

# THE IMPACT OF INFORMATION TECHNOLOGY AND INNOVATION IN SUPPLY CHAIN CAPABILITIES "AN EMPIRICAL STUDY OF INDUSTRIAL COMPANIES LISTED ON THE AMMAN STOCK EXCHANGE"

Gharam Ali Mohammad Abdelaziz

Aqaba University of Technology – Jordan.

[Gharamali@gmail.com](mailto:Gharamali@gmail.com)

**ABSTRACT** :The primary objective of this study is to examine the influence of information technology and innovation on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange. By exploring how different components of information technology and innovative practices affect supply chain performance, the study aims to offer valuable insights for enhancing operational efficiencies in these organizations. The study population consists of all 67 industrial companies listed on the Amman Stock Exchange as of 2023. A random sample of 35 companies was selected, representing approximately 46% of the total population. A questionnaire was distributed to employees in top and middle management within these selected companies, and 280 questionnaires were issued. Ultimately, 260 responses were collected, resulting in an 85% response rate, all validated for statistical analysis. The results indicate a significant relationship between information technology, innovation, and supply chain capabilities.

**Keywords:** Information Technology, Innovation, Supply Chain Capabilities.

## INTRODUCTION

In today's rapidly evolving world, various sectors are experiencing significant transformations driven largely by advancements in information technology (IT). These changes have profoundly impacted how organizations operate, spanning product development and quality enhancement, with the ultimate aim of fulfilling customer desires, which are at the core of competitive dynamics. Technology has emerged as a pivotal element within business organizations, especially amidst the ongoing developments and shifts that characterize modern enterprises. It is one of the most influential factors affecting organizational activities and processes, particularly in information processing. The revolution in information and communication technology has effectively transformed the globe into a "small village. [1]. Technology has restructured many traditional operations within organizations by fostering relationships that, while appearing less complex, are more efficient and cost-effective. As such, technology has become an indispensable component of contemporary organizations, serving as a crucial resource that management relies on to enhance administrative processes, support decision-making, and optimize resource utilization [2]. Given the challenges imposed by technological advancements, traditional management practices have become inadequate in equipping organizations to remain competitive. In an era where competition is the prevailing language of business, it has become a driving force motivating individuals, institutions, and nations alike to innovate, create, and excel. Achieving competitive advantage or superiority has become essential to maximize profitability and return on investment [3].

The rapid technological developments have compelled contemporary organizations to respond swiftly to available opportunities while avoiding risks and threats. The intense competitive landscape has driven organizations to adapt and heed these changes, reflecting the need for agile practices that align with successful entities. Utilizing IT and communication tools is crucial for enhancing organizational performance and ensuring sustainability in the market[4].

Furthermore, the continuous and rapid developments faced by both service and manufacturing organizations have increased their focus on supply chains to enhance performance and bolster competitiveness in a highly competitive business environment. Consequently, organizations are adopting various management strategies to refine and develop their supply chains.

Supply chains are critical for organizations as they facilitate cost reduction and open numerous opportunities between the organization and its customers and suppliers. Effective supply chain management significantly enhances organizational performance by ensuring tasks are accomplished correctly, and streamlining the flow of information, materials, services, and funds to maximize organizational efficiency [5].

However, managing supply chains presents strategic challenges for organizations. Success in this domain is contingent upon the integration of the various components within the supply chain, including suppliers, manufacturers, and customers. Hence, supply chain management has become a strategic approach for connecting partners and managing the flow of materials from sourcing to product delivery.

Supply chain integration is vital for effective supply chain management. Nevertheless, there are uncertainties surrounding the implementation of supply chain integration practices. Research indicates that these practices may vary based on the strategic approach adopted by a company, and different facets of supply chain integration may hold varying importance under distinct conditions. Thus, there remains a need for further research to explore the relationships between supply chain integration practices and various company variables [6, 22].

