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# The Correlation between Supply Chain Performance and Information Technology

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**Abstract:** Supply Chain Performance is regarded as a crucial organizational performance indicators. Much effort has been made to enhance it. So, effective and efficient supply chains are recognized as a crucial strategic aspect for achieving several essential corporate objectives, such as improved customer service, enhanced efficiency, and enhanced competitiveness. Therefore, the objective of this study is to analyze the role of information technology on supply chain performance with information technology support as a mediator. The study has been designed based on a descriptive approach using a survey to collect data by questionnaire from Saudi logistics professionals. The potential respondents were members of Hyper Panda's top level of management and executive personnel who were familiar with the company's operations and supply chain procedures. There are 83 valid responses. The research result has several findings and outcomes that will inform future research. The study findings will shed light on choosing the most effective information technology with a significant influence on supply chain performance.

**Keywords:** information technology; information technology support; PLS-SEM; supply chain performance

## 1 INTRODUCTION

Information Technology and supply chain performance have recently gotten a considerable amount of attention from academics and practitioners alike [1-3]. Firms that are considering incorporating supply chain management into their current organizational models must also consider the need to apply information technology [4-6]. Organizations using information technology to present and apply their resource arrangement processes gained a competitive advantage over their competitors [3, 7]. It has become increasingly popular to discuss information technology and supply chain management, and there has been an increase in supply chain activity attitudes in organizations to ensure that downstream and upstream events are organized and consistent to make supply chains effective [8-11]. The efficiency of a supply chain is becoming more crucial for the survival of a world-class organization. Many businesses get involved in at least one supply chain. To attain higher results, they must perform equally well. Every organization's lifeblood is information; the modern organization needs accurate, timely, and thorough information [2, 12, 13].

The current period has witnessed radical transformations in IT which directly affected the field of business administration and performing the supply chain. Therefore, business administration specialists must adapt to these rapid changes [14, 15]. Rather, it imposed on the business administration specialist to strive hard towards finding mechanisms and building strategies and keeping pace with every talk in IT to confront these rapid changes, especially with the general trends towards the open market and the entry of competitors from international organizations that have become a direct line for all organizations in chain supply. Many businesses strive to effectively improve their supply chain as well as achieve higher performance. Also, using IT was recognized to have high importance in supply chain management performance (SCMP); a new concept among SCM pears is "digitized SCM performance", That is, conventional supply management activities must be transformed into actions based on information that is integrated and encompass both downstream and upstream activities [16-18]. The fundamental challenge for businesses is identifying how to implement internationalization and supply chain operations successfully [16].

Information Technology plays a significant and vital role in supporting SCM to perform its various functions and activities, whether at the internal level that including operations and activities at the operational level, or the level of external working relationships with suppliers, customers, and stakeholders, depending on the information that allows its flow with the speed, accuracy and time required, besides effective forecasts that raise the efficiency and effectiveness of the company and enhance the performance of its supply networks, hence enhancing the organization's overall performance. The utilization of IT is seen as a precondition for the proper management of today's complicated supply chains [19-22].

Even though supply chain performance is among the vital organizational factors of success, lots of effort is dedicated to enhancing it. However, the systems and tools provided by technologies to the organizations cannot be avoided; these tools help organizations survive in an era of such intense competition. From this point, the research attempted to determine the effect of information technology on enhancing the performance of supply chain at the marketing sector, Hyper Panda, in Jeddah, thereby assisting the marketing sector in developing a road map for implementing and employing the most favorable information technologies to achieve the most desirable performance of supply chain [23-27]. The difficulty with the research was the absence of Arabian sources that emphasize the influence of IT on supply chain performance. A survey of the relevant literature indicated that this topic has neither been thoroughly described nor thoroughly confirmed. Therefore, the main question of the study is:

**RQ1:** What is the tangible effect of information technology upon the performance of supply chain management?

The purposes of the study are to investigate the relation between information technology and supply chain performance which the study will lead to many findings that will inform future research. Moreover, provide the marketing industry with information on choosing the most effective

information technology with a substantial effect on the performance of supply chain.

