Logistics Management*, *52*(8), 700–721.

Dirgiatmo, Y. (2023). Testing The Discriminant Validity and Heterotrait–Monotrait Ratio of Correlation (HTMT): A Case in Indonesian SMEs. In *Macroeconomic Risk and Growth in the Southeast Asian Countries: Insight from Indonesia* (pp. 157–170). Emerald Publishing Limited. https://www.emerald.com/insight/content/doi/10.1108/S1571-03862023000033A011/full/html

Eling, M., Nuessle, D., & Staubli, J. (2022). The impact of artificial intelligence along the insurance value chain and on the insurability of risks. *The Geneva Papers on Risk and Insurance - Issues and Practice*, *47*(2), 205–241. https://doi.org/10.1057/s41288-020-00201-7

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Hasan, K., & Juhannis, H. (2024). Religious education and moderation: A bibliometric analysis. *Cogent Education*, *11*(1), 2292885. https://doi.org/10.1080/2331186X.2023.2292885

Hong, L. C., Tee, C., & Goh, M. K. O. (2022). Activities of daily living recognition using deep learning approaches. *Journal of Logistics, Informatics and Service Science*, *9*(4), 129–148.

Jreissat, E. R., Khrais, L. T., Salhab, H., Ali, H., Morshed, A., & Dahbour, S. (2024). An In-Depth Analysis of Consumer Preferences, Behavior Shifts, and Barriers Impacting IoT Adoption: Insights from Jordan's Telecom Industry'. *Applied Mathematics and Information Sciences*, *18*(2), 271–281.

Karki, D., Dahal, R. K., Bhattarai, G., Ghimire, B., & Bastola, S. (2024). The role of remittances in building economic resilience in Nepal: A Keynesian analysis. *Journal of Logistics, Informatics and Service Science*, *11*(7), 411–428.

Kazancoglu, Y., Ekinci, E., Mangla, S. K., Sezer, M. D., & Kayikci, Y. (2021). Performance evaluation of reverse logistics in food supply chains in a circular economy using system dynamics. *Business Strategy and the Environment*, *30*(1), 71–91. https://doi.org/10.1002/bse.2610

Kim, Y.-J., & Ha, B.-C. (2022). Logistics service supply chain model. *Journal of Logistics, Informatics and Service Science*, *9*(3), 284–300.

Ma, H.-L., Leung, L. C., Chung, S.-H., & Wong, C. W.-H. (2023). Insurance incentive to shippers by a container port: Issues of risk management in supply chain finance. *Annals of Operations Research*, *331*(1), 121–139. https://doi.org/10.1007/s10479-021-04261-3

Ma, Y., & Guo, D. (2023). Exploring the application of big data technology in international trade: Case studies from India and China. *Journal of Logistics, Informatics and Service Science*, *10*(2), 138–152.

Maududy, R., & Nurdin, A. M. (2024). An architecture framework for supply chain management systems integrated with supervisory control and data acquisition functionality. *Journal of Logistics, Informatics and Service Science*, *11*(5), 38–51.

Morshed, A. (2024a). Assessing the Economic Impact of IFRS Adoption on Financial Transparency and Growth in the Arab Gulf Countries. *Economies*, *12*(8), 209.

Morshed, A. (2024b). Strategic working capital management in Polish SMES: Navigating risk and reward for enhanced financial performance. *Investment Management and Financial Innovations*, *21*(2), 253–264. https://doi.org/10.21511/imfi.21(2).2024.20

Morshed, A., & Khrais, L. T. (2025). Cybersecurity in Digital Accounting Systems: Challenges and Solutions in the Arab Gulf Region. *Journal of Risk and Financial Management*, *18*(1), 41.

Morshed, A., Maali, B., Ramadan, A., Ashal, N., Zoubi, M., & Allahham, M. (2024). The impact of supply chain finance on financial sustainability in Jordanian SMEs. *Uncertain Supply Chain Management*, *12*(4), 2767–2776.

Morshed, A., Ramadan, A., Maali, B., Khrais, L. T., & Baker, A. A. R. (2024). Transforming accounting practices: The impact and challenges of business intelligence integration in invoice processing. *Journal of Infrastructure, Policy and Development*, *8*(6), 4241.

Negri, M., Cagno, E., Colicchia, C., & Sarkis, J. (2021). Integrating sustainability and resilience in the supply chain: A systematic literature review and a research agenda. *Business Strategy and the Environment*, *30*(7), 2858–2886. https://doi.org/10.1002/bse.2776

Oreqat, A. (2021). The degree of satisfaction of Facebook users about its features, usage motives and achieved gratifications: An applied study on students of the faculty of mass communication at the Middle East university. *Middle East Journal of Communication studies*, *1*(1), 1.

Pham, H. T., Testorelli, R., & Verbano, C. (2023). The impact of operational risk on performance in supply chains and the moderating role of integration. *Baltic Journal of Management*, *18*(2), 207–225.

Proykratok, W., Chuchottaworn, C., & Ngamcharoen, W. (2024). The evaluation and development of Thai logistics service providers to logistics management excellence. *Journal of Logistics, Informatics and Service Science*, *11*(1), 209–227.

Salhab, H., Zoubi, M., Khrais, L. T., Estaitia, H., Harb, L., Al Huniti, A., & Morshed, A. (2025). AI-Driven Sustainable Marketing in Gulf Cooperation Council Retail: Advancing SDGs Through Smart Channels. *Administrative Sciences*, *15*(1), 20.

Saxena, A., Verma, S., & Mahajan, J. (2024). Transforming Banking: The Next Frontier. In A. Saxena, S. Verma, & J. Mahajan, *Generative AI in Banking Financial Services and Insurance* (pp. 85–121). Apress. https://doi.org/10.1007/979-8-8688-0559-2_4

Shaban, O. S., & Omoush, A. (2025). AI-Driven Financial Transparency and Corporate Governance: Enhancing Accounting Practices with Evidence from Jordan. *Sustainability*, *17*(9), 3818.

Singh, S. P., Mehta, A., & Vasudev, H. (2024). Application of Sensitivity Analysis for Multiple Attribute Decision Making in Lean Production System. *Engineering Management Journal*, 1–24. https://doi.org/10.1080/10429247.2024.2383855

Suharyanto, A., Kraugusteeliana, K., Yuniningsih, Y., Agustinova, D., Ramdani, A., & Rahim, R. (2024). K-Nearest Neighbor Algorithm for Data-Driven IT Governance: A Case Study of Project Outcome Prediction. *Journal of Logistics, Informatics and Service Science*, *11*(2), 142–154.

Taqa, S. B. A. (2025). The mediating role of remote communication on the relationship between electronic human resource management practices and organizational performance in Iraqi commercial banks. *Middle East Journal of Communication studies*,, *5*, 1–52.

Wang, M., Hill, A., Liu, Y., Hwang, K., & Lim, M. K. (2025). Supply Chain Digitalization and Agility: How Does Firm Innovation Matter in Companies? *Journal of Business Logistics*, *46*(1), e70007. https://doi.org/10.1111/jbl.70007

Wang, Y., & Lee, E. L. W. (2023). Realizing excellence in enterprise management through digital innovation. *Journal of Logistics, Informatics and Service Science*, *10*(2), 197–211.

Węcel, K., Stróżyna, M., Szmydt, M., & Abramowicz, W. (2024). The Impact of Crises on Maritime Traffic: A Case Study of the COVID-19 Pandemic and the War in Ukraine. *Networks and Spatial Economics*, *24*(1), 199–230. https://doi.org/10.1007/s11067-023-09612-0