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The Influence of Inter-Organizational System Use and Supply Chain Capabilities on Supply Chain Performance

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ABSTRACT

This study is explored the influencing factor that is pivotal in the supply chain. More explicitly, the main emphasize of this research was on IOS use and supply chain management capabilities, and supply chain performance. A quantitative approach was adopted for this study, and a multi-item measurement scale was adapted from previous studies; a structured questionnaire was used to collect primary data. Two hundred thirty-six responses were collected from supply chain employees in various textile sectors. Further, regression analysis was applied for hypothesis testing. The analysis of employees' responses collected from various firms reveals that the use of IOS increases the level of supply chain performance and directly enhances the capabilities of SCM. In addition, it was observed that the influence of SCM capabilities on supply chain performance was very insightful, influential, and even more significant than the impact of IOS use on SC performance. This research study can be helpful for supply chain managers and decision-makers. It gives them guidance for enhancing the supply chain resilience of an organization. It provides a framework containing Communication, Intelligence, Information exchange, Integration, Coordination, and Responsiveness to enhance supply chain performance.

Keywords: *Communication, Intelligence, Information exchange, Integration, Coordination, Responsiveness, Supply chain performance*

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1. Introduction

Organizations use and implement the inter-organizational system (IOS), a network-based enterprise system that allows external firm-related entities. That allows SC partners to instantly share business-related information to collaborate with their supply chain members (Zhang & Cao, 2018). Organizations use the IOS system in their firm by deploying it in multiple ways like vendor-managed inventory, collaborative planning, electronic data interchange (EDI), and estimating & replenishment for the real-time communication between the firm and its SC members to share quality information. IOS also play an essential role for firms in effective decision-making (Asamoah et al., 2019). IOS is an effective tool to deal with firms' competitive conditions without interruption. Therefore, the firms need to follow this kind of technology-based development. Otherwise, it becomes difficult to survive in a competitive business atmosphere (Okano & Fernandes, 2019).

The selection and assigning of technology are now essential to successful businesses. Implementing effective technology is usually necessary, but sometimes it becomes mandatory, as it regulates according to the market's demand (Okano et al., 2017)**.** IOS provide a medium for firms to effectively manage their tasks and activities by following the trend of coordination and integration to achieve competitive benefits to challenge their rivals (Asamoah et al., 2019).

Resource-based view (RBV) theory clarifies that only those organizations that achieve competitiveness in the market manage and effectively combine their unique, valuable & incomparable assets and resources (Shan et al., 2019). An inter-organizational system allows a firm to enhance and expand its internal resources and capabilities with the external resources to achieve the mutual goals of the partners of the SC network (Falcone et al., 2020). They are adopting the IOS system in firms that have just transformed many industries' business environments. In the present era of information and knowledge, a considerable amount of data is generated and exchanged through the IOS between supply chain partners. IOS helps firms to manage the exchange of data and information between the sender and receiver of the SC network. In developed countries, the outcomes achieved after implementing IOS in business are more mature and practical than in developing countries (Agbenyo et al., 2018). But according to, the research studies that were done in the context of developed countries show that the effects of IOS use in business present effective results (Agbenyo et al., 2018; Asamoah et al., 2019)

1.1 Problem statement

The adoption of inter-organizational system n firms allows them to enhance their capabilities and resources with the assets of their SC members to achieve mutual goals and benefits. Past research related to the inter-organizational system proposes that implementing IOS In firms has significant and positive impacts on the overall performance of the supply chain system (Asamoah et al., 2019). In addition, practitioners of manufacturing firms also appeal for the opening of the SC black box and put efforts into a further investigation into how the usage of IOS becomes more effective (Agbenyo et al., 2018; Yu et al., 2018). The current research study mainly concentrates on external usage of IOS in SCM & second is IOS firm management capabilities through the perspective of SCM. Studying the relationship between usage of IOS and capabilities of SCM in improving the performance of the supply chain increase understanding of management about operational dynamics of IOS in a firm. In this research study, we investigate the complex relationship between IOS usage, SCM capabilities and performance of SC. Thus, sharing capabilities and resources through the supply chain is crucial as it increases SC capabilities required to achieve competitiveness at the firm level (Ganbold et al., 2020). The capabilities of SC act as the main element for managing supply chain operations and are a vital element of a firm's success and existence (Matwiejczuk, 2020). These SC capabilities and competencies can be influenced by integrating SC processes all over the SC system (Ataseven & Nair, 2017), resulting

in improved SC flexibility (Pettit et al., 2019). Therefore, the current study focus on testing a framework to enhance the supply chain performance through adopting the inter-organizational system (IOS) and supply chain capabilities in the manufacturing sector.

1.2 Research Objectives and Research Questions

The primary objective of this study is to find the effect of IOS use and supply chain capabilities on supply chain management performance. Therefore, on the bases of research problem and research objectives, this study will specifically focus on the below research questions:

RQ1: To what extent does IOS use influence SC performance?
RQ2: To what extent does Communication influence SC performance?
RQ3: To what extent does Intelligence influence SC performance?
RQ4: To what extent does Information Exchange influence SC performance?
RQ5: To what extent does Integration influence SC performance?
RQ6: To what extent does Coordination influence SC performance?
RQ7: To what extent does Responsiveness influence SC performance?