## 2 THEORETICAL BACKGROUND

Supply chain management (SCM) is defined differently by different authors by bringing together stores, suppliers, manufacturers, and warehouses under a single concept, SCM aims to manufacture a product at the right time and distribute it to the right locations in the appropriate quantities to meet the service level demands at the same time as minimizing system costs [19]. Effective supply chain management is crucial in obtaining sustainable growth and growing competitiveness. This is especially true in the case of SMEs, given the intense competition in the current market [13, 27]. To run the supply chain functions of SMEs efficiently and effectively, they need IT for long-term sustainability [8, 9]. Furthermore, IT globalization has enabled new business opportunities to emerge, and SMEs are searching for ways to boost their productivity and become more competitive [5]. Therefore, SMEs are becoming more aware of the potential for profit-making from IT [8]. In former IT investigations [26], it has been shown that only a few SMEs have focused on IT implementation. Despite the proportional development of IT in SMEs, their IT adoption rate is rather low [11], and large businesses have profited more than SMEs from their IT-based marketing strategy in terms of cost savings [12]. As the causes for the disparate adoption of IT in SME enterprises are discussed, the following features of these organizations may be highlighted: Due to their restricted access to market knowledge, SMEs encounter globalization obstacles [23].

That the spread of IT into supply chain operations increases its value-creating potential. In today's cutting-edge enterprises, the capacity to regulate the flow of information is one of the most valuable assets [19]. IT has the capacity to manage the flow and influence many aspects of the supply chain, delivery, including cost, flexibility, quality, and ultimately the firm's profits [9]. IT facilitates collaboration and communication across the supply chain. Ref. [23] emphasized the role of IT in deciding the final success of supply chain management and presented evidence that IT was a prerequisite for the success of the initiatives of supply chain management. Information technology (IT) to manage the supply chain process has gained increasing attention in the business sector. In fact, according to a recent survey by Forrester Research, U.S. manufacturers are increasingly reliant on IT's benefits to enhance supply chain ability, reduce cycle time, increase efficiency, and deliver products to clients on time [24].

### 2.1 Information Technology

The technical capacity to gather, process, and transmit data to support corporate decision-making and allow communication, coordination, and cooperation across many partners throughout the supply chain is referred to as information technology capability [24]. Successful development of information technology infrastructure paves the way for increased capabilities in information technology [25]. As a consequence, the study found that information technology expertise leads to more effective supply chain integration operations and higher corporate success [23].

### 2.2 Supply Chain Performance

Supply-chain operations reference (SCOR) is an organized and well-adjusted technique for recognizing, assessing, and monitoring supply chain performance that combines performance indicators, processes, best practices, and people, [21]. It has been vastly used for evaluation and optimization, and it is largely regarded as among the most potent approach for strategic supply chain decision-making. SCOR is the only model applicable to all business sectors that incorporates all sorts of informational, flows physical, and financial and all stages of supply chain maturity intra-organizational to societal [22].

Supply chain performance and good supply chain management are increasingly acknowledged as crucial components in a company's ability to acquire a competitive advantage [18]. Earlier supply chain modeling studies included a variety of performance metrics, including cost, customer response, and activity time [27]. Since it was simpler to apply in quantitative models, most of these studies have focused primarily on cost as the major indicator of supply chain success.

### 2.3 Performance of Supply Chain and Information Technology

Information Technology underpins supply chain management. They let firms collect, analyze, and distribute data among supply chain players to improve decision-making [5]. We can reduce the temporal and physical distance by bridging functional and organizational barriers and delivering relevant, accurate, and timely information to managers. This allows managers to make more collaborative decisions. Recent technology improvements have significantly boosted businesses' connectivity. The objective of enabling individuals at any point in the chain to engage smoothly is becoming a technical reality [15].

Using information technologies helps organizations stay competitive in a global market and achieve operational success. The drivers for the adoption of information technology are customer satisfaction and time- and cost savings [1]. With the use of information technology (IT), supply chain performance can be improved without affecting business practices and manufacturing operations [8]. As a result of these findings, ICT plays a pivotal role in the transformation of organizations into competitive enterprises [12]. These observations support the subsequent hypothesis:

**Hypothesis 1**: Information Technology will hold a desirable impact on Supply Chain Performance.

### 2.4 Information Technology Support

In general, information technology support plays a critical role in helping organizations acquire new competencies and skills that would be hard to acquire without them [4]. Additionally, it facilitates cooperation practices [14] and enables organizations to operate at a higher level of

information processing capability [16]. The importance of information technology support as a critical enabler for SCP implementation [4].

