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The Impact of Supply Chain Management Integration on Logistics Performance: The Moderating Role of Information and Communication Technology

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Research Article

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Abstract

It aims at exploring the impact of Supply Chain Management (SCM) (five SCM practices) on Logistics Performance (LP) in Jordanian manufacturing companies, and to see the role of moderating variable in this effect, which is represented by Information and Communication Technology (ICT). Based on the five components of SCM integration proposed by Li et al. (2006), the five dimensions of SCM integration are observed at the operational level of SCM: partnership with strategic suppliers, lean internal operation, sharing information, postponement strategies and CRM. Although these factors are seen as critical factors of operational effectiveness, empirical studies examining the impact of the adoption of ICT on these practices in emerging economies are still very limited. In this investigation, it was used quantitative methodology; it used the data collected from the sample of 100 manufacturing companies, then 500 valid responses were obtained throughout the year 2024. Structural Equation Modeling (SEM) was used for analysis to investigate the proposed relationships between SCM practices, ICT and LP. Findings indicate that SCM has a significant and positive impact on logistics performance and ICT is a significant and moderate influence that reinforces this relationship. The successful implementation of ICT solutions improves the matching of business processes, makes information flows more transparent and increases the integration of the organization, ultimately resulting in better logistics results. Such findings emphasize the need to integrate ICT in the overall strategies of SCM, especially in an environment of rapid and fluctuating competition. This article, from a theoretical point of view, extends the Resource Based View (RBV) adding empirical evidence that ICT can be a strategic enabler that can strengthen the value gained from SCM practices. In practice, the study provides a set of evidence-based recommendations for executives and decision makers in developing countries, capturing the findings on how digital technologies, when combined with supply chain operations, can create long-term, sustainable competitive advantages. Moreover, this research provides new empirical evidence to the body of knowledge related to the impact of SCM and ICT on logistics performance in developing country that could be used in the Jordanian context to fill an important gap in the literature.

1. Introduction

In the current volatile and intensely competitive business landscape, companies are constantly challenged to add value to their customers by providing efficient operations, responsiveness and service reliability. In this context, integration of SCM has become a key strategic solution to improve competitiveness by connecting the financial, material and information flow between manufacturers, suppliers, distributors and consumers (Dumitrașcu et al., 2026). Even though SCM integration is the strategic concept, it is translated into a set of tangible SCM practices that companies apply in implementing their internal operations and inter-organizational relationships. In the present study, the framework of the integration of SCM is captured through five widely adopted practices as described by Rashid et al. (2026): SSP, CRM, information sharing, postponement, and ILP. These practices are promoted in an integrated manner enable companies to minimize uncertainty, decrease the costs, and enhance the performance of the SC and logistics. Of these dimensions, logistics performance (LP) is one of the most important, because it is an indicator of how well a company can provide products and

services to customers in time, efficiently and accurately, in the dynamic market where the customers' expectations become more complex (Jafariet al., 2026).

Logistics activities form the foundation of determining the competitive position of an organisation and customer satisfaction. Although there has been a lot of research on the relationship between SCM and overall supply chain performance, there is a lack of studies that examine in detail the influence of SCM on logistics performance, especially in the context of emerging economies like Jordan. The current research is limited to a specific scale and scope of analysis of this direct relationship and there is a considerable potential for more empirical research in markets in a state of rapid development. In order to be more cost effective, firms must become more efficient in the logistics process to operate in a more global and uncertain environment (Upadhyay et al. 2026; Alsmarai and Maraqa 2015). Meanwhile, Information and Communication Technology (ICT) has experienced significant progress and development that has revolutionized the operations of SC and logistics by allowing real-time information sharing, integration between SC partners and data-driven decisions making (Bani Hani & Awad, 2017). While the role of ICT in the integration of SC has been reported, the moderating role of ICT between SCM and LP has not been studied enough, particularly in developing-country settings. In this moderating role, new ideas might be gained about the digital technology's role in improving the effectiveness of SCM practices for better logistics outcomes (Bani Hani, 2021). It is worth mentioning here that Jordan has seen considerable investments in ICT-related SCM practices, due to the enhanced national industrial-development and logistics programs, and the national Vision 2030 strategy has allowed the development of infrastructure and industrial zones, which creates a favorable environment for ICT-enabled SCM practices to affect logistics outcomes within manufacturing firms.

Accordingly, this study addresses the following research questions:

(1) What core SCM practices are currently adopted by Jordanian manufacturing firms as expressions of SCM integration?

(2) What is the relationship between SCM integration (operationalized through SCM practices) and logistics performance in these firms?

(3) Does ICT play a moderating role in the SCM integration–LP relationship?

This investigation will be meaningful conceptually and practically in answering the questions listed above. In the conceptual aspect, the study contributes to the knowledge of logistics and supply chain management by providing empirical evidence that enhances understanding of the role of ICT as a moderating variable in the relationship between SCM and logistics performance. On an applied level, the findings provide practical guidance for decision makers and policy makers within the framework of SCM activities in the context of Jordan and the results indicate that the integration of ICTs in SCM activities could significantly improve logistics outcomes and promote long-term competitive advantage.

2. Literature Review

2.1. Supply Chain Management Integration and Practices

SCM is defined as the coordination of actions between a company and its suppliers, distributors and customers to achieve an efficient and responsive supply chain (Zhang et al., 2026). The aim of SCM is to transfer information, materials and services rapidly, accurately and efficiently through interrelated operations (Slack & Brandon-Jones, 2019). In the last few decades, SCM integration has emerged as a competitive tool and as a way to provide greater value to customers by strategically synchronizing intra and inter-organizational processes (Akbari, 2026; Lysons & Farrington, 2020). Importantly, there is a distinction between SCM integration as a strategic orientation and the SCM practices through which that integration is made, as can be seen in the literature. Operationalizing SCM integration in this study follows Mahmoud et al. (2026) who developed and validated a measurement instrument for SCM which is now considered the standard reference in the field, and which is used in this study to operationalize SCM integration in five interrelated practices, encompassing intra-organizational and inter-organizational integration.

There are multiple conceptualizations in the literature of SCM practices. These cover integration of postponement and inter-organizational systems (Alvarado & Kotzab, 2001); integration of the supply chain and just in time systems, information sharing (Tan et al., 2009); goal alignment, teamwork, process integration, long term partnership (Min & Mentzer, 2004; Banomyong & Supatn, 2011); supplier partnership, outsourcing and CRM (Benton, 2007); training, innovation and information technology use (Xiang, 2026). However, there is general agreement that good practices in SCM can be considered as the operational realization of supply chain integration, which can result in operational excellence, cost savings, and sustainable competitive advantage (Li et al., 2005; Sukati et al., 2012). Inspired by Li et al. (2006), the present study adopts five main dimensions to operationalize SCM integration: SSP, CRM, ILP, IS, and P, These five practices are expected to be key in driving logistics performance together..