This study aims to investigate the impact of information technology and innovation on the integration of supply chains within industrial companies listed on the Amman Stock Exchange. By focusing on the nexus between IT, innovation, and supply chain capabilities, this research seeks to provide insights into how these factors influence the operational effectiveness and competitive positioning of industrial organizations in Jordan.

### Problem Statement

In the contemporary business landscape, information technology (IT) has emerged as a crucial activity for any organization striving for longevity and success. Companies are continually seeking effective and efficient methods to achieve their objectives and maintain competitiveness among their peers. The integration of IT within organizations enables them to identify avenues for excellence and innovation, thereby ensuring their sustainability in an ever-changing market.

Numerous studies have underscored the significance of leveraging IT in managing organizational processes and executing tasks effectively. The use of IT tools assists companies in confronting the myriad challenges and transformations present in today's business environment, enhancing their capacity to respond swiftly to emerging opportunities while mitigating risks and threats [7, 8].

Currently, many businesses operate within a highly competitive environment characterized by rapid changes in customer preferences and market conditions. This necessitates that organizations distinguish themselves from their competitors to adapt and thrive amid evolving circumstances and achieve long-term strategic goals [9]. The numerous challenges faced by companies such as globalization, intense competition, shortened product life cycles, and variations in management quality highlight the importance of supply chain integration. Successful long-term strategies depend significantly on the cohesive functioning of the supply chain and its direct influence on organizational performance and competitive advantage. Research has emphasized the critical role of supply chain integration in enhancing organizational performance within a competitive landscape. However, the topic of supply chain integration still requires further exploration. Prior studies have pointed out the necessity to investigate the factors influencing supply chain integration, particularly concerning the role of IT and its tools in business operations [10, 11,12, 23]. Based on the above discussion, the topic of supply chain integration is essential and profoundly impacts companies' performance and their ability to enhance competitive positioning amidst various market developments. Therefore, it is crucial to study the integration of supply chains and the factors influencing it, especially with the advent of diverse IT tools in all organizational processes. Consequently, the research problem can be articulated through the following primary question:

**What is the impact of information technology and innovation on supply chain integration in industrial companies listed on the Amman Stock Exchange?**

### Objectives of the Study

This study aims to achieve the following objectives:

1. To examine the impact of information technology, based on its dimensions (software, technical support teams, and communication networks), on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange.
2. To investigate the effect of innovation on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange.

3. To provide a set of recommendations based on the study's findings for the companies in the sample and stakeholders interested in this field.

### Theoretical Background and Research Hypothesis

[13] conducted a study aimed at providing a comprehensive understanding of the key information technology factors affecting successful supply chain management. The research was based on a thorough analysis of recent literature and utilized a survey methodology, distributing a questionnaire to 150 employees in logistics roles within the automotive industry in the Jabajika region of Indonesia. The study proposed a model illustrating the impact of information technology factors on collaboration within the supply chain. Findings highlighted the need for further research to identify specific IT factors influencing successful supply chain management and to enhance the accuracy of sample modelling.

The study by [14] investigated the impact of internal integration, supply chain partnerships, supply chain agility, and supply chain flexibility on sustainable competitive advantage in Indonesian manufacturing companies. This research employed a descriptive-analytical approach by developing a questionnaire distributed to 672 employees in manufacturing firms. Results indicated that internal integration, facilitated through data sharing among departments, positively influenced supply chain partnerships, agility, and flexibility. Additionally, partnerships characterized by timely material delivery and adaptability to changing demands enhanced overall flexibility and sustainable advantages. Supply chain agility played a crucial role in maintaining smooth production processes and managing capacity, contributing to both flexibility and sustainability.

Others [15], aimed to explore the relationship between information technology capabilities, digital transformation, and innovation performance in Chinese manufacturing enterprises. Using a questionnaire from 138 firms, the research employed structural equation modelling (SEM) and fuzzy-set qualitative comparative analysis (fsQCA). Results indicated that IT capabilities positively impact process innovation and digital transformation, which, in turn, enhance both process and product innovation performance. Digital transformation acts as a partial mediator for process innovation and a complete mediator for product innovation.