According to [10], information technology investment appears necessary if SCP solutions are scaled up. This is because information technology enables and coordinates SCP using a wide collection of knowledge-based tools and technologies. In addition, it supports efficient information search, access, and retrieval and increases cooperation and communication among organizational members [11]. As a result, it appears as though information technology support mediates the influence of information technology on SCP. As a result, higher information technology support is claimed to have a more decisive impact on SCP. This mediating effect is consistent with the idea that information technology investments boost performance by supporting fundamental competencies [9, 12]. Each component of the SCOR model incorporates these abilities.

These observations support the subsequent hypothesis:

**Hypothesis 2:** Information Technology will positively affect Information Technology Support.

### 2.5 Information Technology Support with Supply Chain Performance

Information Technology Systems have been the basis infrastructure of cooperation and competition for contemporary enterprises, and the favorable impacts of IT upon the performance of supply chain have been affirmed by numerous researchers [8,12].

The development of information system support improves the operational performance of businesses in terms of cost savings, improved resource utilization, and enhanced business performance [3]. Information technology improves the operational performance of businesses in terms of customer responsiveness and cost-effectiveness [26]. These observations support the subsequent hypothesis:

**Hypothesis 3**: Information Technology Support will have a positive effect on Supply Chain Performance.

**Hypothesis 3a:** Information Technology Support will positively mediate the relationship between Information Technology and Supply Chain Performance.

### 2.6 Research Model

The research framework in this study is expected to provide an overview and lead to the assumptions of the variables studied that consists of two key variables: the independent variable, supply chain performance, information technology and the dependent variable, which consists of four main dimensions (plan, source, make, and delivery) with information technology support mediating the relationship between information technology and supply chain performance. The research model can be seen below.

## 3 RESEARCH METHODOLOGY

The methodology describes the actions to be taken when analyzing the relationship between variables of interest. It includes the following steps: the sample, instrument, and procedure.

### 3.1 Sampling

This study uses nonprobability random sampling. The population of this research was the Hyper-Panda Mall in Jeddah, representing the Saudi Arabian marketing industry. The possible respondents of this survey were members of Hyper Panda's upper and executive personnel who were familiar with the company's activities and supply chain practices. The study sample was recruited using social media. There are 83 valid responses.

### 3.2 Instrument and Procedure

The questionnaire is made up of two sections. The first section has demographic and other information. The second section related to questions that covered IT [9, 21, 30]. Those inquiries have been made following the analysis of facto. Furthermore, the inquires in the part one is based on a nominal scale. All responses and items reflect over a five-point Likert scale. In the scale one represents firmly disagree and five shows firmly agree.

Smart PLS 3.0 has been utilized to assess the data employing PLS-SEM (partial least squares structural equation modelling) technique [5, 7]. Recently, this method has been considered as an effective means for business-related analyses [22]. In 2 stages, the data have been analyzed and discussed. The PLS technique has been firstly utilized in the measurement pattern to evaluate discriminant validation, internal consistency reliability, as well as convergent validation.

## 4 RESULTS

According to Fig. 1, the model of the study has two main variables, one is information technology, and the other is supply chain performance consisting of 4 main dimensions (plan, source, make, delivery) that will be measured using the tool suggested by Bronzo et al. [7] with mediating Effect Information Technology support.

### 4.1 Measurement Model and Descriptive data

As shown in Tab. 1, 83 individuals took part in the present survey, including 85.5% male and 14.5% female, the majority were in the middle age, and two-thirds had bachelor's degrees, the income varied across the category with an advantage of 10-15 thousand Saudi riyals, the participants seem to have good experiences, and 54.2% held manager position.

The relation among the constructs have been substantial and positive. Besides, they were in the range of ($r = 0.898$, $p < 0.01$) and ($r = 0.444$, $p < 0.01$). In order to confirm the validity of discriminate among the latent constructs, the lowest square root of AVE (0.769) was greater than the highest correlation (0.731).

So, to meet the above criteria, 6 indicators were eliminated from the model (IT5), which was deleted due to the low factor loading, and (SSO1), which was deleted to improve the model fit.

The considerable amount of path estimations ($\beta$) has been analyzed on the basis of the t value ($p < 0.05$). $R$ squared ($R^2$) is a influence function of the independent variables upon the dependent variable, so $R^2$ of supply chain efficiency is 0.514, meaning that 51% of the impact done by independent variables (information technology and information technology support). SRMR achieved a good result (0.098). The mean scores of the variables indicated a high level, they ranged between (3.99±0.65/high level) and (3.85±0.68/high level) (See Tab. 2 and 3). So model is accepted for testing the hypotheses.