2.2. Logistics Performance

A key source of long-term competitive advantage has been gaining recognition in the last decade or so—logistics performance (Ip et al., 2011; Embury et al., 2009). In the current business environment, companies are increasingly expected to have strong logistics skills to improve cost efficiency, consistency, and reliability of products and services delivered to market (Acar & Uzunlar, 2014). However, compared to the volume of research focusing on supply chain management, there is less empirical research on logistics performance (Abdulameer & Yaacob, 2020). LP has a multi-dimensional character that is greatly influenced by upstream and downstream partners along the chain and has dimensions related to both operational efficiency and overall effectiveness (Cai et al., 2009; Ahi & Searcy, 2015). Examples of LP measures are cost, service level, inventory turnover, throughput, and supplier performance (Hwang, & Kang, 2026). In addition, customer satisfaction, innovativeness and flexibility have been identified as qualitative indicators that better reflect logistics capabilities (Basu et al., 2017; Barros, 2006). Nevertheless, scholars point to the difficulty of setting up standard measurement systems due to the interdependence of actors along the supply chain (Anand & Grover, 2015). Therefore, the aim

of this study is to concentrate on five selected LP indicators: cost, time, quality, flexibility and innovativeness, which are the most relevant indicators for Jordanian manufacturing companies in their efforts to be more competitive.

2.3. The Role of Information and Communication Technology

Information and Communication Technology (ICT) has become an indispensable element that is embedded in modern supply chain management and logistics operations, which allows the supply chains to be seamlessly integrated, improves the coordination of SC actors, and enables fast reaction and response to the supply chain operations when decisions need to be taken on them (Azemi et al., 2017; Dweekat et al., 2017). Information can be collected, processed and shared by SC partners through ICT, which includes hardware, software, communication networks and enterprise systems (Laudon & Laudon, 2021). Supporting a strong ICT infrastructure helps to ensure that information is accurate, timely and reliable which are crucial for effective LP (Kinney, 2000; Choy et al., 2004).

From an operational perspective, ICT plays a role in LP in four key ways: (i) data integration and real-time access to information for SC partners; (ii) process automation, minimizing order delivery and inventory management errors; (iii) decision support and analytics for forecasting and optimization; and (iv) coordination and communication, allowing for seamless collaboration. Empirical studies validate direct beneficial effects of ICT on SCM efficiency, as well as its positive impact on the linkage between SCM and logistics outcomes (Nguyen, 2026; Lee & Levy, 2014). Companies that use ICT tools and techniques, like supplier collaboration, information sharing and lean practices, generally achieve better logistics results.

2.4. The Effect of SCM Integration on Logistics Performance

The 5 practices above have been found to be a successful way to operationalize effective SCM integration, which in turn results in better logistics performance. Companies with extensive degrees of SCM integration end up with more efficient, responsive, and reliable logistics (Kannan, 2010; Cigolini et al., 2004). Manufacturing companies find that customer relationships management and information sharing have a positive impact on operational and logistic results (Kumar & Kushwaha, 2018). The SCM integration is also expected to improve the sustainable logistics efficiency (Saragih et al., 2020), and to improve customer satisfaction, customer loyalty, and competitiveness of the supply chain (Prathiba, 2020). Furthermore, the impact of SCM practices on LP depends on the industry context (Alahmad, 2021; Cook et al., 2011). As a result of this evidence the following hypothesis is made:

H1: SCM integration, operationalized through SCM practices, has a significant positive effect on logistics performance.

2.5. ICT as a Moderating Construct

In addition to the direct contribution to SCM practices, ICT is also considered a moderating variable that enhances the impact of the integration of SCM in LP. ICT supports the effectiveness and reactivity in

SCM activities by allowing the transfer of data, communication and system integration (Afshan et al., 2018; Croom et al., 2000). Previous research findings have shown that companies with more advanced capabilities of ICT use make stronger connections between SCM practices and logistics outcomes (Jabeen et al., 2026; Jabeen et al., 2026). But, this moderating effect has received little attention in the context of developing countries especially in Jordan. Based on the current study, in this regard, ICT serves as a moderating variable that enhances the integration–LP relationship in the SCM. The current study therefore situates ICT as a moderating variable, which strengthens the SCM integration–LP relationship. Given this, the following hypotheses are put forward:

H2: ICT has a significant positive effect on logistics performance.

H3: ICT significantly moderates the relationship between SCM integration (operationalized through SCM practices) and logistics performance, such that higher levels of ICT capability strengthen this relationship.

Building on the foregoing arguments, the proposed conceptual framework integrating SCM practices (as operationalization of SCM integration), ICT, and logistics performance is illustrated in Figure 1.

2.6. Theoretical Foundation: Resource-Based View (RBV)

The RBV theory suggests that firms can gain a sustained competitive advantage by leveraging resources that are VRIN. SCM integration within this framework consists of the five SCM practices, which are integrated into a coherent operational system, as a capability of the organizations. SCM integration within this framework is an organizational capability that bundles the five practices of SCM into a coherent operational system, namely strategic relationships, internal lean processes, information flows, and demand-supply coordination. ICT, in turn, is a strategic enabler that helps contribute to this capability, which is complemented and amplified by the ICT's ability to support the integration, coordination and information visibility across the supply chain. From this angle, it is not the ICT that drives the SCM integration itself, but it is an additional capability that could improve the efficiency with which SCM integration can be implemented and become a better logistics performance, hence it is still theoretically considered as a moderating variable.

3. Methodology

3.1. Participants and Data Collection

The subjects of the study were Manufacturing companies executives in Jordan, and functional executives in particular. The participating companies were initially selected from the MODON database. Due to the lack of a comprehensive sampling frame of executives among these firms, a convenience sampling approach was used as was done in previous studies (Rahi & Abd. Ghani, 2019). The a priori power analysis revealed that at least 245 valid responses were needed for adequate statistical power (Rahi et al., 2018). A total of 100 Jordanian manufacturing companies were targeted and 600

questionnaires were sent out (10 questionnaires per company), to general managers, operations managers, marketing managers, human resource managers and finance managers. This facilitated the direct interaction with multiple respondents in each firm and it facilitated on site data collection (Rahi, 2021; Diakopoulos & Essa, 2008).

Questionnaires were sent to 500 and returned with 500 valid questionnaires, which represents an 83% return rate. The number of usable responses were distributed as follows: General Managers (n = 114); Operations Managers (n = 139); Marketing Managers (n = 125); HR Managers (n = 64); and Finance Managers (n = 58). The participating companies came from all over the manufacturing sub-sectors, including electronics (30 companies), textiles (26 companies), leather (21 companies), ceramics and glass (12 companies), food and beverage (24 companies), pharmaceuticals (7 companies), and clothing (12 companies).

The study used a multi-respondent design to gather a variety of perspectives on the function of each of the participating firms. As in supply chain scholarship generally, the responses were aggregated at the firm level by calculating the mean scores of the respondents. The independent-samples t-test was then used to test if there was any non-response bias between the first and second half of the data collection period, with no statistically significant difference between the groups, indicating that non-response bias did not threaten the integrity of the data. Therefore all of the correct answers (N = 500) were kept and used in the inferential analyses used to test the research model.

