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## Assessing the Moderating Effect of Innovation on the Relationship between Information Technology and Supply Chain Management: An Empirical Examination

Heba Hatamlah

*Hospital Management Department, Faculty of Business, Philadelphia University, Amman, Jordan,*  
Basil8011@gmail.com

Mahmoud Allahham

*Department of Supply Chain and Logistics, College of Business, Luminus Technical University College, Amman, Jordan,* Basil8011@gmail.com

Ibrahim A. Abu-AISondos

*Department of Information Technology Management (ITM), College of Computer Information Technology (CCIT), American University in the Emirates (AUE), Dubai, United Arab Emirates (UAE),*  
Basil8011@gmail.com

Alaa S. Mushtaha

*Department of Management, College of Business Administration, American University in the Emirates (AUE), Dubai, United Arab Emirates (UAE),* Basil8011@gmail.com  
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Ghadeer M. Al-Anati

*Department of E-Business and Technical Accounting, Khawarizmi University Technical College (KUTC),*  
Basil8011@gmail.com

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## Authors

Heba Hatamlah, Mahmoud Allahham, Ibrahim A. Abu-ALSondos, Alaa S. Mushtaha, Ghadeer M. Al-Anati, and Mustafa Al-Shaikh

# Assessing the Moderating Effect of Innovation on the Relationship between Information Technology and Supply Chain Management: An Empirical Examination

*Heba Hatamlah<sup>1</sup>, Mahmoud Allahham<sup>2</sup>, Ibrahim A. Abu-ALSondos<sup>3</sup>, Alaa S. Mushtaha<sup>4</sup>, Ghadeer M. Al-Anati<sup>5</sup>, Mustafa Al-Shaikh<sup>6</sup>, and Basel J. A. Ali<sup>7,\*</sup>*

<sup>1</sup>Hospital Management Department, Faculty of Business, Philadelphia University, Amman, Jordan

<sup>2</sup>Department of Supply Chain and Logistics, College of Business, Luminus Technical University College, Amman, Jordan

<sup>3</sup>Department of Information Technology Management (ITM), College of Computer Information Technology (CCIT), American University in the Emirates (AUE), Dubai, United Arab Emirates (UAE)

<sup>4</sup>Department of Management, College of Business Administration, American University in the Emirates (AUE), Dubai, United Arab Emirates (UAE)

<sup>5</sup>Department of E-Business and Technical Accounting, Khawarizmi University Technical College (KUTC), Amman, Jordan

<sup>6</sup>Department of Electronic Marketing and Social Media, College of Business Zarqa University, Zarqa, Jordan

<sup>7</sup>College of Economics and Management (CoEM), Al Qasimia University, Sharjah, United Arab Emirates

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**Abstract:** This study examines how innovation (INN) influences the relationship between supply chain management and information technology in Jordan. 211 employees of Jordanian industrial enterprises who work in the Operations Department provided information for the study, which examines this subject. The findings indicate a close connection between information technology and supply chain management. Innovation also dramatically modifies the interaction between supply chain management and information technology. Management help may be the subject of future research.

**Keywords:** Innovation, Information technology, Supply chain management

## 1 Introduction

The term "supply chain management" (SCM) refers to the administration of a system of interconnected companies that provide product and service bundles desired by final consumers [1-3]. Information exchange across supply chain networks enables cooperation on the creation of coordinated and integrated supply chains for effective supply chain management [4-6]. Additionally, information improves efficiency and lowers risks in supply chains since it gives instructions for transactions and enables decision-makers to take action as necessary [7]. This involves the use of information technology, which comprises hardware and software. Suppliers, producers, distributors, and customers are all integrated through the use of information technology in order to fulfill the quantity and quality of

products[8-11]. Supply chain management gives companies an advantage by helping them gather crucial data throughout the whole supply chain and act swiftly in response to any predicted shifts in the market [12]. The purpose of IT in the supply chain is to make data more transparent and accessible, to provide a centralized hub for all data, to facilitate the use of all relevant data in decision making, and to facilitate cooperation between all parties involved [13]. Execution of transactions, cooperation and coordination, and decision support are among the IT's functional tasks mentioned in the supply chain [14-18]. Organizational effectiveness in the corporate environment is also heavily influenced by information technology [18-20]. It provides a steady stream of data that strengthens the supply chain without negatively impacting productivity. The vast majority of organizations are progressively using information technology solutions in supply chain management to improve their performance in fiercely competitive global markets [21] Thanks to recent

\*Corresponding author e-mail: [Basil8011@gmail.com](mailto:Basil8011@gmail.com)

developments in information technology and scientific management, many sectors now have procedures for acquiring, exchanging, and utilizing information [22]

