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Impact of Innovativeness in Supply Chain Integration on Supply Chain Performance: A Moderating Role of Information System Capability

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Abstract

This study aims to investigate how innovativeness in supply chain (SC) integration improves the SC performance of manufacturing small and medium enterprises (SMEs) in Pakistan. Moreover, the research addresses the significance of information system capabilities as the mediating factor. The data was obtained from 251 SMEs in Pakistan's manufacturing sector, and the companies' managers, CEOs, and proprietors. The measurements of different nature, such as normality tests, reliability evaluation, and ANOVA, were used along with an interrelationship study via correlation and factor analysis. Also, linear regression was applied. Data analysis shows a close relationship between innovations, SC integration improvements, and operation efficiency. The ability to use and manage information systems data efficiently is crucial for the operational success of SMEs in Pakistan and for integrating innovative practices into their SC. On the one hand, innovative SC integration is vital for companies – they should focus on strategic SC integration. For diverse SMEs immersed in changing environments, internal and external integration is one of the critical factors in ensuring proper innovation chain processes.

Keywords: Innovativeness, Supply Chain, Supply Chain Integration, Supply Chain Performance, SMEs, Information System Capability.

INTRODUCTION

Due to increased rivalry, numerous organizations are compelled to modify their supply chain (SC), which are seen as a means to enhance financial and operational efficiency (Ataseven et al., 2018). According to the literature, modern organizations need an advanced SC management program to stay ahead of their competitors. SC management, or SCM, is a strategic approach to enhance a company's value by effectively allocating and utilizing its resources. A manufacturer's SC encompasses all interconnected processes inside a corporation that involve receiving and fulfilling consumer needs. Partner exchanges have facilitated the operation and oversight of the SC since their inception (Mentzer et al., 2001). Effective SC management is crucial for maintaining a competitive advantage in the long term, as stated (Cheng & Lu, 2017). Cai et al. (2016) and Zhou et al. (2014) have identified that a significant obstacle in SC value creation management is constructing and expanding a company's SC system while also

establishing a global SC. Major industrial firms worldwide depend on SCs to manufacture customized products and cater to the varied wants of their consumers. Prior research has demonstrated that for a corporation to effectively handle uncertain demand and a short product life cycle, it is essential for its SC to possess adaptability (de Santos Pérez et al., 2018). The SC enables the introduction of new commodities to fulfill the demands of various clients and successfully manage fluctuations in product quantities and delivery.

To maintain a competitive edge and adjust to a changing market, it is crucial to prioritize Innovation (Azadegan & Dooley, 2010). For instance, to augment their ability to innovate, several prominent manufacturing businesses are allocating a significant sum of money. The Alibaba DAMO Academy was founded in 2017 by the Chinese e-commerce giant to gain a long-lasting competitive advantage.

Furthermore, the entire business market is undergoing significant changes in commerce and technology. Bogers et al. (2018) assert that a firm's success in the dynamic and highly competitive global market hinges solely on a robust knowledge management system and a heightened focus on Innovation. To achieve optimal innovation performance, a company must actively pursue external sources of knowledge that surpass its capabilities, facilitating information exchange. Forward-thinking researchers have increasingly recognized the importance of companies involved in the SC.

SC customization is becoming increasingly popular as a competitive strategy to improve financial operational performance in response to growing competitive issues (Ataseven et al., 2018). According to research, companies can gain unmatched superiority among competitors discovering and implementing advanced management techniques in their SCs. The procurement services are poised to offer a comprehensive package of strategic management to maximize the organization’s value through efficient management of all resources. This ranges from processing customer orders to delivering goods to the end of the manufacturer's SC.

In developing countries like Pakistan, specific requirements for an innovative way of managing the SC are set up and enforced to keep businesses prosperous. Innovation in SCM is also discussed extensively by the research community. This group of investors has discovered the critical role of integration and Innovation in SCM in supporting corporate sustainability. These findings prove that SCM is crucial to achieving and maintaining a competitive edge. The study of Skippari et al. (2017) implies that Innovation could boost the firm’s ability to cope with multiple adverse factors such as coordination difficulties, supplier troubles, and customer interactions.