3.2. Instrument Development

A detailed review of previous research on the subject of SCM, logistics performance and ICT guided the process of designing the survey instrument. The tool was designed to identify the moderating effect of ICT use on the relationship between SCM and LP from the responses of executives working in manufacturing companies found in the industrial zones of Amman (as identified in MODON). The questionnaire was divided into four main sections: Demographic data, SCM practices dimensions, Logistics performance dimensions and ICT dimension and integration. All items included in the instrument were drawn from other previously published studies and were rated on a seven-point Likert scale (strongly disagree to strongly agree) as used by Rahi et al (2018). A design like this enabled a wealth and depth of information capturing the executives' perceptions of their organization's SCM activities, ICT solutions deployment and overall logistics outcomes.

3.3. Ethical Approval and Informed Consent

Isra University, Jordan, IRB (2025/625), approved the research protocol according to the ethical principles of Declaration of Helsinki and the national ethical guidelines. All participants gave written informed consent before the data collection and were free to refuse to participate in the study.. All collected data was kept in confidentiality and anonymity and the participants were assured that they were free to withdraw without any consequences during the study.

3.4. Common Method Variance

As all of the answers came from one informant per firm, there was a concern about common method variance (CMV). To check this potential bias, Harman's one factor diagnostic was used, following the methodological guidelines given by Podsakoff et al. (2003). Results showed that the biggest extracted factor accounted for less than 50% of the variance thus indicating that CMV is unlikely to affect the conclusions that can be drawn from this data. Based on this, the measurement framework was deemed suitable for advancing the evaluation of the structural model.

4. Data Analysis and Results

4.1. Analytical Approach

A quantitative research design was used in conducting inferential statistical analysis. Structural Equation Modeling (SEM) was chosen because it allows simultaneous testing of measurement and structural models, and can estimate causal relationships among latent constructs (Anderson & Gerbing, 1988). SEM is a widely adopted method in the research of SCM and logistics (Rahi et al., 2020; 2021). The analyses were conducted with SmartPLS 3.0 (Ringle et al., 2015) which is a reliable and consistent method for such investigation..

4.2. Assessment of the Measurement Model

The reliability of the constructs was examined by calculating the Cronbach's alpha coefficient with result that all constructs exceeded the criterion of 0.70 (Nunnally & Bernstein, 1994; Hair et al., 2013). Also, the CR values ranged from 0.945 to 0.974 which is well above the standard threshold values defined by previous methodological studies (Gefen et al., 2000). Then the convergent validity was tested by computing AVE, and all constructs were found to be greater than 0.50 (Fornell & Larcker, 1981; Bagozzi & Yi, 2012). In terms of discriminant validity, the squared correlation between constructs was invariably lower than the ASV and MSV obtained for each construct, thus providing supportive evidence for the distinctiveness among the constructs being examined (Hair et al., 2013). The results of the CFA also supported the satisfactory level of psychometric properties required for the measurement model as shown in Table 1. The factor loadings for all the individual measurement items are well documented in Appendix A.

Table 1
Reliability and validity indices of the proposed model.

Variable	Dimension	Loading	Cronbach's α	CR	AVE	MSV	ASV
SCM	SSP	0.776	0.890	0.958	0.778	0.548	0.378
	CRM	0.812					
	ILP	0.894					
	Information Sharing	0.951					
	Postponement	0.943					
ICT	Intrinsic Accuracy	0.968	0.850	0.945	0.782	0.588	0.359
	Representation	0.734					
	Contextual Relevance	0.838					
	Accessibility	0.882					
LP	Cost	0.978	0.880	0.974	0.698	0.538	0.362
	Time	0.872					
	Quality	0.946					
	Flexibility	0.918					
	Innovativeness	0.729					

Note: CR = Composite Reliability, AVE = Average Variance Extracted, MSV = Maximum Shared Variance, ASV = Average Shared Variance. SCM: Supply Chain Management, ICT: Information and Communication Technology, LP: Logistics Performance.

Table 2
Fornell–Larcker discriminant validity analysis.

Variables	SSP	CRM	ILP	IS	P	ICT	LP
SSP	*0.882*						
CRM	0.415	*0.901*					
ILP	0.568	0.412	*0.883*				
IS	0.416	0.368	0.407	*0.892*			
P	0.478	0.572	0.468	0.214	*0.912*		
ICT	0.408	0.322	0.659	0.259	0.218	*0.884*	
LP	0.479	0.352	0.709	0.377	0.054	0.358	*0.836*

Note: The numbers in italics along the diagonal are the square root of the construct's AVE; the numbers across the off-diagonal are the inter-construct correlations. Abbreviations: SSP = Strategic Supplier Partnership; CRM = Customer Relationship Management; ILP = Internal Lean Practices; IS = Information Sharing; P = Postponement; ICT = Information and Communication Technology; LP = Logistics Performance.

To further assess discriminant validity, the Heterotrait–Monotrait (HTMT) ratio was also computed, as it is a more stringent and demanding criterion in comparison to the more traditional Fornell–Larcker criterion. The overall pattern of HTMT values for all pairs of constructs was below the recommended value of 0.86, once again supporting the conclusion of satisfactory discriminant validity among the constructs measured.

4.3. Goodness-of-Fit of the Model

This set of twelve widely used indices covered three categories: absolute fit indices, incremental fit indices, and parsimonious fit indices (Hair et al., 2013; Bentler, 1990; Cheung & Rensvold, 2002; Marsh et al., 1988). A wide variety of indices were used because the idea was that using a number of indices would reduce the danger of being given false impressions if only one index was used. As a whole the information obtained indicates a satisfactory model–data fit, for both the measurement model and the structural model, supporting the validity of the conceptual framework used in this study (see Table 3).

Table 3
Goodness-of-fit indices of the structural model.

Measure	Index	Value	Threshold
Absolute fit	Chi-square (χ^2)	921.69	—
	p-value	0.000	—
	Degrees of freedom	498	—
	Normed χ^2 (χ^2/df)	1.848	≤ 3
	GFI	0.943	≥ 0.90
	RMSEA	0.066	≤ 0.08
Incremental fit	TLI	0.972	≥ 0.90
	NFI	0.936	≥ 0.90
	NNFI	0.918	≥ 0.90
	CFI	0.925	≥ 0.90
	IFI	0.928	≥ 0.90
	RFI	0.939	≥ 0.90
Parsimonious fit	Parsimonious Normed Fit Index (PNFI)	0.778	≥ 0.50
	Parsimonious Goodness-of-Fit Index (PGFI)	0.854	≥ 0.50

Table 3 shows that all GOF indices meet or exceed the recommended values, suggesting that the proposed model is suitable for empirical testing and is adequate to represent the data. The square roots of the AVEs (diagonal values in Table 2) are also compared to the inter-construct correlations and all are higher than the inter-construct correlations, thus supporting the theoretical soundness and discriminant validity of the constructs.