[16] explored the role of information technology resources, innovation, and supply chain capabilities as drivers of business performance. Using a descriptive approach and a comprehensive literature review, the study found that these capabilities significantly influence company performance. Investments in information technology are particularly important, with the trend of digitization growing in supply chains. The findings emphasized that managing innovation and supply chain capabilities are top priorities for senior management, driven by global competitive pressures to deliver advanced products and enhance operational efficiency. [17] suggested that supply chain capabilities enabled by information technology are unique to each firm and difficult to replicate across organizations. These capabilities can act as a catalyst for converting IT-related resources into greater value for a company. Drawing on data

gathered from a survey of supply chain and logistics managers across various industries, this research highlights these critical aspects. The findings offer a fresh perspective on assessing IT investments within the supply chain process.

[18] aimed to examine the impact of supply chain management on competitive advantage and organizational performance. The study employed a descriptive-analytical approach for data collection and analysis. Results indicated a positive effect of supply chain management, particularly through its dimensions of relationships with suppliers, intermediaries, distributors, and customers on enhancing organizational performance. The study recommended a strategic approach focusing on establishing long-term relationships with suppliers and fostering effective communication, as efficiency in supply chain management is key to the organization's long-term success.

Elsewhere [19], evaluated the impact of supply chain management practices specifically storage and operational elements and total quality management practices on company performance in the automotive industry in Thailand. The results indicated that organizations implementing both supply chain management and total quality management practices achieved higher performance levels.

Others [20], investigated the impact of information technology (IT) usage on the supply chain capabilities of organizations. The study posited that utilizing IT resources enhances these capabilities. A structural equation model was developed to examine the relationships between IT usage, IT advancement, IT alignment, and supply chain capabilities. Data were gathered from 307 managers across eight segments of the manufacturing industry. Findings supported the hypothesis that increased IT usage contributes to greater IT advancement (utilization of advanced technologies) and IT alignment (investments in IT that synchronize with channel partners), significantly influencing supply chain capabilities.

**Research Methodology**

Regarding the methodology used, there are several research methods. In this particular study, due to its nature, objectives, and questions, the descriptive-analytical method was employed. This method contributes to answering the research questions by collecting data and then analyzing and discussing it. As for the sources of data, multiple sources were relied upon, with primary data collected through questionnaires and interviews. This research aims to provide a comprehensive understanding of the Impact of Information Technology and Innovation in Supply Chain Capabilities "An Empirical Study of Industrial Companies Listed on the Amman Stock Exchange".

**Study Population and Sample**

The study population consists of the industrial companies listed on the Amman Stock Exchange as of 2023, totalling 67 companies. A random sample of 35 companies was selected, representing 46% of the total industrial companies listed. The study tool (the questionnaire) was distributed to employees in the selected companies, with 280 questionnaires distributed to On Top and Middle Management. A total of 260 questionnaires were retrieved, resulting in a response rate of 85%, and all were valid for statistical analysis.

**Validity of The Study Tool**

The study tool (questionnaire) was submitted to a panel of five arbitrators with academic expertise and experience from various public and private universities in Jordan. Their feedback was sought to evaluate the tool's suitability regarding the number of items, clarity, accuracy, coherence, and any other relevant comments. They were invited to suggest deletions, modifications, or additions as they deemed necessary. This review process, along with the subsequent revisions based on their recommendations, was considered a test of the apparent validity of the questionnaire.

**Hypotheses Testing**

**Model Validity**

In the context of the study titled "The Impact of Information Technology and Innovation on Supply Chain Capabilities: An Empirical Study of Industrial Companies Listed on the Amman Stock Exchange," various tests were conducted to validate the hypothesized model and ensure that the data met the criteria for linear or multiple regression analysis.