According to the literature, supply chain stakeholders should cooperate to spend money on information technology to make supply networks more transparent [23] Thanks to the increasing adoption of integrated information systems and enabling technology, seamless supply chains connecting suppliers to customers may now be established, eliminating inadequate supplier performance, unpredictable customer expectations, and an uncertain business climate [17] The investment required among supply chain participants to adopt new information technology frequently fails to materialize as planned, even if such coordinated efforts may give unique value that a single organization cannot achieve independently [23]

Information technology innovation is generally acknowledged to be well established in industrialized nations, whereas newly industrializing and agricultural nations have been taking administrative measures to hasten the development of information technology within their borders [17, 24-26] A loss in research understanding of the function of government foundations, and organizations more generally, in information technology innovation is also shown by the absence of adequate approach recommendations for building government information technology development strategies. Additionally, academics [27] contend that there is little research on cost-effective and environmentally friendly supply chain innovation strategies. The literature now in existence largely fails to produce theory-focused and data-driven research that can significantly advance our understanding of frugal innovation in connection to sustainability (Rosca, Reedy & Bendul, 2018; Levanen et al. 2015). Many scholars argue that more detailed empirical study is urgently needed because frugal innovation is still relatively new [27]. As a result, this study will examine how innovation in relation to information technology has impacted supply chain management. For the first time in the context of Jordan, the current study investigates the variable of innovation as a mediator between information technology and supply chain management.

The following information is divided into six sections in this paper: Section 1 introduces the subject under consideration; Sections 2-4 explore the literature, generate hypotheses, and provide specifics on study theories. In Section 5, the research methodology is given, the research hypotheses that will be tested in this study are described, the study outcomes are summarized, and Section 6 discusses the study's limitations and conclusion. Thus, the following research issues are put forth:

1. How information technology is related to supply chain management?
2. How much does innovation influence the interaction between supply chain management and information technology?

The study achieves the following two main research goals by answering the research questions:

1. explore supply chain management with information technology.
2. To examine how innovation influences the link between supply chain management and information technology.

## 2 Literature Review

[2, 3] define supply chain management as the conclusion of all operations, beginning with the acquisition of raw materials from manufacturers or producers and ending with the delivery of the finished good to the client. [28] found that as data complexity rose, supply networks became more unreliable, increasing the sensitivity of electronic dangers (e-risks). To accomplish the goals of supply chain management, the supply chain network must be upstream and downstream integrated. Supply chains that are IT-enabled may control the movement of data with important business processes, resources, and money both inside and outside of networks. They boost business earnings by enhancing quality and lowering coordination expenses and transaction risks [29]

More recent studies has shown that businesses gain significantly from the use of information technology. discovered substantial productivity advantages from information flow [30] There is now enough evidence of the advantages of information technology, according to other studies, to declare the productivity paradox to be a myth of the past [31] Although it seems to be the case that investments in information systems do pay off in the present, it is still unclear exactly how. According to earlier study, corporate strategies, mass customization, and supply chain management are only a few organizational components that can benefit from information technology in a synergistic way. Information software does not operate in a vacuum and interacts closely with other firm assets [32] However, it was thought that the widespread use of information technology in supply chain management would boost the value it could deliver. Information technology has the ability to direct the flow and affect a number of SC characteristics, including cost, quality, delivery, flexibility, and, ultimately, the firm's profits [33]

Adding innovative components to preexisting products, processes, and services is also an example of innovation [34]. Based on the results and observations, it is clear that the aforementioned elements may act as mediators and facilitate the development of a causal link between an explanatory and a response variable [17]. Connecting the independent variable to the mediation and the mediation to the dependent variables may both be done via the usage of variables. Consequently, the following assertions are made:

**H1: Information technology impacts the supply chain management.**

**H2: Innovation moderate the positive relationship between Information technology and supply chain management.**

### 3 Theories of Study

In order to support the variables of the study and its model, this study will use two theories: the resource-based view theory and the institutional theory as follows:

#### 3.1 Institutional theory

According to [35] institutional pressures of three different kinds—coercive, mimetic, and normative—are the fundamental reason of how similar organizations are becoming in nature. So, in accordance with institutional theory, external institutions have an impact on the performance and results of organizations [36] Some of these institutions include social and political conditions, market tendencies, and competitiveness [37] Institutional theory has emerged as one of the most well-liked and acknowledged theories in supply chain management [38] From an institutional theory vantage point, we accounted for such extraneous variables as public financing, public policies and laws, international norms and regulations, societal values and ethics, and market competitiveness. Sustainability-oriented innovations in the supply chain might be influenced by these aspects.