4.4. Demographic Characteristics of the Study Participants

Table 4 presents the descriptive statistics of the respondents' demographic characteristics.

Table 4
Respondents' demographic characteristics (n = 500).

Variable	Category	Frequency	Percentage
Age	Less than 30 years	20	4.0%
	30–40 years	189	37.8%
	41–50 years	118	23.6%
	More than 50 years	173	34.6%
Education	Bachelor's degree	350	70.0%
	Master's degree	120	24.0%
	PhD	30	6.0%
Position	General Manager	114	22.8%
	Operations Manager	139	27.8%
	Marketing Manager	125	25.0%
	HR Manager	64	12.8%
	Finance Manager	58	11.6%
Experience	Less than 5 years	80	16.0%
	5 to less than 10 years	320	64.0%
	More than 10 years	100	20.0%

4.5. Descriptive Analysis of the Constructs

The main constructs were summarized with descriptive statistics to give an initial overview of the data. As shown in Table 5, the mean and SD values are as follows: SCM practices (M = 3.76, SD = 0.27), ICT (M = 3.65, SD = 0.36), and logistics performance (M = 3.84, SD = 0.79). The low standard deviations for the constructs, relative to the total variance, suggest that there was little inter-group variation in respondents' perceptions and that the sample was relatively consistent across the constructs. Such clustering of the responses around the mean increases data reliability and forms a basis for the following inferential analyses such as the assessment of measurement and structural model.

Table 5
Mean and standard deviation of the study constructs.

Variable	Mean	SD	Rank	Level
SCM	3.76	0.27	2	High
ICT	3.65	0.36	3	Medium
LP	3.84	0.79	1	High

4.6. Hypothesis Testing

4.6.1. Normality Test

Data were checked for normality before performing parametric analysis. As shown in Table 6, the value of the Shapiro–Wilk test showed that all the variables examined in this research were normally distributed. All the p values were higher than 0.05, which made the null hypothesis accepted in all cases. This type of results supports the validity of the use of parametric statistical analyses in the later stages of the analysis.

Table 6
Shapiro–Wilk normality test.

Variable	Shapiro–Wilk Statistic	p-value
SCM	0.99	0.18
ICT	0.96	0.21
LP	0.92	0.36

4.6.2. The Impact of SCM on Logistics Performance

The significance of the structural model was analyzed by combining Smartpls and bootstrapping procedure, and the results are shown in Table 7. Results show that SCM has a positive and significant effect on LP with the value of $\beta = 0.540$, $t = 13.72$, and p-value < 0.001 that supports the first hypothesis (H1). The correlation value $R = 0.54$ ($p < 0.05$) further confirms the presence of a positive association between the adoption of SCM and the positive results of logistics among manufacturers in Jordan, meaning that the more the SCM practices are strengthened, the more tangible the results of logistics. In addition, determination coefficient ($R^2 = 0.29$) shows that the model can explain about 29% of the variability of LP, with 71% that can be explained by other variables not included in this model.

4.6.3. The Impact of ICT on Logistics Performance

The results presented in Table 7 indicated that there was a positive and statistically significant effect of ICT on logistics performance with path coefficient of $\beta = 0.560$, t-statistic = 4.79 and p-value < 0.01, which supports the second hypothesis (H2). Moreover, the correlation coefficient obtained between ICT and LP

(R = 0.56, p < 0.05) indicates the presence of a positive association, which means that as the Jordanian manufacturing enterprises invest more on ICT and put more emphasis on its usage, the logistics outcomes of these enterprises tend to improve. The coefficient of determination (R^2 = 0.31) also shows that about 31 percent of the variance in LP can be explained by the variable ICT, with the rest of the variance that is not explained by the present model attributed to other factors that are outside the scope of this model.

4.6.4. The Moderating Role of ICT in the SCM–LP Relationship

The results as shown in Table 7 indicate that ICT has a moderating effect between the linkage between the SCM and Logistics Performance, as evidenced by the value of path coefficient = 0.580, t-value = 9.59, and p-value < 0.001, thereby supported the third hypothesis (H3). The finding suggests that the positive contribution of SCM to improve LP is amplified if ICT is used optimally in the manufacturing companies in Jordan. The coefficient of determination (R2) before and after this term (SCM × ICT) is added to the model, 0.31 and 0.36, respectively, further underscores the impact of ICT on the SCM–LP relationship. The impact of the result is that it highlights the key role of ICT in enabling firms to use SCM practices to improve their logistics results.

An interaction plot was created to illustrate the moderating effect by displaying the strength of the SCM–LP relationship at various levels of ICT. As shown in the result, the relationship between the mean score of SCM and LP is positive and not reversed, this means that the higher the ability of using ICT, the more positive the relationship between the mean score of SCM and LP, which shows that ICT has a reinforcing role in the effectiveness of SCM..

Table 7
Structural model results (PLS bootstrapping).

Hypothesis (Path)	β	R^2	Std. Error	t-value	p-value
H1: SCM → LP	0.540	0.29	0.018	13.72	< 0.001
H2: ICT → LP	0.560	0.31	0.014	4.79	< 0.01
H3: SCM × ICT → LP	0.580	0.36	0.038	9.59	< 0.001

Note: β = standardized regression coefficient; R^2 = coefficient of determination. All paths are statistically significant.

5. Discussion

The descriptive statistics of the present study showed that the respondents had high value for SCM integration (measured by five SCM practices), ICT and logistics performance. This may be indicative of the importance that the government of Jordan has given to the supply chain, including logistics services, in recent times. The findings align with previous studies conducted by Alahmad (2021), who found that

the direct effect of SCM is significant on the performance of the supply chain, and have been extended to logistics performance in this study. From the positive correlation between SCM integration and LP, it can be seen that Jordanian manufacturing companies that invest in SCM integration practices tend to have better logistics performance. In addition, ICT was determined to be a significant influence on LP, suggesting that the benefits of using ICTs for improving operational results occur when ICTs are used effectively throughout the supply chain. Also, findings of the study revealed that the integration of SCM and the use of ICT has shown to be a moderating variable between the two variables of the study namely, the use of ICT and the impact on LP: firms that use ICT to improve information sharing, coordination and integration across their value chains have seen a higher positive effect of SCM practices on LP. The results are consistent with those from Marinagi et al. (2015), who claimed that the influence of ICTs is not only manifested directly in the outcomes of supply chain but also in better management practices. The same positive relationship between SCM practices and different performance variables have been reported in previous research on manufacturing organizations (Al-Shboul et al., 2017; Abdallah et al., 2014; Kannan & Tan, 2004; Karimi & Rafiee, 2014). The present results are also corroborated by other studies, which show that integration of SCM improves the efficiency of supply chain operations, in terms of cost, speed, quality, flexibility and innovation (Aboelmaged et al., 2026; Utami et al., 2019; Thatte, 2007; Wang, 2026). As competition has shifted from firm-to-firm to supply chain-to-supply chain (Li et al., 2006), SCM integration will be imperative for Jordanian manufacturing firms, alongside the use of advanced ICT applications. The logistics management side will help companies achieve greater operating efficiency and enhance logistics performance, while the business side will provide them with a competitive advantage in the dynamic business world.