According to a study conducted by Redmond et al. (2016), small and medium enterprises (SMEs) have significant positive contributions to the economic growth of a country, be it in developed or developing countries. They reduce poverty, create jobs, and improve technological capabilities. Thus, they significantly contribute to the growth of exports and the overall economy.

SMEs are the factories that make economic bodily structures and help develop a productive society through technological advancements, wherein they play a crucial role in stabilizing national economics. Despite this, obtaining enough capital for SMEs to run smoothly becomes a barrier to management. SMEDA, an organization's SME development authority, mentioned that SMEs employ 80 percent of the national non-agriculture labor force and contribute 40 percent to the national GDP. Pakistan is home to 400,000 small and medium manufacturing enterprises and numerous service providers, with SMEs being around 90% of all businesses in the country.

At the forefront of this growth, SMEs grapple with SC challenges that arise as industries enlarge. Major research studies have been conducted to establish the root causes of ineffective SC functionality, thus focusing on improving performance. Research has been done to investigate the influence of leadership, demographics, environmental conditions, and organizational structures on the effectiveness of SC management. Contrary to the different studies that decide to explore its logistics or financial performance only, there is no adequate quantitative assessment of how innovative integration can influence SME's SC performance in Pakistan.

Zhuo et al. (2021) conducted new research revealing that SCM integrates each internal and external integration to deliver an innovative one. Kim and Chai (2017) and Seo et al. (2014) studies have shown that these partnerships can be formed by implementing innovative SCM practices through the SC. The research on innovative integration defines a process of joint and mutual activity that leads to smooth and effective SC performance between the internal and external valuable SC partners.

The research project essentially analyzes the relationship between innovative integration and SC performance of the SMEs of Pakistan, with a particular focus on IT capabilities, which are seen as the main leverages of the relationship. The study is structured around two main objectives: The first is to study how the Innovation of SC integration improves the SC performance of SMEs. The second is to examine the moderating effect of information systems capabilities on this relationship. The study intends to fill the existing knowledge gap and serve policy-making at the SMEDA level in Pakistan.

LITERATURE REVIEW

Supply Chain Performance

Efficacy and efficiency are the key components of assessing the success of a SC operation. The researchers suggest two leading indicators for measuring the efficiency of a SC. The first measurement is the initial metric, SC cycle efficiency, which is the ability of a SC to perform both flexible operations and operations generating value. It indicates the period the SC spends responding to sudden increases in demand while maintaining service quality and preventing extra costs. These indicators are the main factors to evaluate the flexibility of the SC and the possibility of cost savings. Working at the optimum is what intelligent SC management does, thus reducing the SC expenses. As a

result, a high level of customer service is maintained constantly. According to Seo et al. (2014), these metrics successfully capture the essence of what it means to have an efficient supply network. Monitoring the order fulfillment rate, which is the ratio of fulfilled orders to total orders, and the lead time from order placement to delivery are two methods for assessing the effectiveness of the SC.

The SC's reliability is assessed using two primary "SCOR performance indicators." The quality of the order fulfillment process significantly affects customers' experiences and happiness with the service they receive, influencing the interaction between the company and the client. Effective economic coordination and communication among the firm's many functional divisions, suppliers, and consumers are also essential. The concepts of "flawless order execution" and "order performance" encapsulate the ideals of customer satisfaction and SC efficiency.

Innovative and Green Supply Chain Integration

Researchers assert that the primary focus of green SC integration and technical progress is to enhance business processes, procedures, and methods in the industrial sector. The objective of incorporating cutting-edge and eco-conscious SC integration is ultimately to improve the well-being of consumers. Integrating innovative and sustainable SCs is pivotal in driving technological advancements within companies. This integration facilitates the flow of information and acts as an impetus for creative problem-solving, benefiting suppliers and customers. Effective implementation of an innovative and green SC requires members to share information seamlessly, collaborate on problem-solving, and build mutual trust. This approach enhances direct and indirect relationships between companies and their SC partners, which is crucial for stimulating Innovation as it can lead to new ideas and alternative solutions.