2. Relevant Theory

2.1 Resource-Based View

The resource-based view of an organization proposes that organizations which have rare, valuable, non-substitutable and unique resources can accomplish maintainable competitive benefits by applying strategies in a firm which are difficult and complex for rivals or challengers to duplicate (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). The theory of resource-based view considers a set of resources and competencies Wernerfelt, (1984), and this point of view is considered an impactful theoretical framework for knowing how strong financial performance and competitive advantage are accomplished (Corbett & Claridge, 2002). Usually, the element of capabilities is mainly linked to the abilities of an organization to utilize its assets and resources "to affect the desired end" and are equivalent to the intermediate goods that are produced or manufactured by the organization through various firm processes to deliver "improved resource productivity" (Amit & Schoemaker, 1993). In opposition to resources, capabilities are surrounded by the interactions of more than one source of knowledge and information. They are more specific to the organization and less exchangeable, ultimately leading to a competitive advantage for the firm (Peng et al., 2008). The firm's capabilities can be classified into basic functional activities performed by the firm and those that guide it to improve and renew its functions or activities (Collis, 1994). The resource-based view holds the perspective that an organization have various resources and different level of capabilities regarding the utilization of resources. The survival of an organization is based on the capability to come up with new resources, builds upon existing competencies and make all the capabilities more unique and distinctive(Peteraf, 1993).

2.2 Literature Review

2.2.1 Supply Chain Performance

The parameters of supply chain performance are the bundle of factors that are mainly used to determine the effectiveness and efficiency level of the SC system (Asamoah et al., 2019). So many scholars in their literature have mentioned many parameters that can judge the performance level of the supply chain system. In those parameters, qualitative and quantitative measures are included. Qualitative measures of SC's performance include customer satisfaction, information integration, material flow integration, quality of risk management and performance of suppliers (Fernando et al., 2018). Supply chain performance measures that are quantitative include an increase in sales, cost reduction, increase in return on investment, increase in fill rate, minimize the time of product delivery, reduce the time of customer response and less lead time (Lima-Junior & Carpinetti, 2017). There are

also other parameters of supply chain performance that are accuracy of the material, projecting and planning, the capability of delivering product on time, reliability & consistency of delivery, precise SC cost knowledge & control, quick customer response, management of inventory, validation & responsiveness, the synchronized flow of product exact from supplier to the distribution store (Govindan et al., 2018; Hashmi et al., 2021; Mani et al., 2018; Hüseyinoğlu et al., 2020).

2.2.2 Inter-Organizational System (IOS) Use

The inter-organizational system (IOS) relates to the application of information technology used to complete the transaction process between supplier and buyer and the relationship between them (Asamoah et al., 2021). The literature on IOS discloses more than one goal and aims to encourage its utilization in firms. IOS enables an organization to fulfil multiple goals, which include, necessity refers to the fulfilling monitoring requirement, asymmetry, which refers to the exerting control over other rivalry firms, reciprocity, which refers to following mutual goals, efficiency, creativity, agility, rightfulness and steadiness (Aros & Gibbons, 2018). To describe the negative results of IOS, the utilization of IOS has been hypothesized as depth, volume, scope, diversity and intensity (Zhang et al., 2017). However, it was observed that these hypotheses are not enough to capture the usage of IOS systems that is encouraged by various objectives, which afterwards lead to negative results even when the situation of IOS system usage and technology are the same (Subramani, 2004). The research defines the concept of IOS appropriation as trends, fashions, modes, and patterns. A researcher, Saeed et al. (2005), built a research framework that postulates features of IOS as the primary ancestor of an integrated supply chain whereby the IOS feature includes integration of IOS and intelligence of IOS. By adopting the above work according to the perspective of SC collaboration, the current research study presents two main components of IOS appropriateness: Communication and intelligence

The utilization of the IOS system for the means of Communication is mainly responsible for maintaining the flow of messages and contacts between members of supply chain firms. The primary technologies and applications accountable for maintaining Communication between two parties include channel management, communication network, message service & protocol and specific communication standards (Chi & Holsapple, 2005). There are specific examples of channel management that maintain contact between SC parties, including electronic fund transfer, call centres, wireless devices, websites, and point of sales; on the other hand, the example of technologies for message service include instant messaging service, voice mail, controlled posting, and E-bulletin board. Essential Communication depends on networks which consist of wireless networks, broadband, internet & extranet (Zhang & Cao, 2018).

The use of an inter-organizational system relates to the utilization of IOS for increasing the learning and creation of information and knowledge between SC partners. The application and technology of IOS for the intelligence that exists between two firms could exchange data warehouse and text mining, shared warehouse database & decision support systems, shared digital documents & archives and shared acquisition of information and knowledge, search of knowledge, navigation and recovery, group decision support system and software agents.