The moderating effect of ICT shows that when SCM is integrated alone it does not necessarily lead to an improvement in logistics performance without having technological capabilities. The observation can be explained by the RBV that focuses on complementary resources affecting organizational performance. In this sense, SCM integration is an operational capability that is integrated into five interrelated practices and the ICT is a strategic resource that supports and enriches this capability.

Unlike the previous research which mainly considered direct impact of ICT on performance, the current research focuses on the amplifying effect of SCM–LP relationship through the use of ICT. Specifically, ICT increases information sharing, coordination and integration among partners in the supply chain, which increases the effectiveness of SCM practices. This impact is particularly pronounced in less-mature markets like Jordan, where the impact of digital maturity on the value of firms' supply chain efforts is most evident.

The Jordanian context comes with its own set of challenges, such as limited infrastructure, digital maturity, and reliance on import-driven supply chains. In these circumstances, coordination and integration among actors in the supply chain using ICT is even more important. Companies that invest in ICT potential have a better chance of addressing these inefficiency with their operations and also enhance their logistics performance. The results of this research have, therefore, implications that are specific to emerging economies that have structural features similar to those of this research.

6. Conclusions

The purpose of this study was to investigate whether SCM integration (measured based on five core SCM practices) affects logistics performance of Jordanian manufacturing firms, and whether the integration of these five SCM practices is moderated by ICT. The data for the survey were gathered from executives in the various functional areas of 100 companies, and analyzed with the aid of Structural Equation Modeling. The results have implications for theory and practice, as both SCM integration and ICT potentially can contribute to improve logistics performance in highly competitive business environments. The results show that integration of SCM has a significant positive influence on LP. Implementing integration-oriented SCM practices (information sharing, ILP, postponement, customer and supplier relationship management and SSP) has the potential to increase the efficiency of logistics, to lower costs and to increase flexibility and innovation. ICT was also found to be a significant moderating variable between the integration of SCM and LP, thus strengthening the positive effect of SCM integration on LP. Companies that use ICTs to facilitate real-time information flow, coordination and integration throughout the supply chain perform better. The findings have significant implications for the manufacturing companies in Jordan: SCM integration, in conjunction with the use of the advanced ICT solutions, enables manufacturing companies to obtain better logistics results, to gain competitive advantage and to better optimize the performance of their operations. Therefore, it is recommended that managers should emphasize the need for proactively aligning the practices in ICT and SCM to achieve technological parity and ensure the smooth operation of the supply chain.

Theoretically, the study can be added to the literature by elucidating the role of ICT as a moderating variable between the integration of SCM and the relationship, which elaborated on the contribution of technological integration to the benefits of SCM integration practices. Managerially, the results give managers at various levels of organizational levels guidance on how to integrate ICT in the supply chain operations to ease uncertainty, minimize supply chain risks, and enhance logistic performance. The study highlights the need to link SCM integration to ICT capabilities for Jordanian manufacturing companies to achieve better logistics performance. Good use of high quality information in SCM processes can reduce the risk and uncertainty, which can further enhance LP. ICT is a key tool to support the process of aligning SCM practices with manufacturing to ensure successful performance in the supply chain, as manufacturing firms are increasingly looking to utilise ICT to enable this alignment. In order to take full advantage of the benefits of SCM integration for better logistics performance, organizations need to attach sustainable importance to ICT.

7. Limitations and Future Research

There are several limitations to this study. First, the findings from the present study may not be generalized to the wider population of manufacturing companies in Jordan due to the use of convenience sampling. Secondly, research design (cross section) limits the possibility of making casual inferences between the variables in this study. Thirdly, the use of self-reported data can lead to response bias. Further studies are thus recommended to use longitudinal designs, to include objective

performance measures, and to replicate the study in different country contexts to increase external validity. The framework could also be expanded to cover other moderating variables, like organizational culture, leadership style, environmental dynamism, or other industrial sectors or service settings, in order to gain a deeper understanding of the SCM–ICT–LP relationship.

Declarations

Funding: This research received no external funding.

Author Contributions: Amer Zaid Alqudah was responsible for conceptualization, methodology, formal analysis, investigation, data curation, writing of the original draft, review and editing, and approved the submitted version of the manuscript.

Human Ethics and Ethics Approval: The research protocol involving human participants was reviewed and approved by the Institutional Review Board (IRB) of Isra University, Amman, Jordan (approval number 2025/625). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and the applicable national ethical guidelines.

Consent to Participate: Written informed consent to participate in this study was obtained from every human participant prior to data collection. All participants were informed of the purpose of the study and of their right to withdraw at any time without consequence, and all collected data were treated with full confidentiality and anonymity.

Consent to Publish: Not applicable.

Competing Interests: The author declares that there are no competing interests.

Data Availability

The data used and/or generated during the current study are available from the corresponding author upon reasonable request.

References

1. Abdallah, A. B., Obeidat, B. Y., & Aqqad, N. O. (2014). The impact of supply chain management practices on supply chain performance in Jordan: The moderating effect of competitive intensity. *International Business Research, 7*(3), 13–27. https://doi.org/10.5539/ibr.v7n3p13
2. Abdulameer, S. S., & Yaacob, N. A. (2020). The moderating role of information sharing on the relationship between lean supply chain and supply chain performance: A conceptual framework. *International Journal of Supply Chain Management, 9*(1), 411–419.