In addition, the scholars' empirical research shows inviting suppliers at the beginning of product innovation can eliminate expensive last-stage redesigns. The technological advancements in supplier involvement significantly increase the operational efficiency of innovations. Through the participation of the customers in developing new products, companies can obtain the needed information and skills. Strategies for new product development can cater to customer needs by improving the quality and reducing the costs of products. A thorough understanding of consumer needs and preferences is essential to drive Innovation in product design. Engaging customers in the innovation process improves the quality of the innovations and their overall performance. When integrated with advanced, environmentally sustainable SC practices, the network resource becomes an indispensable asset to enhance a company's knowledge base and operational efficiency. Networks can facilitate problem-solving and knowledge-sharing across businesses and the whole SC. This enables the advancement of innovative performance and the accumulation of creative assets. Networks can utilize the data to expedite the dissemination of information among SC enterprises.

According to previous studies, networks enabling knowledge sharing and the integration of SCs can enhance Innovation, improve the quality of services, and increase

product levels. Members can engage with each other through Innovative and SC Integration. By integrating environmentally sustainable and innovative SCs, we may cultivate a shared comprehension, optimize the utilization of implicit knowledge and promote transparent communication at each phase.

Innovativeness in Supply Chain integration and Supply Chain performance

To maintain a competitive edge, contemporary enterprises are increasingly placing importance on technology. They facilitate a quicker exchange of information, resources, and knowledge. Soosay et al. (2008) determined that this type of competition diminishes the durability of an item. For businesses, greater technological integration is essential. The success of SC innovation is significantly influenced by technical networks, knowledge, and relationships; therefore, technologies play a vital role in enabling the exchange of information within these networks (Chapman et al., 2003). Through the simplification of data transmission and collection, technology fosters innovative thought.

Researchers posit that organizations' ability to proactively address performance concerns and efficiently implement environmentally sustainable modifications is the defining characteristic of creative businesses. Applied to performance concerns, this technology can alleviate the adverse consequences of specific hazards. As stated by Panayides and Lun (2009), the performance of a SC can be enhanced by adopting novel methodologies and processes. Businesses can analyze and respond to changes in their SCs more effectively with the assistance of Innovation, which improves the systems' efficiency and effectiveness. Simplifying SC management through the implementation of cutting-edge technologies is possible. Seo et al. (2014) argue that implementing state-of-the-art technologies can potentially improve the efficacy of SCs.

Additionally, businesses can increase their efficiency by minimizing costs associated with the transformation of values, products, and services via Innovation. Organizations must spend less time processing primary materials and work in progress. Furthermore, the capacity of Innovation to enhance organizations' adaptability to unforeseen demand will contribute to an improvement in SC efficiency (Li et al., 2020). Furthermore, to reduce order processing times, meet the SC's lowest cost criteria, and accurately execute customers' orders, businesses must possess the ability to be inventive in all circumstances (Tarafdar & Qrunfleh, 2017).

Moderating the role of Information System Capability

Tarafdar et al. (2017) assert that once the capability of Information Systems (IS) is achieved, IS capability can be utilized for diverse duties, including market research and monitoring, exchanging information between clients and providers, planning for future scenarios, and launching products and services. Information systems possess adaptability, enabling them to establish connections between the three "SC" techniques and their respective information processing requirements and capacities, enhancing their overall effectiveness. Uncertainty, as defined by Duncan (1972), refers to the inability of a