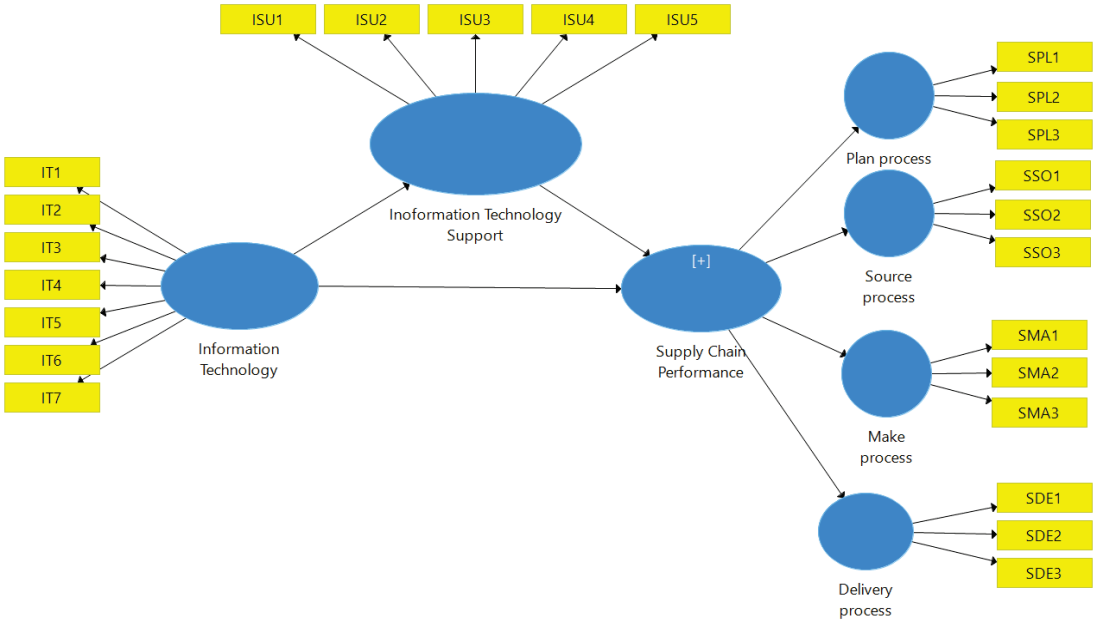


**Figure 1** The study framework

**Table 1** Descriptive data (N=83)

| Variables | | N | % |
|---|---|---|---|
| Gender | Female | 12 | 14.5 |
| | Male | 71 | 85.5 |
| Age | 20 – 29 years old | 19 | 22.9 |
| | 30 – 40 years old | 34 | 41.0 |
| | 40 – 50 years old | 25 | 30.1 |
| | 50 – 60 years old | 4 | 4.8 |
| | More than 60 years | 1 | 1.2 |
| Education | Secondary school | 13 | 15.7 |
| | Bachelor | 62 | 74.7 |
| | Master | 8 | 9.6 |
| Income | 5.000 or below | 16 | 19.3 |
| | 5.000 –10.000 | 12 | 14.5 |
| | 10.000 –15.000 | 29 | 34.9 |
| | 15.000 –20.000 | 10 | 12.0 |
| | 20.000 or more | 16 | 19.3 |
| Experience | less than 5 | 19 | 22.9 |
| | from 5 to 10 | 3 | 3.6 |
| | from11 to 15 | 19 | 22.9 |
| | from 16- 20 | 18 | 21.7 |
| | more than 20 | 24 | 28.9 |
| Position | Administrative | 7 | 8.4 |
| | Chairman of board director | 18 | 21.7 |
| | Manager | 45 | 54.2 |

The measurement model's validity was assessed by evaluating the discriminant and convergent validity of the constructs. Firstly, convergent validity, construct reliability can be evaluated from the Cronbach's alpha and composite reliability values of constructs. The suggested composite reliability and the Cronbach's alpha value above 0.7 [18, 19]. The outcome of the test of reliability in Tab. 3 demonstrate that all of the constructs hold the Cronbach's alpha and the values of composite reliability are greater that (0.7). Given some studies [12, 21], the average variance extracted (AVE) is more than 0.50 for nearly all of the constructs, demonstrating enough convergence. For a next validation measurement, discriminant validity may be evaluated by making a comparison into relationships among constructs with the square root of the average variance extracted for a construct [22, 23]. Considering Tab. 3, the AVE square root is above the relation with other constructs, indicating sufficient validity of discriminant.