2.2.3 Supply Chain Capabilities

The concept of supply chain capabilities relates to the ability of the firm to recognize, utilize and adapt both external and internal information and resources to enable the whole processes and activities of the supply chain (Yu et al., 2018). A research study observed the SC capabilities as a second-order construct which include four approaches and dimensions: the exchange of information, cooperation and coordination, integration in activities within the firm and responsiveness of the supply chain system (Asamoah et al., 2021). These four dimensions are the main approaches because they cover all the essential activities involved in the supply chain processes. Moreover, various studies highlight the dynamic nature of capabilities that allows an organization to learn and effectively and timely respond to the ecological changes of the firm. Researchers believe that the capabilities and competencies of the supply chain show a higher level in the order of firm capabilities, in which they

require an extensive range of information integration, as highlighted above (Ferreira et al., 2020). It is believed that this kind of high-order capability is challenging to accomplish; therefore firm experiences a high level of protection in defence of competitive actions (Alnawas & Hemsley-Brown, 2019). Supply chain capabilities can hold the quality of valuable sources (Hong et al., 2019).

The supply chain's capabilities are essential for organizations to get a high range of benefits from their inter-organizational use (Zhu et al., 2018). The supply chain capability of information technology includes four comprehensive SC capabilities between two. First are named sharing of information, integration between two firms, SC responsiveness & synchronization (Wu et al., 2006). In various research studies, these capabilities are adapted. The capability of exchange of information in an SC firm relates to an organization's ability to share information and knowledge with its SC partners efficiently and effectively (Wu et al., 2006). Organizations must use the information exchange capability effectively to make every supply chain system effective by delivering the correct information at the right time to their suppliers (Nova & Bitencourt, 2020). The capability of integration in SC relates to an organization's ability to arrange its activities, technologies, and applications with its members for strategic advantages (Wu et al., 2006). The coordination capability of the supply chain relates to the ability of an organization to efficiently manage and coordinate various processes and activities of the supply chain and do transactions with their SC members (Sahin & Robinson, 2002). The capability of responsiveness in SC mainly relates to the degree to which members of SC can quickly respond to the changes and variations arising from the SC partners and corporate atmosphere (Um et al., 2017).

2.3 Conceptual Framework

The proposed conceptual framework shows in given below Figure 1. According to the framework, two significant independent variables are IOS and supply chain capabilities. These variables are further divided into sub-variables which include communication (C), Intelligence (I), Information exchange (IE), Integration (INT), Coordination (CO) and Responsiveness (RS). On the other hand, there is only one dependent variable: supply chain performance (SCP).

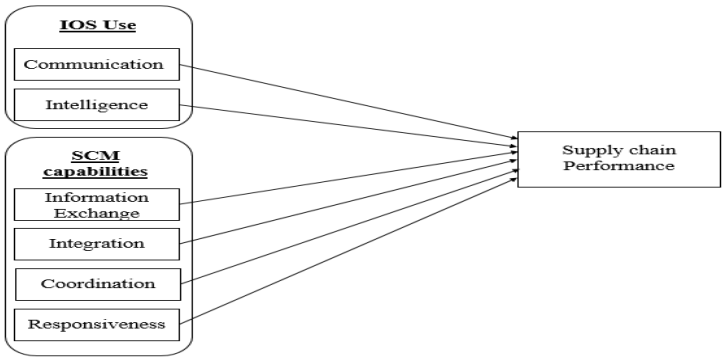

Figure 1: Research model

2.4 Hypothesis Development

2.4.1 IOS USE & Supply Chain Performance

Inter-organizational systems act as a resource for firms that help firms in achieving high-performance levels in many ways. Initially, an IOS system can be deemed as a comprehensive information system that works in the firm and across the firm that can be maximized for recognizing the streams that can generate more revenue and profit from the system of the supply chain (Agbenyo et al., 2018; Hartono et al., 2010). Moreover, IOS can work as a tool through which organizations can integrate their resources effectively to achieve an adequate level of performance. Moreover, IOS can act as a source through which firms can access the quality resources of external parties.

To achieve a high level of performance in operations, IOS provide the capability to the firm to

provide quality information to their members (Hartono et al., 2010). The utilization of IOS empowers the firm for the exchange of real-time information. In that way, the partners of the SC firm can effectively respond to the market and environmental variations. The IOS can be used to gain the element of coordination in activities & planning of the supply chain that permit the firm to reduce the inventory level throughout their supply chain (Lee et al., 2014; Zhang & Cao, 2018). Organizations achieve flexibility in their operations & also enable themselves to fulfil customers' requirements and act as reliable partners for their supply chain network. For example, by implementing IOS use in a firm, organizations can gain higher visibility in the levels of stock of their key distributors and vendors. These IOS provide an opportunity to avoid stock-outs that lower the performance of the supply chain (Lee et al., 2014). The proper usage of IOS in the firm is to exchange accurate information about customers' and suppliers' demands. Organizations protect themselves from the problem of demand distortion through IOS (Kim et al., 2012; Lee et al., 2014). Overall enhance the performance level of the firm's operations and reduce the level of incompetence.

IOS system is a kind of information system that works and exceeds the boundaries of a firm (Weiqing, 2021). IOS act as a resource that mainly relates to the pair of associations because pairs of relationship must participate in the IOS through several ways like investment, sharing of knowledge, and synergistic creation of value (Lee et al., 2014). In some scenarios, IOS participate in various activities that exist between two firms, and those activities include; IOS works as an interconnected asset between firms and provides an electronic medium and network through which organizations can rapidly observe the information of their SC member without paying any cost for a transaction or any exchange of information. The association of firms based on IOS can attain relational rents by minimizing errors of contact and Communication, lessening the cost of the total value chain and developing a high level of product differentiation (Baloch & Rashid, 2022; Khajouei et al., 2018). For instance, a supply chain firm with an effective information sharing system can compete more effectively in the market than low-quality information sharing systems.