3. Aboelmaged, M., Hashem, G., & Mady, K. (2026). Direct and indirect effects of supply chain plasticity and AI capability on business performance: the moderating role of network embeddedness. Business Process Management Journal, 1-29.
4. Acar, A. Z., & Uzunlar, M. B. (2014). The effects of process development and information technology on time-based supply chain performance. *Procedia – Social and Behavioral Sciences, 150*, 744–753. https://doi.org/10.1016/j.sbspro.2014.09.044
5. Afshan, N., Chatterjee, S., & Chhetri, P. (2018). Impact of information technology and relational aspect on supply chain collaboration leading to financial performance: A study in Indian context. *Benchmarking: An International Journal, 25*(7), 2496–2511. https://doi.org/10.1108/BIJ-09-2016-0142
6. Ahi, P., & Searcy, C. (2015). Measuring social issues in sustainable supply chains. *Measuring Business Excellence, 19*(1), 33–45. https://doi.org/10.1108/MBE-11-2014-0041
7. Alahmad, Y. (2021). The relationship between supply chain management practices and supply chain performance in Saudi Arabian firms. *American Journal of Industrial and Business Management, 11*(1), 42–59. https://doi.org/10.4236/ajibm.2021.111004
8. Alam, A., Bagchi, P., Kim, B., Mitra, S., & Seabra, F. (2014). The mediating effect of logistics integration on supply chain performance: A multi-country study. *The International Journal of Logistics Management, 25*(3), 553–580. https://doi.org/10.1108/IJLM-05-2013-0050
9. Al-Shboul, M. D., Barber, K. D., Garza-Reyes, J. A., Kumar, V., & Abdi, R. (2017). The effect of supply chain management practices on supply chain and manufacturing firms' performance. *Journal of Manufacturing Technology Management, 28*(5), 577–609. https://doi.org/10.1108/JMTM-11-2016-0154
10. Alsmarai, S., & Maraqa, M. (2015). Logistics performance and supply chain efficiency in Jordan. *Jordan Journal of Business Administration, 11*(2), 367–384.
11. Alvarado, U. Y., & Kotzab, H. (2001). Supply chain management: The integration of logistics in marketing. *Industrial Marketing Management, 30*(2), 183–198. https://doi.org/10.1016/S0019-8501(00)00142-5
12. Anand, N., & Grover, N. (2015). Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs). *Benchmarking: An International Journal, 22*(1), 135–166. https://doi.org/10.1108/BIJ-05-2012-0034
13. Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411
14. Azemi, N. A., Zaidi, H., & Hussin, N. (2017). Information quality in organization for better decision-making. *International Journal of Academic Research in Business and Social Sciences, 7*(12), 429–437. https://doi.org/10.6007/IJARBSS/v7-i12/3624
15. Bagozzi, R. P., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science, 40*(1), 8–34. https://doi.org/10.1007/s11747-

011-0278-x

16. Bani Hani, J. (2021). The moderating role of lean operations between supply chain integration and operational performance in Saudi manufacturing organizations. *Uncertain Supply Chain Management, 9*(1), 169–178. https://doi.org/10.5267/j.uscm.2020.10.004
17. Bani Hani, J., & Awad, H. (2017). A broad-spectrum orientation of business innovation: An empirical investigation using managers' attitudes toward the effectiveness of innovation measurement indicators in Saudi private hospitals. *International Journal of Innovative Research in Engineering & Management, 4*(4), 729–734. https://doi.org/10.21276/ijirem.2017.4.4.11
18. Banomyong, R., & Supatn, N. (2011). Developing a supply chain performance tool for SMEs in Thailand. *Supply Chain Management: An International Journal, 16*(1), 20–31. https://doi.org/10.1108/13598541111103476
19. Barros, C. P. (2006). Efficiency measurement among hypermarkets and supermarkets and the identification of the efficiency drivers. *International Journal of Retail & Distribution Management, 34*(2), 135–154. https://doi.org/10.1108/09590550610649795
20. Basu, G., Jeyasingam, J., Habib, M., Letchmana, U., & Radhakrishnan, R. (2017). The impact of supply chain management practices on the performance of private universities in Malaysia. *International Journal of Supply Chain Management, 6*(3), 22–35.
21. Beamon, B. M. (1999). Measuring supply chain performance. *International Journal of Operations & Production Management, 19*(3), 275–292. https://doi.org/10.1108/01443579910249714
22. Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238–246. https://doi.org/10.1037/0033-2909.107.2.238
23. Benton, W. C. (2007). *Purchasing and supply chain management*. McGraw-Hill.
24. Cai, J., Liu, X., Xiao, Z., & Liu, J. (2009). Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment. *Decision Support Systems, 46*(2), 512–521. https://doi.org/10.1016/j.dss.2008.09.004
25. Chan, F. T. S., & Lam, H. Y. (2011). Modeling supply chain performance and stability. *Industrial Management & Data Systems, 111*(8), 1323–1354. https://doi.org/10.1108/02635571111171649
26. Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5
27. Choy, K. L., Lee, W. B., & Lo, V. (2004). An enterprise collaborative management system: A case study of supplier relationship management. *Journal of Enterprise Information Management, 17*(3), 191–207. https://doi.org/10.1108/17410390410531443
28. Christopher, M. (2000). The agile supply chain: Competing in volatile markets. *Industrial Marketing Management, 29*(1), 37–44. https://doi.org/10.1016/S0019-8501(99)00110-8
29. Cigolini, R., Cozzi, M., & Perona, M. (2004). A new framework for supply chain management. *International Journal of Operations & Production Management, 24*(1), 7–41. https://doi.org/10.1108/01443570410510979

30. Cook, L. S., Heiser, D. R., & Sengupta, K. (2011). The moderating effect of supply chain role on the relationship between supply chain practices and performance. *International Journal of Physical Distribution and Logistics Management, 41*(2), 104–134. https://doi.org/10.1108/09600031111118521
31. Croom, S., Romano, P., & Giannakis, M. (2000). Supply chain management: An analytical framework for critical literature review. *European Journal of Purchasing & Supply Management, 6*(1), 67–83. https://doi.org/10.1016/S0969-7012(99)00030-1
32. Dai, F., Wang, S., Wu, H., Hwang, D., & Kang, M. (2026). Efficacy of supply chain integration in meeting customers' on-time delivery needs: moderating effect of product life cycle. Journal of Business & Industrial Marketing, 41(1), 99-116.
33. Diakopoulos, N., & Essa, I. (2008). An annotation model for making sense of information quality in online video. In *Proceedings of the 3rd International Conference on the Pragmatic Web* (pp. 31–34). https://doi.org/10.1145/1479190.1479195
34. Dweekat, A. J., Hwang, G., & Park, J. (2017). A supply chain performance measurement approach using the internet of things: Toward more practical SCPMS. *Industrial Management & Data Systems, 117*(2), 267–286. https://doi.org/10.1108/IMDS-03-2016-0096
35. Embury, S. M., Missier, P., Sampaio, S., Greenwood, R. M., & Preece, A. D. (2009). Incorporating domain-specific information quality constraints into database queries. *Journal of Data and Information Quality, 1*(2), 1–11. https://doi.org/10.1145/1577840.1577846
36. 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
37. Gandhi, A. V., Shaikh, A., & Sheorey, P. A. (2017). Impact of supply chain management practices on firm performance. *International Journal of Retail & Distribution Management, 45*(4), 366–384. https://doi.org/10.1108/IJRDM-06-2015-0076
38. Gefen, D., Straub, D., & Boudreau, M. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems, 4*(1), Article 7. https://doi.org/10.17705/1CAIS.00407
39. Goldman, S. L., Nagel, R. N., & Preiss, K. (1995). *Agile competitors and virtual organizations: Strategies for enriching the customer*. Van Nostrand Reinhold.
40. Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (2013). *Multivariate data analysis* (7th ed.). Pearson.
41. Ip, W. H., Chan, S. L., & Lam, C. Y. (2011). Modeling supply chain performance and stability. *Industrial Management & Data Systems, 111*(8), 1332–1354. https://doi.org/10.1108/02635571111171649
42. Jafari, M., Akhavan, P., & Akbari, A. H. (2026). Enhancing supply chain agility and performance through big data analytics: the role of digitalization and top management support. International Journal of Productivity and Performance Management, 1-22.