#### 3.2 Resource based view theory

Since resource requirements, environmental possibilities, and commercial requirements are all intertwined, a corporation might get an edge over its competitors by making use of resources that are distinctive from or more advantageous than those of its rivals [39]. According to the resource-based view paradigm, an organization is best seen as a stockpile of resources, including hard and soft assets and tacit knowledge [40]. Knowledge and resource-based view-theory based innovation frameworks have been the subject of much academic research [27]. Alexander and Childe, both of them. The study's major enablers have been considered because they may have an effect on sustainability-oriented supply chain innovations. These enablers include process design expertise, supply chain talent, infrastructure quality and connectivity, environmental awareness, knowledge, and technology.

### 4 Theoretical Framework

In order to evaluate the moderating effect of innovation on the interaction between information technology and supply chain management in Jordan, this study offers a theoretical framework. The overall structure is shown in Figure 1.

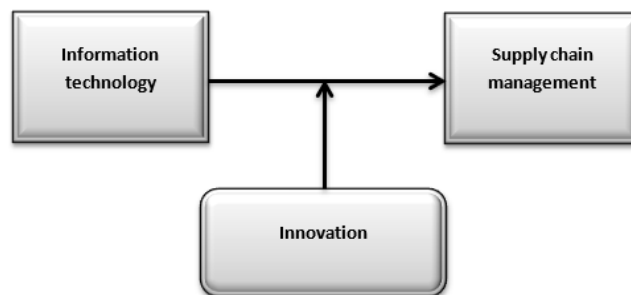


Fig. 1: Theoretical Framework.

### 5 Research Methodology

A study design makes up the master plan, which specifies the steps and techniques to be taken in gathering and analyzing the required data [41] The (PLS Smart) and other statistical analyses were used to extract meaningful information from data analysis.

The components of the questionnaire employed in the current study were modified versions of those used in a number of earlier studies. Closed-ended questions on a Likert scale from 1 to 5 made up the survey's items. The data was analyzed using PLS Smart and the values represent the possible replies to each factor. This study used percentage analysis and presents the results in an uncomplicated, understandable way. Data ranking is used to select the five-point Likert scale responses that score the highest in each area. Cronbach's alpha was utilized in this study to evaluate internal consistency. The parts' relationships with one another are demonstrated by the internal consistency. It was suggested that if the obtained Cronbach's alpha value falls between 0.70 and 1.00, it should be considered credible. According to [42] Cronbach's alpha and a coefficient of reliability employ statistical techniques to achieve dependability but not statistical tests. How accurately a measurement reproduces a concept is referred to as its reliability. Cronbach's alpha is one approach for evaluating the strength of consistency. A total of 211 employees in the Operations Department of Jordanian industrial companies who were chosen at random answered the questionnaire. These auditors were qualified to take part in the study since they had a clear comprehension of what they were doing.

### 6 Data Analysis and Results

According to table 1, the supply chain management R-square variable's value is 0.845, or 84.5%. This may suggest that 84.5% of the variability in supply chain management variables can be accounted for by information technology and innovation variables, or, put another way, that information technology and innovation variables contribute 84.5% to supply chain management, with the remaining 15.5% coming from other variables not included in this study.

Table 1: R Square.

	R Square	R Adjusted Square
Supply chain management	0.845	0.843

Measurement and structural models combine to form PLS's structural equation. Path coefficients between and among latent variables are provided by the structural model, while the measurement model proves the conceptual model's soundness and validity. In this research, we applied these two methods. The measurement scheme used in this experiment is shown in Figure 2.

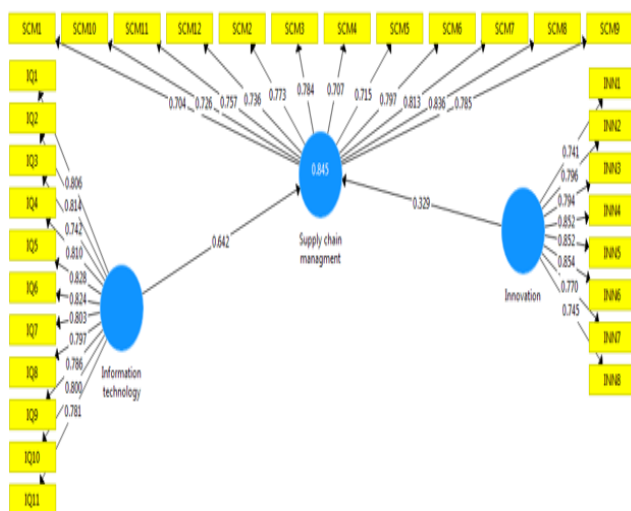


Fig. 2: Measurement model.

Table 2 details the existing model's convergent validity. Outside loadings for each item are greater than 0.70. Some things were dropped because they were less than 0.07, while others were maintained [42]

Table 2: Outer loading.