2.4.1.1 Communication and supply chain performance

Business communication is the primary and essential function that synchronizes the mutual interchange of knowledge and information and flows of product & association-based capabilities and resources among supply chain members (Ali et al., 2021). Communication is the glue in business processes as it has a notable effect on the social dimension of associations that also play a role in creating and keeping the trust between supply chain partners (Kaya & Schoop, 2020). In corporate associations, the collaborating dimension of Communication explains that the primary relational vector between the organization and their environment permits the initiation of mutual adaptation of processes among the partners, ultimately supporting the stability of the long-term relationships and associations (Hänninen & Karjaluoto, 2017). Therefore the variable of Communication is considered the key element to developing the relationship and maintaining coordination within the firms and between two organizations (Iankova et al., 2019).

As discussed above, at the corporate level, the element of Communication plays the role of glue and vector of information that mainly supports the formation of culture & adjusting inside the organization that also plays the leading role in the management of identity in the supply chain system. For this reason, face-to-face interaction and Communication are most particularly beneficial to negotiating and exploring a trade-off among several sensitivities and anticipation of stakeholders mainly involved in the supply chain management. In strategic decision-making, the face to face communication also plays an active role in lowering the problems and issues of the long-term supply chain system. At the strategic level of businesses, the Communication factor increases the firm's competitiveness and the strategic level of supply chain processes by supporting the image building of the supply chain from inside and outside (Koval et al., 2018). In addition, internet-based Communication is used in a firm to communicate with partners and other actors in the supply chain for sharing information.

According to the perspective of operational performance, the results of studies reveal that the Communication factor keeps and endures the process of procurement that acts at two levels of firms

(Cheptora et al., 2018). At the level of intra-organization, the communication factor synchronizes internal flows of information that are mainly related to the identification of vendors' selection & the meaning of procurement strategies (Nizamova et al., 2021). At the inter-firm level, the communication factor mainly supports the negotiation process based on shared values between two organizations and their SC members, which include (suppliers, service providers and sub-suppliers). Communication is also responsible as it activates the collaborative processes to enhance knowledge development through arranging priorities and sensitivities with supply chain members (Naqshbandi & Jasimuddin, 2018).

H1: Communication has a significant effect on supply chain performance.

2.4.1.2 Intelligence and supply chain performance

In today's competitive environment of businesses, the firms need to have strong integration and coordination among partners of SC (Jermsittiparsert et al., 2019). The environment all over the world is affected by the enhancement of globalization & outsourcing, unions, advanced technologies and business through the internet that forces firms to approve new ideas for running businesses in the market (Kumi et al., 2021). The intelligence of the supply chain provides a broad perspective of competitive intelligence on the dynamic association of SC integration for providing better decisions related to business (Belhadi et al., 2021). The supply chain's intelligence influences the firm's internal processes and the external environment, including supply chain partners (Belhadi et al., 2021). Swain and Cao (2019) defines supply chain intelligence as the art of presenting, analyzing, refining, and acquiring information and knowledge about the competition of SC and then receiving actionable findings about significant improvements of the firm. According to the study of Sambasivan and Jacob (2008), the results were based on eighty-five organizations exposed that those organizations with advanced intelligence systems to control their environment displayed a higher level of profitability than those organizations that do not use this kind of advanced systems in their firms. At the same time, it was observed that some studies displayed positive results in the supply chain intelligence and firm operational performance. On the other hand, it was also discussed that there are not enough studies that are re-done on the topic of SCI appropriateness and also not studied mainly determine the impact of SC performance (Swain & Cao, 2019).

H2: Intelligence has a significant effect on supply chain performance.

2.4.2 Supply Chain Management Capabilities and Supply Chain Performance

Supply chain capabilities facilitate the whole supply chain system by assimilating external and internal information and other resources. Supply chain capability works as the ability of the firm to recognize, utilize and assimilate external and internal resources (Yu et al., 2018). A study conceptualizes the variable of supply chain capabilities as a construct of 2nd-order that includes four dimensions, information exchange, coordination, integration between firms and responsiveness of SC. These four activities are selected because they mainly show the ability to execute cross-functional activities between two firms that are mainly required in Supply chain management. Moreover, they show the dynamic nature of SC capabilities, allowing an organization to learn and respond to ecological changes (Aslam et al., 2018).

2.4.2.1 Information exchange and supply chain performance

The concept of the exchange of information relates to the ability of an organization to share information with its members of the supply chain in a very effective manner. In a supply chain collaborative system, the shared information includes all the knowledge and information that is exchanged between partners directly and across the whole supply chain system (Raweewan & Ferrell, 2018). It is essential to use the information and exchange it among partners when required. For sharing quality information with the partners, it is essentially required to achieve the information from a reliable source and in an acceptable format (Yu & Huo, 2018). Effective exchange of information has been considered one of the most fundamental capabilities in supply chain systems (Nuruzzaman & Singh,

2019).

H3: Information exchange has a significant effect on supply chain performance.

2.4.2.2 Integration and supply chain performance

Organizations integrate their processes and activities internally and externally across their supply chain network. In organizations, serval integration occurs, from which two are discussed here, interfirm technology integration and activity integration. Technology integration relates to the level of technology arrangement with network partners; on the other hand, activity integration is conceptualized as the degree to which an organization synchronize its strategic channel process and activities like planning and forecasting with its members of the supply chain (Ganbold et al., 2020).