43. Kannan, V. R. (2010). Supplier development and buyer-supplier relationships. *International Journal of Production Research, 48*(15), 4453–4473.
44. Kannan, V. R., & Tan, K. C. (2004). Supplier alliances: Differences in attitudes to supplier and quality management of adopters and non-adopters. *Supply Chain Management: An International Journal, 9*(4), 279–286. https://doi.org/10.1108/13598540410550028
45. Karimi, E., & Rafiee, M. (2014). Analyzing the impact of supply chain management practices on organizational performance through competitive priorities. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 4*(1), 1–15. https://doi.org/10.6007/IJARAFMS/v4-i1/503
46. Kinney, W. R., Jr. (2000). *Information quality assurance and internal control*. McGraw-Hill.
47. Krajewski, L. J., Malhotra, M. K., & Ritzman, L. P. (2019). *Operations management: Processes and supply chains* (12th ed.). Pearson.
48. Kumar, A., & Kushwaha, G. S. (2018). Supply chain management practices and operational performance of fair price shops in India: An empirical study. *LogForum, 14*(1), 85–99. https://doi.org/10.17270/J.LOG.2018.237
49. Laudon, K. C., & Laudon, J. P. (2021). *Essentials of MIS* (14th ed.). Pearson.
50. Le, P. L., Nguyen, T. T., & Huynh, P. L. T. (2026). Sequential mediating effects of sustainability efforts on sustainable supply chain performance: moderating the role of big data expertise. Journal of Global Operations and Strategic Sourcing, 1-27.
51. Lee, A. S., & Levy, Y. (2014). The effect of information quality on trust in e-government systems' transformation. *Transforming Government: People, Process and Policy, 8*(1), 76–100. https://doi.org/10.1108/TG-10-2012-0011
52. Li, S., & Lin, B. (2006). Accessing information sharing and information quality in supply chain management. *Decision Support Systems, 42*(3), 1641–1656. https://doi.org/10.1016/j.dss.2006.02.011
53. Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S., & Rao, S. S. (2006). The impact of supply chain management practices on competitive advantage and organizational performance. *Omega, 34*(2), 107–124. https://doi.org/10.1016/j.omega.2004.08.002
54. Li, S., Rao, S. S., Ragu-Nathan, T. S., & Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of Operations Management, 23*(6), 618–641. https://doi.org/10.1016/j.jom.2005.01.002
55. Lysons, K., & Farrington, B. (2020). *Procurement and supply chain management* (10th ed.). Pearson.
56. Mahmoud, A. M., Zowid, F. M., & Rahman, M. N. (2026, January). Impact of digital transformation on logistics management, and the mediating role of integration in the context of food supply chains for Muslims' pilgrimage event. In Supply Chain Forum: An International Journal (Vol. 27, No. 1, pp. 107-118). Taylor & Francis.
57. Marinagi, C., Trivellas, P., & Reklitis, P. (2015). Information quality and supply chain performance: The mediating role of information sharing. *Procedia – Social and Behavioral Sciences, 175*, 473–479.

https://doi.org/10.1016/j.sbspro.2015.01.1225

58. Marsh, H. W., Balla, J. R., & McDonald, R. P. (1988). Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological Bulletin, 103*(3), 391–410. https://doi.org/10.1037/0033-2909.103.3.391
59. Min, S., & Mentzer, J. T. (2004). Developing and measuring supply chain management concepts. *Journal of Business Logistics, 25*(1), 63–99. https://doi.org/10.1002/j.2158-1592.2004.tb00170.x
60. Nazir, S., Piprani, A. Z., Mukhuty, S., Upadhyay, A., Vilko, J., & Poon, W. C. (2026). Industry 4.0 integration for sustainability and value creation: moderating the role of digital and environmental strategy. Business Strategy and the Environment, 35(2), 2192-2209.
61. Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.
62. Öztürk, R., Öztürk, M., Kızılkan, Z., Dumitrașcu, C., Cîrțînă, D., Ghimișı, S. S., ... & Nioață, A. (2026). Green Supply Chain Management, Green Innovation, and Carbon-Neutral Performance: A Meta-Analytic Examination of the Moderating Role of Sustainability Metrics. Sustainability, 18(2), 681.
63. Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879
64. Prathiba, S. (2020). Can supply chain management practices influence customer satisfaction and loyalty? *Journal of Supply Chain Management Systems, 9*(1), 1–12.
65. Rahi, S. (2021). Investigating the role of employee psychological well-being and psychological empowerment with relation to work engagement and sustainable employability. *International Journal of Ethics and Systems, 38*(2), 266–285. https://doi.org/10.1108/IJOES-12-2020-0200
66. Rahi, S., & Abd. Ghani, M. (2019). Integration of expectation confirmation theory and self-determination theory in internet banking continuance intention. *Journal of Science and Technology Policy Management, 10*(3), 533–550. https://doi.org/10.1108/JSTPM-06-2018-0057
67. Rahi, S., Ghani, M. A., & Ngah, A. H. (2020). Factors propelling the adoption of internet banking: The role of e-customer service, website design, brand image and customer satisfaction. *International Journal of Business Information Systems, 33*(4), 549–569. https://doi.org/10.1504/ijbis.2020.105870
68. Rahi, S., Ghani, M. A., & Ngah, A. H. (2021). Mobile banking adoption: Empirical evidence from the banking sector in Pakistan. *Journal of Innovation in Digital Marketing, 2*(1), 27–38.
69. Rahi, S., Ghani, M., & Ngah, A. (2018). A structural equation model for evaluating user's intention to adopt internet banking and intention to recommend technology. *Accounting, 4*(4), 139–152. https://doi.org/10.5267/j.ac.2018.3.002
70. Ringle, C. M., da Silva, D., & Bido, D. (2015). Structural equation modeling with the SmartPLS. *Revista Brasileira de Marketing, 13*(2), 56–73. https://doi.org/10.5585/remark.v13i2.2717
71. Saragih, J., Tarigan, A., Pratama, I., Wardati, J., & Silalahi, E. F. (2020). The impact of total quality management, supply chain management practices, and operations capability on firm performance. *Polish Journal of Management Studies, 21*(2), 384–397. https://doi.org/10.17512/pjms.2020.21.2.27