	Information technology	Innovation	Supply chain management
INN1		0.741	
INN2		0.796	
INN3		0.794	
INN4		0.852	
INN5		0.852	
INN6		0.854	
INN7		0.770	
INN8		0.745	
IQ1	0.806		
IQ10	0.800		

IQ11	0.781		
IQ2	0.814		
IQ3	0.742		
IQ4	0.810		
IQ5	0.828		
IQ6	0.824		
IQ7	0.803		
IQ8	0.797		
IQ9	0.786		
SCM1			0.704
SCM10			0.726
SCM11			0.757
SCM12			0.736
SCM2			0.773
SCM3			0.784
SCM4			0.707
SCM5			0.715
SCM6			0.797
SCM7			0.813
SCM8			0.836
SCM9			0.785

The examination of reliability makes use of Cronbach's alpha, composite reliability, and average extracted variance (AVE). Table 3 demonstrates that our study is reliable since all of the results are greater than the thresholds.

Table 3: Construct reliability and validity.

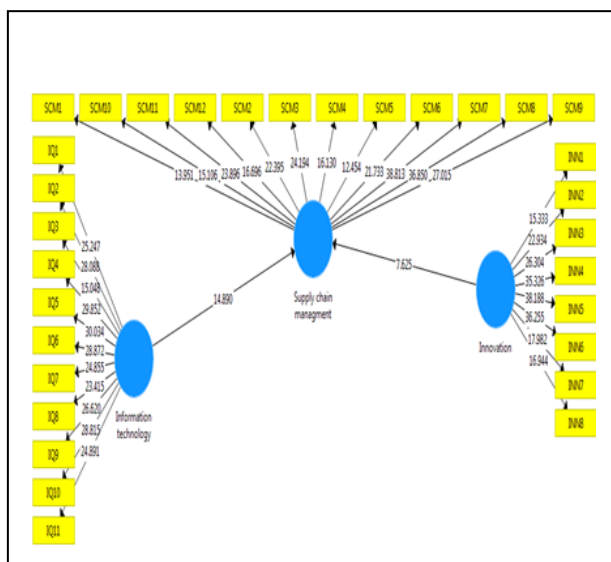
	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Information technology	0.943	0.945	0.951	0.639
Innovation	0.920	0.922	0.935	0.643
Supply chain management	0.934	0.935	0.943	0.581

According to the findings of the inquiry into the criterion's discriminant validity, all diagonal values significantly surpass both the threshold values and the lower values [43]

**Table 4:** Discriminant validity.

	Information technology	Innovation	Supply chain management
Information technology	0.799		
Innovation	0.768	0.802	
Supply chain management	0.895	0.822	0.762

After examining the validity and dependability of the research, the route coefficient for the current study is established. Figure 3 depicts the experimental structure used to conduct the study. Bootstrapping is used to examine the potential direct and indirect interactions between the variables.



**Fig 3:** Model of measurement

The structural route hypothesis was tested by using both the absolute values and the standard errors of the path coefficients. Therefore, to evaluate the significance of the route coefficients using a one-tailed test, we used both the PLS technique and the conventional bootstrapping method using 1000 bootstrap samples (Hair et al., 2010). The evidence supports Hypotheses H1 and H2 adequately, as seen in Table 5. Overall, the results show the value and power of build route coefficients. The SCM increases proportionately to the magnitude of IM, as shown by the positive and statistically significant route coefficient (2.5625) from IT to SCM (p-value = 0.000, t-value = 14.890). The data indicated a significant positive INN as a moderator between the relationship between IT and SCM in the instance of H2 (p-value = -0.000, t-value = 7.625).

**Table 5:** Results of hypotheses testing for the IT, SCM and INN.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Information technology - > Supply chain management	0.642	0.642	0.043	14.890	0.000
Innovation - > Supply chain management	0.329	0.329	0.043	7.625	0.000

### 7 Conclusions

This study aims to investigate how innovation affects the interaction between supply chain management and information technology. The following findings were reached based on the results of tests performed on three regression models: The findings of the Jordanian businesses were discussed, and it became clear that INN improves their SCM and IT. The study's findings, which are in line with those of other studies on the subject, demonstrate that IN has a favorable effect on SCM in these businesses [30]. This study equips decision-makers with the core understanding necessary to design efficient SCM support systems and policies. The report shows how extensively the SCM has used IT. To overcome the shortcomings of the study, additional research is necessary. Future research should use alternative methodologies and focus on other industries. Studies in the future may delve deeper into subjects like managerial support. These are not included in this study. The most significant limitation of the study's conclusions is that they cannot be used to analyze Jordan's public sector. The researchers discovered a gap in their understanding of SCM. The researchers addressed these constraints because some of the sample proved to be challenging to understand.

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