H4: Integration has a significant effect on supply chain performance.

2.4.2.3 Coordination and supply chain performance

The coordination between two firms relates to the capability of an organization to coordinate activities related to transactions with partners of the supply chain (Zhang & Yousaf, 2020). Coordination with supply chain members includes the arrangements of materials, workforce, money and capital tools, from taking an order to following the order (Yan et al., 2017). Enhanced coordination and synchronization between partners in the supply chain can help minimize the cost of transactions and enhance the efficiency of operations among SC partners. In that way, it acts as the leading indicator in assessing the capabilities of SC of a firm (Zhao et al., 2017).

H5: Coordination has a significant effect on supply chain performance

2.4.2.4 Responsiveness and supply chain performance

Responsiveness in a firm's supply chain is explained as the degree to which members of the channel respond supportively against environmental variations. It produces the dynamic nature of SC capabilities that permit the firm to develop and reintroduce organizations' specific competencies and also enable the firm to respond to environmental changes better (Jermsittiparsert et al., 2019). In the complex marketplace, it is essential to require a reliable, collaborative and efficient response from the whole supply chain system (Giannakis et al., 2019). To be able to take action & react afterwards to collecting information is the ultimate way of learning (Dissanayake & Cross, 2018). Therefore, we consider the supply chain's responsiveness as one of the critical dimensions of firm supply chain capabilities.

H6: Responsiveness has a significant effect on supply chain performance

3. Methodology

3.1 Research Approach

The research approach is defined as the plan and procedure of research. According to Bell et al. (2018) and Rashid et al. (2021), there are three research approaches are deductive, inductive and abductive. These research approaches distinguish on the base of hypothesis applicability. In the deductive approach, hypotheses and assumptions are tested, and these hypotheses are developed through reviewing existing theories. In the inductive approach, the researcher will explore new concepts and theories (Bell et al., 2018). Moreover, the deductive approach deals with the "surprising facts" or "puzzle", while the study's objective is to explain these facts. In the current study, the deductive research approach was used because the research model of this study was based on existing theories and variables, and the hypothesis was developed to delve into the association between dependent and independent variables.

3.2 Data Collection Source

As the paper manufacturer required a tree as a raw material for paper, the data also plays a vital role in the information enhancement. The data collection sources for research are divided into two types: primary and secondary. The primary data is initially collected by a researcher or newly collected data, whereas secondary data has already been gathered for some other purpose (Mesly, 2015). Moreover, primary data is considered accurate and objective data, while secondary data is just interpretation and explains the primary data. The primary source of data collection in the current research study was used because the researcher initially collected data.

3.3 Population and Target population

The overall group of individuals who can give information related to research is known as the study population (Saunders et al., 2009; Agha et al., 2021). Asiamah et al. (2017) state that this population is further divided into three categories; general population, target population and accessible population. The general population is defined as the whole population, i.e. in the current study, the general population are the textile sector employees. Further refinement of this population to narrow down toward the required most relevant group of individuals is termed as the targeted population, i.e. in the current study, the employees related to the supply chain are in the group of the targeted population. As it is not possible or feasible to cover the whole target population, the third part is termed accessible individuals, and the data was collected from these respondents.

3.4 Sample and Sampling Procedure

Due to the limited time and resources, it is impossible to consider the whole target population, so sampling must be used to cope with this issue. The sampling consists of probability sampling and non-probability sampling (Hashmi & Tawfiq, 2020; Rashid et al., 2021; Shaheen, 2022; Saunders et al., 2009). Probability sampling is defined as the observer already knows choosing an individual for a sample, and it has various types such as simple random, systematic, stratified and cluster sampling. Whereas non-probability sampling, all the individuals can participate in response; it has different types such as convenience, judgment and quota sampling. The present study's sampling procedure was based on the non-probability sampling technique, and the type of non-probability sampling was convenient sampling.

3.5 The Sample

The sample is defined as the group of individuals chosen from the target population, which represents the whole population. Alternatively, it can be termed as the number of participants from the target population from which the researcher collects data (Rashid et al., 2021). Hair et al. (2018) stated that the sample size should be error-free and reliable. In the current study, the sample size was calculated using G*power software based on statistical tests and research objectives (Faul et al., 2009). G*power identified a minimum sample size of 146 respondents. Therefore, this study will collect data from more than 146 respondents.

3.6 Instrumentation and Data Management

A structured questionnaire having close-ended questions was developed by adapting constructs from previous studies of Asamoah et al. (2021). These constructs include Communication (C) four items, Intelligence (I) four items, Information exchange (IE) four items, Integration (INT) three items, Coordination (CO) three items, Responsiveness (RS) four items, and Supply Chain Performance (SCP) three items. After collecting data, it was recorded on an MS excel worksheet and then transferred to the SPSS worksheet. That data was analyzed using SPSS and SmartPLS to perform various statistical analysis.

4. Data Analysis and Results

Statistical analysis for this study included some data examination tests, i.e. descriptive statistics, reliability analysis, and correlation analysis (Hashmi et al., 2020a; Hashmi et al., 2021; Rashid et al., 2020; Victory et al., 2022). After checking the data, the hypothesis was tested (Rashid & Amirah, 2017; Rashid et al., 2019; Tabachnick & Fidell, 2007).