### 4.2 Hypothesis Analyses and structured Model

Following carrying out validity experiments on the models of measurement, we assessed the structural model.

The hypothesis tests' results are illuminated in Tab. 4.

**H1: Information Technology will have a positive effect on Supply Chain Performance.**

The structural equation model's outcomes affirmed that the structural path among the constructs has been substantial ($\beta = 0.164$, $t = 2.652$, $p = 0.008 < 0.005$). **Thus, H1 is confirmed.**

**Hypothesis 2: Information Technology will positively affect Information Technology Support.**

The structural equation model's result confirmed that the structural path among the constructs has been remarkably positive ($\beta = 0.541$, $t = 5.983$, $p = 0.000 < 0.005$). Consequently, **H2 is confirmed.**

**Hypothesis 3: Information Technology Support will have a positive effect on Supply Chain Performance**

The structural equation model's outcomes confirmed that the structural path among the constructs has been substantially positive ($\beta$ = 0.273, $t$ = 4.062, $p$ = 0.000 < 0.005). As a result, **H3 is fulfilled.**

**Hypothesis 3a: Information Technology Support will positively mediate the relationship between Information Technology and Supply Chain Performance.**

The result of structural equation modelling approved that Information Technology Support statistically mediate the relationship between Information Technology and Supply Chain Performance ($\beta$ = 0.245, $t$ = 3.160, $p$ = 0.000 < 0.005), the mediation is supported. Thus, **H4 is supported.**

**Table 2** Factors' loading ($N$ = 8)

| Constructs | Indicator | VIF | Information technology | IT support | Delivery process | Make process | Plan process | Source process |
|---|---|---|---|---|---|---|---|---|
| IT support | ISU1 | 2.035 | 0.801 | | | | | |
| | ISU2 | 2.206 | 0.831 | | | | | |
| | ISU3 | 2.201 | 0.818 | | | | | |
| | ISU4 | 2.369 | 0.865 | | | | | |
| | ISU5 | 1.692 | 0.753 | | | | | |
| Information technology | IT1 | 1.949 | | 0.704 | | | | |
| | IT2 | 2.419 | | 0.814 | | | | |
| | IT3 | 1.834 | | 0.741 | | | | |
| | IT4 | 1.804 | | 0.804 | | | | |
| | IT6 | 2.105 | | 0.809 | | | | |
| | IT7 | 2.548 | | 0.760 | | | | |
| Delivery process | SDE1 | 2.009 | | | 0.869 | | | |
| | SDE2 | 2.363 | | | 0.896 | | | |
| | SDE3 | 2.009 | | | 0.869 | | | |
| Make process | SMA1 | 2.260 | | | | 0.883 | | |
| | SMA2 | 2.112 | | | | 0.871 | | |
| | SMA3 | 2.739 | | | | 0.916 | | |
| Plan process | SPL1 | 2.746 | | | | | 0.913 | |
| | SPL2 | 1.892 | | | | | 0.861 | |
| | SPL3 | 2.116 | | | | | 0.853 | |
| Source process | SSO1 | 1.337 | | | | | | 0.878 |
| | SSO2 | 1.696 | | | | | | 0.854 |

**Table 3** CR, AVE, α, √AVE , $R^2$ and Relation among variables

| Construct | M±SD | Cronbach's Alpha | Composite Reliability | Average Variance Extracted (AVE) | R square ($R^2$) | Delivery process | IT Support | Information Technology | Make process | Plan process | Source process | Supply Chain Performance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Delivery process | 3.78±0.70 | 0.85 | 0.91 | 0.77 | 0.807 | **0.878** | | | | | | |
| IT Support | 3.99±0.65 | 0.85 | 0.90 | 0.60 | 0.351 | 0.609 | **0.773** | | | | | |
| Information Technology | 3.85±0.68 | 0.87 | 0.89 | 0.67 | -- | 0.659 | 0.592 | **0.815** | | | | |
| Make process | 3.76±0.75 | 0.87 | 0.92 | 0.79 | 0.761 | 0.634 | 0.444 | 0.457 | **0.890** | | | |
| Plan process | 3.84±0.71 | 0.85 | 0.91 | 0.77 | 0.671 | 0.741 | 0.630 | 0.572 | 0.643 | **0.876** | | |
| Source process | 3.87±0.62 | 0.77 | 0.86 | 0.75 | 0.703 | 0.670 | 0.574 | 0.622 | 0.617 | 0.731 | **0.866** | |
| Supply Chain Performance | 3.76±0.63 | 0.90 | 0.92 | 0.59 | 0.514 | 0.898 | 0.618 | 0.659 | 0.872 | 0.819 | 0.839 | **0.769** |
| SRMR=0.098 | | | | | | | | | | | | |