The results indicated that there is no significant correlation between the independent variables. Specifically, the variance tolerance value exceeded 0.1, and the Variance Inflation Factor (VIF) was less than 10, as assessed by the Multicollinearity test.

Additionally, the skewness coefficients for the independent variables specifically, software, technical support teams, and communication networks confirmed that the data are normally distributed, with skewness values below one indicating adherence to a normal distribution (Doane & Seward, 2011). The validity results are summarized in Table (1).

A normal distribution test was conducted based on the skewness coefficients to determine whether the data used in the analysis followed a normal distribution. The results are presented in Table (1).

**Table (1) Testing the normal distribution of the data depending on the value of the skewness coefficient**

| Domains                 | Skewness |
|-------------------------|----------|
| software                | -.570    |
| technical support teams | -.246    |
| communication networks  | -.422    |
| innovation              | -.348    |

These findings underscore the robustness of the model and its suitability for analyzing the impact of information technology and innovation on supply chain capabilities among industrial companies listed on the Amman Stock Exchange.

To validate the hypothesized model, several tests were conducted to ensure that the research data meets the criteria for linear or multiple regression analysis. The results indicate that there is no significant correlation among the independent variables, as assessed by the Multicollinearity test, which involved examining the tolerance and Variance Inflation Factor (VIF). Specifically, the variance tolerance value exceeded 0.05, and the VIF coefficient was below 10 (Gujarati, 1988).

Additionally, the skewness coefficients for the independent variables' efficiency, complementarities, lock-in, and novelty

confirm that the data are normally distributed, with skewness values less than 1 indicating adherence to normality (Doane & Seward, 2011). Table () provides a summary of the validity results.

**Table (2): Tolerance and Variance Inflation Factor Test**

| Model                   | Skewness | Tolerance | VIF   |
|-------------------------|----------|-----------|-------|
| software                | -0.570   | 0.344     | 2.903 |
| technical support teams | -0.246   | 0.298     | 3.357 |
| communication networks  | -0.422   | 0.229     | 4.371 |
| innovation              | -0.421   | 0.230     | 4.369 |

Table (2) illustrates that the tolerance values for the tests ranged from 0.229 to 0.344, which are all greater than 0.05. Additionally, the Variance Inflation Factor (VIF) values were all below 5 (21), indicating no threat of multicollinearity among the independent variables. Furthermore, the skewness values were all less than 1, confirming the normal distribution of the data. Consequently, after examining the multicollinearity constraints, the model is deemed valid for further statistical analysis.

**Hypothesis H1**

**H1: There is no direct impact of information technology specifically (software, technical support teams, and communication networks) along with innovation on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange.**

The relationship between information technology (software, technical support teams, and communication networks) and innovation in supply chain capabilities was examined using correlation and multiple linear regression analysis. The results from Pearson's correlation test, presented in Table (-), indicate a statistically significant positive correlation between the components of information technology and supply chain capabilities. The correlation coefficients are  $r = 0.791$  for software,  $r = 0.745$  for technical support teams,  $r = 0.820$  for communication networks, and  $r = 0.823$  for innovation, all significant at  $\alpha = 0.000$ . These findings suggest that information technology and innovation have a direct impact on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange, thereby contradicting hypothesis H1

**Table (3): Multiple Regression Analysis of Information Technology (Software, Technical Support Teams, Communication Networks) and Innovation on Supply Chain Capabilities**

| Model                   | Unstandardized Coefficients | Standardized Coefficients | F       | Sig.  |
|-------------------------|-----------------------------|---------------------------|---------|-------|
| 1                       | .877(a)                     | .766                      | 247.743 | .000  |
|                         | B                           | Std. Error                | Beta    | T     |
| Software                | .365                        | .050                      | .351    | 7.364 |
| Technical Support Teams | .034                        | .049                      | .036    | .696  |
| Communication Networks  | .336                        | .051                      | .387    | 6.617 |
| Innovation              | .338                        | .051                      | .386    | 6.615 |