Two hundred fifty questionnaires were sent to the targeted population via email and physical dropping the questionnaire. A total of 236 responses were reverted, which is a 94.4% response rate. The respondents were related to the textile sector and also working in the supply chain department. The selected companies include Gul Ahmed, Khadi, Siddique sons, Pak Denim, Bari textile, Star textile, Arabian textile, Lucky textile, Royal textile, Orient textile, and Western textile industry.

4.1 Demographic Profile of participant

The demographic profile of the respondents is shown in table 1, which states that a significant proportion was male respondents along with all other significant percentage of different demographic attributes. Further, the study recognized that the various demographic attributes of respondents did not affect the study analysis (Rashid, 2016).

Table 1: Demographic profiles

Demographic variable	Category	Frequency	Percentage
Gender	Male	198	83.9
	Female	38	161
Age	Less than 25 years	66	28
	25- 30 years	136	57.6
	36-40 years	34	14.4
	Above 40 years	0	0
Experience	less than three years	120	50.8
	3 to 6 years	88	37.3
	7 to 10 years	28	11.9
	above ten years	0	0
Designation	Executive	102	43.2
	Assistant Manager	94	39.8
	Manager	38	16.1
	Senior Manager	0	0
	Director	2	0.8
Income	25,000- 40,000	82	34.7
	41,000- 70,000	96	40.7
	71,000- 100,000	44	18.6
	Above 100,000	14	5.9
Education	Diploma	15	6.4
	Intermediate or less	61	25.8
	Graduation	92	39
	Masters	62	26.3
	M Phil/PhD	6	2.5

Source: SPSS output

4.2 Descriptive Statistics and Reliability Test

Descriptive statistics were applied to check the univariate normality, including mean, standard deviation, skewness and kurtosis. Hair et al. (2018) stated that the value of skewness and kurtosis should not be increased from -3 to +3. The summarized results of descriptive analysis are presented in Table 2. The consolidated outcomes presented in the table given above show that the highest skewness value (sk=0.741) is for construct supply chain performance (SCP) (M=3.45, SD=0.75) while the minimum skewness value (sk=0.370) is for construct intelligence (I) (M=3.50, SD = 0.72). Beside this, the maximum kurtosis value (k=1.277) is for construct supply chain performance (SCP) (M=3.45, S.D=0.75) and the minimum kurtosis value (k= 0.076) is for construct Communication (C) (M=3.30, S.D=0.73). These findings illustrate that all the skewness and kurtosis values are not greater than $\pm$3, so all adapted constructs achieve the acceptable requirement of univariate normality.

Table 2: Descriptive statistics

Construct	Mean	Std. Dev.	Skewness	Kurtosis
Communication	3.30	0.73	-.508	.076
Intelligence	3.50	0.72	-.370	.245
Information exchange	3.56	0.62	-.391	.566
Integration	3.52	0.75	-.615	.020
Coordination	3.50	0.75	-.785	.778
Responsiveness	3.48	0.74	-.415	.316
Supply chain performance	3.45	0.75	-.751	1.277

Source: SPSS output

4.2 Construct Validity

The critical purpose of accretion construct validity is confirmation of data accuracy that supports the analysis for hypothetical results. The convergent, discriminant, and convergent were carried out to analyze the construct validity for this study (Hair et al., 1998).

4.2.1 Convergent Validity

Convergent validity states that the assumption and theoretical two constructs are inter-linked and inter-linked in reality (Hair et al., 1998; Khan et al., 2022; Khan et al., 2022). There are three criteria to measure and test the convergent validity. Hsieh and Hiang (2004) and Khan et al. (2022) stated that the factor loadings are not less than 0.40. Secondly, the composite reliability (CR) criteria stated that the value of CR for each construct should not be less than 0.70. The third criteria stated that each construct's average variance extracted (AVE) should not be less than 0.50 (Fornell & Larcker, 1981). The summarized outcomes for mentioned above three criteria are presented in given below in Table 3.

Table 3: Convergent validity

Construct	Items	Factor loading	AVE	Composite reliability(CR)	Cronbach's alpha
Communication	C1	0.662	0.584	0.807	.880
	C3	0.853			
	C5	0.767			
Intelligence	I1	0.763	0.607	0.822	.861
	I3	0.808			
	I4	0.766			
Information exchange	IE3	0.651	0.537	0.775	.872
	IE4	0.691			
	IE5	0.843			
Integration	INT1	0.738	0.605	0.859	.861
	INT2	0.790			
	INT3	0.860			
	INT4	0.717			
Coordination	CO1	0.698	0.510	0.838	.867
	CO2	0.747			
	CO3	0.724			
	CO4	0.651			
	CO5	0.747			
Responsiveness	RS1	0.712	0.537	0.823	.858
	RS3	0.739			
	RS4	0.716			
	RS5	0.763			
Supply chain performance	SCP1	0.693	0.511	0.862	.860
	SCP2	0.724			
	SCP3	0.701			
	SCP4	0.761			
	SCP5	0.734			
	SCP6	0.674			

Source: SmartPLS output

The consolidated outcomes presented in given above convergent validity table (Refer to Table 3) illustrate that the highest factor loading value is (0.860) and the minimum value of factor loadings is (0.661), indicating that no factor loading value is less than 0.40 so the first standard was fulfilled. In addition, the highest value of AVE is (0.607), which is for construct intelligence, while the minimum

AVE (0.510) is for construct Coordination. However, the AVEs for all constructs are more significant than 0.50, so the second acceptable standard was also achieved by all constructs. Lastly, the minimum composite reliability value is (0.775) for construct information exchange, and the maximum CR value is (0.862) for construct supply chain performance. These CR results indicate that all the constructs have the acceptable CR value (i.e. at least 0.70). Since the results fulfilling all three convergent validity standards, all construct has no issue with convergent validity.