72. Seif, M., & Jafari, H. (2026). Unpacking the role of analytics for supply chain resilience and performance: the complex influence of supply chain integration. Production Planning & Control, 37(3), 272-289.
73. Shepherd, C., & Günter, H. (2006). Measuring supply chain performance: Current research and future directions. *International Journal of Productivity and Performance Management, 55*(3/4), 242–258. https://doi.org/10.1108/17410400610653219
74. Slack, N., & Brandon-Jones, A. (2019). *Operations management* (9th ed.). Pearson.
75. Strategic Supplier Partnerships (SSP), Customer Relationship Management (CRM), Internal Lean Practices (ILP), Information Sharing (IS), and Postponement (P).
76. Subburaj, M., Babu, T. R., & Subramonian, B. S. (2015). A study on strengthening the operational efficiency of dairy supply chain in Tamil Nadu, India. *Procedia – Social and Behavioral Sciences, 189*, 285–291. https://doi.org/10.1016/j.sbspro.2015.03.224
77. Sukati, I., Hamid, A. B., Baharum, R., & Yusoff, R. M. (2012). The study of supply chain management strategy and practices on supply chain performance. *Procedia – Social and Behavioral Sciences, 40*, 225–233. https://doi.org/10.1016/j.sbspro.2012.03.185
78. Tan, K. C., Kannan, V. R., & Leong, G. K. (2009). Supply chain management practices as a mediator of the relationship between operations capability and firm performance. *International Journal of Production Research, 47*(3), 835–855. https://doi.org/10.1080/00207540701452142
79. Thatte, A. A. (2007). *Competitive advantage of a firm through supply chain responsiveness and SCM practices* (Doctoral dissertation, The University of Toledo). ProQuest Dissertations and Theses Global.
80. Utami, C. W., Susanto, H., Septina, F., Sumaji, U. M. P., & Pratama, I. (2019). Effect of supply chain management practices on financial and economic sustainable performance of Indonesian SMEs. *International Journal of Supply Chain Management, 8*(5), 523–535.
81. Wang, L., Meng, Y., Xiao, W., & Wang, J. X. (2026). Navigating the supply chain environmental sustainability: the moderating role of digitalisation in driving supply chain efficiency on circular economy performance. Production Planning & Control, 1-15.
82. Wu, Y., Mehmood, K., Mangla, S. K., & Jabeen, F. (2026). A Dynamic Capability View to Evaluate the Role of FinTech in Green Supply Chain Performance: Moderating the Role of Data-Driven Lean and Green Practices. Business Strategy and the Environment, 35(4), 5841-5858.
83. Wu, Y., Mehmood, K., Mangla, S. K., & Jabeen, F. (2026). A Dynamic Capability View to Evaluate the Role of FinTech in Green Supply Chain Performance: Moderating the Role of Data-Driven Lean and Green Practices. Business Strategy and the Environment, 35(4), 5841-5858.
84. Zhang, H., Yu, A., Xiang, R., & Gao, Y. (2026). Does supply chain efficiency accelerate firm innovation performance? An investigation in the digital transformation era. Production Planning & Control, 1-15.
85. Zhang, J., Tariq, M., & Waseel, A. H. (2026). Examining the impact of supply chain integration on firm innovation: A dual mediation and moderation study. Journal of Enterprise Information Management, 39(2), 562-601.

Figures

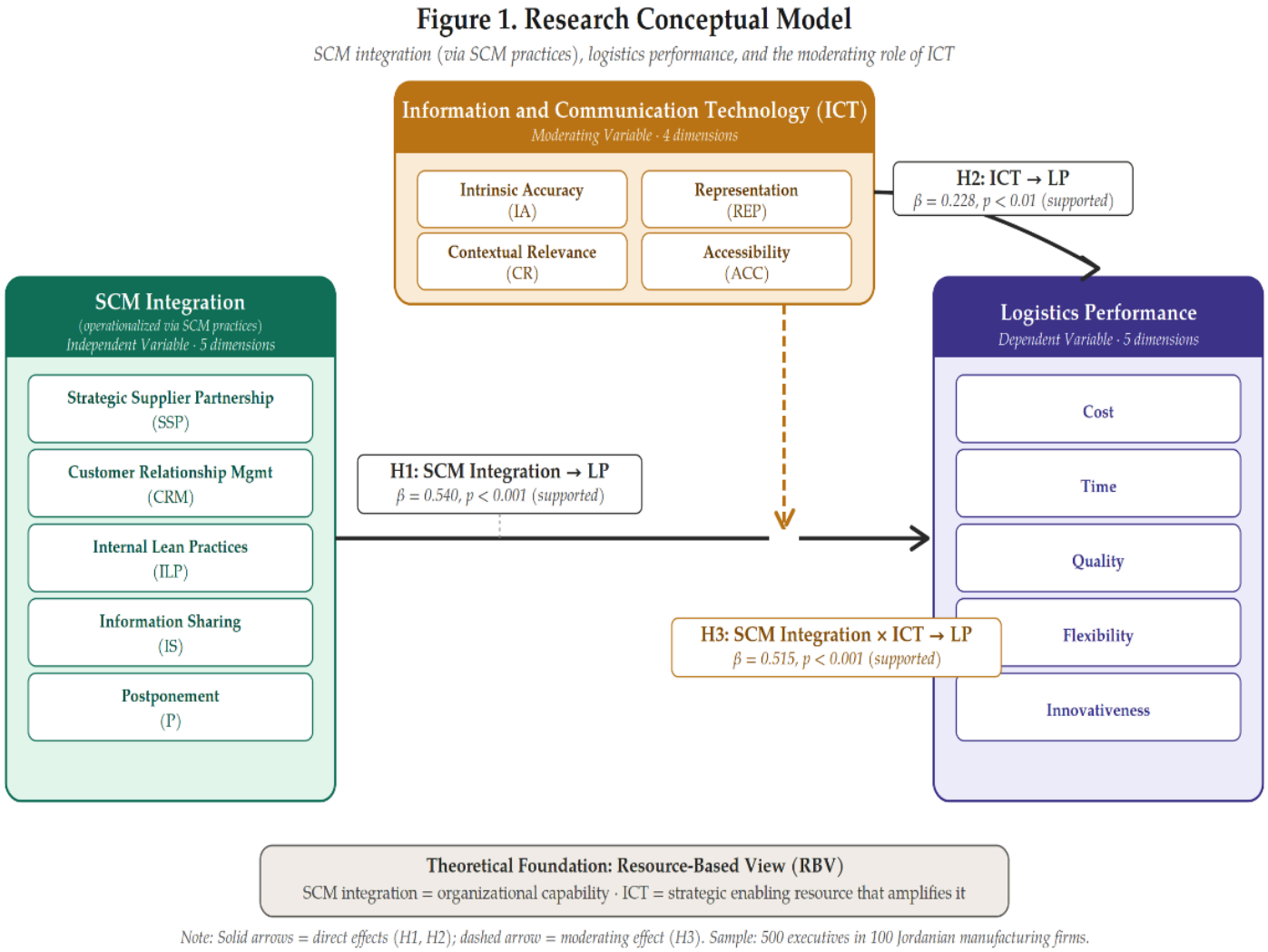


Figure 1

A conceptual model depicting how SCM integration, expressed through its core practices, shapes logistics performance, alongside the moderating function exercised by ICT.

Supplementary Files

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- AppendixA.docx