**DISCUSSION OF RESULTS**

The multiple regression analysis indicates a strong relationship between information technology, innovation, and supply chain capabilities, evidenced by an  $R^2$  value of 0.766. This suggests that around 76% of the variance in supply chain capabilities can be explained by the independent variables included in the model. The F-value of 247.743, with a significance level of 0.000, confirms that the model is statistically significant. Among the analyzed components:

**Software** shows a robust positive impact on supply chain capabilities, with a coefficient of  $B = 0.365$  ( $p < 0.001$ ). This highlights that advancements in software are likely to yield significant improvements in supply chain performance.

**Communication networks** also contribute positively, with a coefficient of  $B = 0.336$  ( $p < 0.001$ ), emphasizing the essential role of effective communication in enhancing supply chain operations.

**Innovation** presents a similarly strong positive effect ( $B = 0.338$ ,  $p < 0.001$ ), indicating that innovative practices and solutions are crucial for optimizing supply chain capabilities. In contrast, **technical support teams** exhibit a minimal impact ( $B = 0.034$ ,  $p = 0.487$ ), suggesting that their role is less influential compared to software, communication networks, and innovation.

Overall, these findings support the rejection of hypothesis H1, confirming that information technology especially software and communication networks along with innovation, has a direct and positive effect on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange.

**CONCLUSION**

This study provides compelling evidence of the significant impact of information technology and innovation on the supply chain capabilities of industrial companies listed on the Amman Stock Exchange. The results of the multiple regression analysis reveal that approximately 76% of the variance in supply chain capabilities can be attributed to the independent variables, underscoring the importance of these factors in enhancing operational performance.

Key findings highlight that advancements in **software** and the effectiveness of **communication networks** are critical drivers for improving supply chain performance. Additionally, the role of **innovation** is confirmed as essential for optimizing capabilities within the supply chain. In contrast, the minimal influence of **technical support teams** suggests that their impact may not be as significant as the other components studied.

The rejection of hypothesis H1 indicates that information technology—particularly in terms of software and communication networks—along with innovative practices, has a direct and positive effect on supply chain capabilities. These insights suggest that industrial companies should prioritize investments in these areas to enhance their supply chain performance, ensuring greater competitiveness and efficiency in the marketplace. Future research could explore additional factors that may influence supply chain capabilities, further enriching the understanding of this critical area.

### Recommendations

1. Companies should prioritize investments in advanced software solutions to enhance their supply chain capabilities, as the analysis indicates a significant positive impact on performance.
2. Enhance Communication Networks: Firms should strengthen their communication networks to facilitate better coordination and information sharing within the supply chain, thereby improving overall operational efficiency.
3. Foster Innovation: Organizations need to cultivate a culture of innovation by encouraging the adoption of new practices and technologies that can further optimize supply chain processes.
4. Evaluate Technical Support: Companies should assess the effectiveness of their technical support teams and consider additional training or restructuring to ensure they can contribute more significantly to supply chain operations.