As the collected data might have some errors related to data collection or respondents' bias, so to eliminate these errors and test the internal consistency of data, Hair et al. (2018) recommended the reliability analysis. The recommended acceptable range for reliability is not less than (0.60) (Rashid et al., 2020; Hashmi et al., 2020). According to the summarized results presented in table 3, the construct Communication (C) has the maximum reliability value (Alpha = 0.880). Meanwhile, the construct responsiveness (RS) has the minimum reliability value (0.58). Since these results indicate that the reliability values for all constructs are not less than 0.60, all constructs are reliable for this research study.

4.2.2 Discriminant Validity

Compared to convergent validity, discriminant validity states that the concepts or measurement scales assumed to be distinct are measures of distinct concepts (Hulland, 1999). In this study, discriminate validity was accumulated by the method given by (Fornell & Larcker, 1981). According to this method, the square root of AVEs should be greater than the correlation among each construct pair. The given below Table 4 shows the summarized results for discriminant validity.

Table 4: Discriminant validity

Construct	T_C	T_CO	T_IE	T_INT	T_I	T_RS	T_SCP
Communication	0.764						
Coordination	0.322	0.714					
Information exchange	0.459	0.412	0.733				
Integration	0.405	0.564	0.542	0.778			
Intelligence	0.508	0.479	0.406	0.49	0.779		
Responsiveness	0.437	0.582	0.454	0.496	0.496	0.733	
Supply chain performance	0.405	0.607	0.439	0.566	0.547	0.656	0.715

Source: SmartPLS output

The diagonal of the given above matrix shows the square root of AVEs. According to calculated results, the square root AVEs is greater than the correlation among each pair of constructs. Thus the discriminant validity stated was established (Hashmi et al., 2020b).

4.3 Testing Overall Model

The proposed, tested model has six independent variables: Communication, Intelligence, Information exchange, Integration, Coordination and Responsiveness, whereas there is one dependent variable: supply chain performance. The give below Figure 2 shows the SEM path model. The proposed model has six independent variables: Communication, Intelligence, Information exchange, Integration, Coordination and Responsiveness and one dependent variable (supply chain performance).

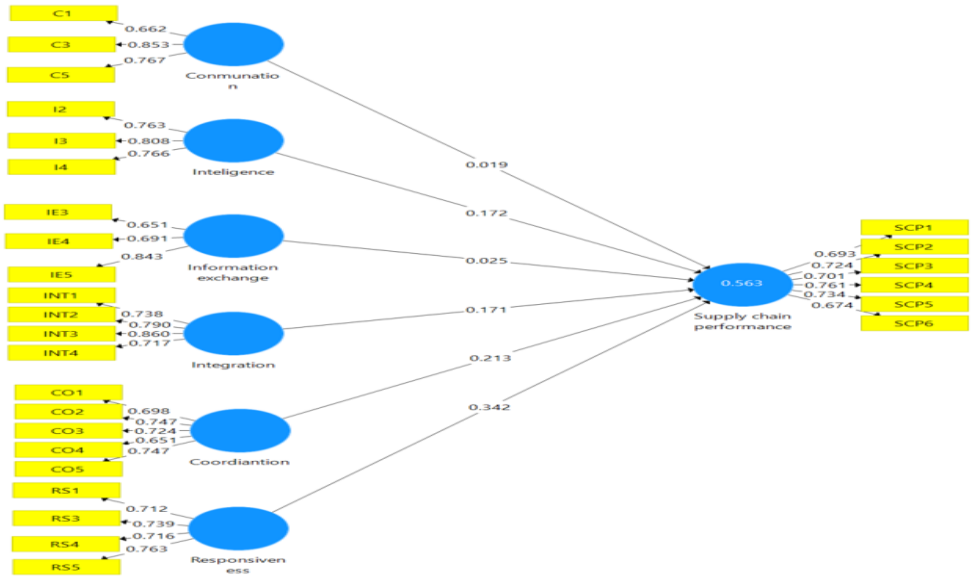

Figure 2: SEM path diagram

According to calculated path coefficient values in Table 5, intelligence significantly and positively influences supply chain performance (β=0.172, p-value <0.05), which supports the *hypothesis two (H2)*. Integration positively and significantly influences supply chain performance (β=0.171, p-value <0.05, which supports *hypothesis four (H4)*. Coordination also has a significant and positive relationship with supply chain performance (β=0.213, p-value <0.05) that supports *hypothesis five (H5)*. The path coefficient results for responsiveness also show that responsiveness has a positive and significant relationship with supply chain performance (β=0.342, p-value <0.05), which supports *hypothesis six (H6)*. The results for *hypothesis one (H1)* and *hypothesis three (H3)* were insignificant.