**Table 4** Results of Hypotheses Testing

| Relationship | Std. $\beta$ | $t$ | $p$ | Decision |
|---|---|---|---|---|
| **Hypothesis 1**: Information Technology has a desirable impact on Supply Chain Performance | 0.164 | 2.652** | 0.008 | Supported |
| **Hypothesis 2:** Information Technology will positively affect Information Technology Support. | 0.541 | 5.983*** | 0.000 | Supported |
| **Hypothesis 3:** Information Technology Support has a desirable impact on Supply Chain Performance | 0.273 | 4.062*** | 0.000 | Supported |
| **Hypothesis 3a:** Information Technology Support will positively mediate the relation between Supply Chain Performance and Information Technology. | 0.245 | 3.160*** | 0.000 | Supported mediation |
| *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$ | | | | |

## 5 DISCUSSION

The study aimed to define the relationship between information technology and supply chain performance, emphasizing the moderating effects of information technology support. To achieve this goal, the researcher developed a questionnaire and distributed it to a sample of employees from the top-level management or executive staff of Hyper Panda in Jeddah

Consequently, eighty three questionnaires have been returned in a successful manner. Following gathering information, the validity of reliability and testing measurement took place via EFA. After that, the data was analyzed with the aid of Smart-PLS version 3.0 and SEM. The significance of SEM is rooted in the reality that several indices could be included in the hypothesized models, its validity of the latest model analyzed, and the simultaneous test of the independent elements' prediction on dependent variables.

As mentioned in the study model, it comprises 2 main variables, with information technology as the independent variable. The dependent variable is supply chain performance, consisting of four key aspects (plan, source, make, and delivery). It will be assessed employing the instrument put forward by Bronzo et al. [7], with Information Technology support serving as mediator. That study indicates that information technology could supply value. That affirms the RBV theory that common technology may transform into valuable resources by deploying processes. Therefore, our findings imply that it is beneficial to monitor intermediate information technology support and investigate how information technology support can enhance organizational operations for the information technology and supply chain performance.

As shown in Tab. 4, all four hypotheses were significant. A key of operational effectiveness is information technology, which enables supply chain performance competitive benefit, which quickens more desirable supplier and customer interaction. The result of structural equation modelling confirmed that the structural path among the constructs has not been substantial ($\beta = 0.164$, $t = 2.652$, $p = 0.008 < 0.005$). Hence, H1 is supported and [18] also proved that this hypothesis is confirmed.

According to Information Technology will positively affect Information Technology Support, the outcome of structural equation modelling affirmed that the structural path among the constructs has been substantially positive ($\beta = 0.541$, $t = 5.983$, $p = 0.000 < 0.005$). As a result, H2 is confirmed, this result was proved in the previous study [24, 4].

This research also examined the mediating effects of information technology support. Results reveal that supply chain competencies can increase the value of information technology related resources for a company. Also, by integrating information technology into a company's supply chain system, the company is able to increase assets through effective information interchange and improved supply chain partner coordination. In addition, higher levels of information technology support between supply chain processes were shown to be related to a stronger favorable relationship between information technology and supply chain performance. This was consistent with earlier results regarding the critical enabling function of information technology support and the influence on performance through bolstering core capabilities.

## 6 CONCLUSION

The research examines the role of information technology support between information technology and supply chain performance. We have conducted field research in 2022 on a cross-sectional sample of Saudi logistics professionals. The potential respondents were members of Hyper Panda's top level of management and executive personnel who were familiar with the company's operations and supply chain procedures. In order to conduct the field research, a structured questionnaire was developed using several criteria from previous empirical studies. As a result of the study, empirical evidence is provided that information technology support affects supply chain performance and highlights the positive and significant relationships between information technology and supply chain performance. In the future, our conceptual framework may be replicated in other Saudi Arabian regions, which could help us compare our findings with the present research. The impact of information technology on supply chain processes throughout the organization is also important. It will be interesting to investigate the role of knowledge technology support in the relationship between supply chain performance and information technology.

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