### REFERENCES

1. **Chae, B. (2019).** "The Role of Information Technology in Supply Chain Management." *International Journal of Production Research*, 57(16), 4873-4890.
2. **Gunasekaran, A., & Ngai, E. W. T. (2004).** "Information Systems in Supply Chain Integration and Management." *European Journal of Operational Research*, 159(2), 269-285.
3. **Kumar, S., & Singh, R. (2015).** "Impact of Information Technology on Supply Chain Management: A Review." *Journal of Supply Chain Management*, 51(1), 1-10.
4. **Zhao, X., et al. (2011).** "The Impact of Information Technology on Supply Chain Management." *Supply Chain Management: An International Journal*, 16(3), 192-203.
5. **Mentzer, J. T., et al. (2001).** "Defining Supply Chain Management." *Journal of Business Logistics*, 22(2), 1-25.
6. **Kahn, K. B., & Mentzer, J. T. (1998).** "Managing the Supply Chain: The Definitive Guide for the Business Professional." *Journal of Business Logistics*, 19(2), 7-27.
7. **Zhao, X., Huo, B., & Sun, L. (2021).** "Information Technology and Supply Chain Management: A Literature Review and Future Directions." *International Journal of Production Research*, 59(15), 4567-4589.
8. **Wang, Y., Gunasekaran, A., & Ngai, E. W. T. (2020).** "Innovative Information Technologies in Supply Chain Management: A Systematic Review." *Computers in Industry*, 115, 103172.
9. **Kumar, A., & Singh, R. (2020).** "Role of Information Technology in Enhancing Supply Chain Performance." *Journal of Business Research*, 112, 212-220.
10. **Mandal, S., & Deshmukh, S. G. (2019).** "Supply Chain Integration: A Review of Literature and Future Directions." *International Journal of Production Research*, 57(12), 3918-3940.
11. **Boon-itt, S., & Bode, C. (2020).** "Information Technology and Supply Chain Resilience: A Study of the Impact of IT on Supply Chain Flexibility." *Supply Chain Management: An International Journal*, 25(5), 677-694.
12. **Davis, T., & Evers, P. T. (2019).** "Information Technology as a Driver of Supply Chain Integration: A Case Study Approach." *International Journal of Logistics Management*, 30(3), 804-821.
13. Gumilang, D & Teknik, F. (2021). Information Technology Factors Affecting Supply Chain Collaboration in Automotive Component Manufacturing in Indonesia. **Journal of Physics Conference Series**, DOI: 10.1088/1742-6596/1779/1/012081.
14. Tarigan, Z., Siagian, H & Jie, F. (2021). Impact of Internal Integration, Supply Chain Partnership, Supply Chain Agility, and Supply Chain Resilience on Sustainable Advantage. **Sustainability**, 13, <https://doi.org/10.3390/su13105460>.
15. Chu, Y., Chi, M., Wang, W., & Luo, B. (2019). The impact of information technology capabilities of manufacturing enterprises on innovation performance: Evidences from SEM and fsQCA. *Sustainability*, 11, 5946.
16. Yenyurt, S, Wu, F, Kim, D & Cavusgil, S. (2019). Information technology resources, innovativeness, and supply chain capabilities as drivers of business performance: A retrospective and future research directions. **Industrial Marketing Management**, 79 (1), 46-52.
17. Wu, F., Yenyurt, S., Kim, D., & Cavusgil, S. T. (2016). The impact of information technology on supply chain capabilities and firm performance: A resource-based view. *Industrial Marketing Management*, 35(4), 493-504.
18. Ben Salah, T. (2016). The impact of supply chain management on competitive advantage and organizational performance. *The International New Issues in Social Sciences*, 22(3), 46-57.
19. Vanichchinchai, A. (2014). "Supply chain management, supply performance and total quality management". *International Journal of Organizational Analysis*, 22(2), 126-148.
20. Shah, K., Gorty, V. R. L., & Phirke, A. (2011). Impact of information technology on supply chain capabilities: A study of Indian organizations. In *ICTSM 2011* (Vol. 145, pp. 305–311). Springer-Verlag Berlin Heidelberg.
21. Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019), "When to use and how to report the results of PLS-SEM", *European Business Review*, Vol. 31 No. 1, pp. 2-24.

22. Kasasbeh, E. A., (2021). Moderating Effect of Innovation on the Relationship between Human Resources Information Systems and Organizational Performance. *Mu'tah Lil-Buhuth wad-Dirasat, Humanities and Social Sciences Series*, Vol. 36, No.1.
23. Kasasbeh, E. A. (2024). Analysis of factors influencing consumers' use behavior with mobile banking services in Jordanian commercial banks. *Science International (Lahore)*, 36(3), 355-359.