Table 5: Results of the structural model

	Path coefficient	**T statistics**	***p*-value**	**Hypothesis**	**Support yes/No**
Communication -> Supply chain performance	0.019	0.29	0.772	*H1*	No
Intelligence -> Supply chain performance	0.172	2.418	0.016	*H2*	Yes
Information exchange -> Supply chain performance	0.025	0.457	0.648	*H3*	No
Integration -> Supply chain performance	0.171	3.067	0.002	*H4*	Yes
Coordination -> Supply chain performance	0.213	2.946	0.003	*H5*	Yes
Responsiveness -> Supply chain performance	0.342	4.516	0.000	*H6*	Yes

Source: SmartPLS output

The significance of the relationship among these variables was tested by applying bootstrap using PLS. The bootstrapping results found significant and Summarized results are presented in given Table 6, which expresses that the P-value is less than 0.05, meaning the overall relationship among independent and dependent variables is statistically significant. However, the value of the adjusted R-square is (0.552), which indicates that the predictors of Communication, Intelligence, Information exchange, Integration, Coordination and Responsiveness can significantly predict a 55.2% variance in supply chain performance.

Table 6: Bootstrapping results

Construct	**Adjusted R-Square**	**T- statistics**	**P-value**
Supply chain Performance	0.552	14.478	0.000

Source: SmartPLS output

5. Summary and Conclusion

5.1 Conclusion and Discussion

The research study explored the relationship between IOS use and supply chain management capabilities with firms' supply chain performance. This study was mainly based on the responses of employees that belong to the supply chain departments of firms in the textile sector located in Karachi, Pakistan. The research framework of the study is mainly based on SCM capabilities & IOS use that considered as a predictor to test its influence on SC performance. A sample size of the research population was measured by using G*power software & found a sample size of 146 respondents Whereas, this study utilized 236 respondents that is greater than 146. A structured questionnaire was developed to collect data, and close-ended questions were developed by adapting constructs from previous studies. A questionnaire technique was used to collect data from the SC employees of the firm. After collecting data from respondents, it was analyzed by using SPSS and Smart PLS software. After analyzing the data, it was observed that all the hypotheses (*H2, H4, H5, H6*) were retained and had a positive & significant relationship with firm performance except *H1* and *H3*. The analysis of employees' responses collected from various firms reveals that the use of IOS increases the level of supply chain performance and directly enhances the capabilities of SCM. In addition, it was observed that the influence of SCM capabilities on supply chain performance was very insightful, influential, and even more significant than the impact of IOS use on SC performance. The study's results explore the great significance and importance of managing SCM capabilities when an organization uses IOS.

All the proposed hypotheses were consistent with existing studies, and four hypotheses were also retained. The hypothesis that "Intelligence has a positive influence on Supply chain performance" was retained and answered research question 1b: Does Intelligence influence SC performance? "Was matched with existing literature". For instance, the researcher explained that supply chain intelligence provides a comprehensive perspective of competitive intelligence on the dynamic association of SC integration for better business decisions (Belhadi et al., 2021). The intelligence of the supply chain influences the firm's internal processes and the external environment, including partners of the supply chain (Belhadi et al., 2021). The hypothesis that "Integration has a positive influence on Supply chain performance" was retained and answered to research question 2b: Does Integration influences SC performance? Was it match with existing literature? For instance, the researcher explained that in organizations serval kind of integration occurs, from which two are discussed here, interfirm technology integration and activity integration. Technology integration relates to the level of technology arrangement with network partners; on the other hand, activity integration is conceptualized as the degree to which an organization synchronize its strategic channel process and activities like planning and forecasting with its members of the supply chain (Ganbold et al., 2020). The hypothesis that "Coordination has a positive influence on Supply chain performance" was retained and answered to research question 2c: Does coordination influence SC performance? Was it match with existing literature? For instance, the researcher explained that The coordination between two firms relates to the capability of an organization to coordinate activities related to transactions with partners of the supply chain (Zhang & Yousaf, 2020). The hypothesis that "Responsiveness has a positive influence on Supply chain performance" was retained and answered research question 2d: Does Responsiveness influence SC performance? Was matched with existing literature? For instance, the researcher explained that in the present complex marketplace, it is essential to require a reliable, collaborative and efficient response from the whole supply chain system (Giannakis et al., 2019). To be able to take action & react afterwards to collecting information is the ultimate way of learning (Dissanayake & Cross, 2018). Therefore, we consider the supply chain's responsiveness as one of the critical dimensions of firm supply chain capabilities.

5.1 Limitations & Recommendations

This particular research study has certain limitations and recommendations for future research, i.e. The data of this research was utilized only in one context, as it was discussed only through the firms in the textile sector in Karachi, Pakistan. Therefore, future research may discover the same concept that is discussed in this research from multiple perspectives. Future research can further explore the compatibility and complementarity of SC's inter-organizational use and capabilities in enhancing the

supply chain's performance level. The complementarity influence of IOS use may not be directly influential, and other indirect associations would help provide extra understanding about this phenomenon. In future research, the conceptual framework of this study can be expanded by adding more constructs and variables (mediating variables). Results can be more reliable by using a large population through a large sample size.

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