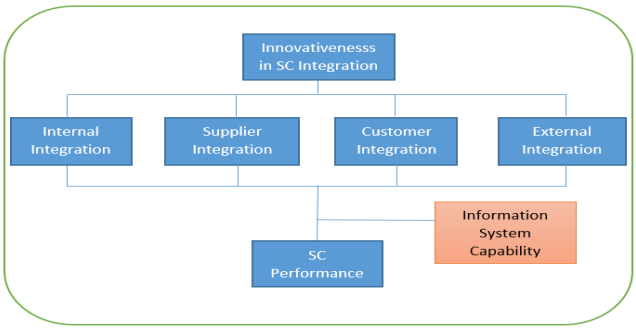
corporation to anticipate future risks or conduct precise and thorough assessments. The intricate interconnections among organizations can lead to significant unpredictability in SCs and other economic activities. Anticipating the interaction between events is difficult due to the numerous potential routes for resources, commodities, and data (Lu et al., 2018).

A company's information systems (IS) proficiency determines its ability to create and implement IT solutions effectively. Gu and Jung (2013) assert that information systems (IS) competence includes a cost-effective operations and support plan and a strategically aligned delivery strategy. Information systems (IS) capabilities enable the organization to use easily accessible and well-utilized data efficiently. According to Cepeda-Carrion et al. (2012), having expertise in information systems (IS) directly improves an organization's ability to gather and utilize information. A comprehensive knowledge of the company's information systems enables personnel to promptly adapt to changes in the business environment (Peppard & Ward, 2004). The anticipation is that the focal company will discover that the SC information systems make these processes and activities more accessible. Proof of the SC's ability to handle and apply information.

Theoretical Framework

An essential principle of organizational information processing theory (OIPT) posits that organizations must establish specific internal structures to manage diverse types of uncertainty efficiently. The information processing requirements of the organization must align with its structure to ensure optimal performance even in unforeseen circumstances (Galbraith, 1977).

Although SCI has been demonstrated to be effective in numerous studies, only a limited number of investigations have examined the impact of this novel integration on performance. Although SC integration (SCI) has been proven effective in many studies, only a few studies have looked at the effects of this innovative integration on performance outcomes. This study seeks to answer this question by examining the impact of Innovation in SC integration on the chances. This research applies Organizational Information Processing Theory (OIPT), according to Galbraith in 1973 and 1977, as the instrument for shedding insight into SCI. SCI effectively combines various SC components and impacts the total SC performance. Organizations are expected to bear the brunt of these tasks, which entails high interdependence and increasingly volatile risks.



DATA AND METHODS

This numerical research examines the consequences of implementing cutting-edge SC coordination on the outcomes of small and medium-sized manufacturing enterprises (SMEs) in Pakistan. The study focuses on SMEs in Pakistan to help organizations enhance their performance by optimizing their SC processes. This research is based on various small and medium-sized enterprises in Pakistan. Among the people selected for this study are entrepreneurs, CEOs, and managers who have enough knowledge and experience of the organizations they represent. These participants are already acquainted with the intricacies of their company's SC because of relations with customers, suppliers, and internal operations. The research methodology consists of the distribution and analysis of 500 surveys based on the guidelines provided by Hair Jr et al. (2021); Sekaran (2016).

Nevertheless, 251 surveys were submitted by participants, though. Moreover, Mellahi and Harris (2016) reported that the case of Pakistan has an average response rate of 52%—68%, as per their research results. With 251 responses out of 400 participants, the response rate for this study is 62.75 percent, deemed adequate and satisfactory.

This Pakistan-based study focuses on small and medium-sized enterprises (SMEs) in five distinct industrial subsectors. We initiated communication with SMEDA to procure their inventory of establishments situated in Pakistan's principal cities and capital, as no other organization in Pakistan is dedicated to assisting SMEs. Due to the impracticality of reaching out to every small and medium-sized enterprise (SME) in each sector, the researcher was compelled to determine a sample size. There are several justifications for employing a convenience sample approach in this investigation. The primary data utilized for statistical analysis in this study were gathered through convenience sampling.

Likert-type scales were employed in this study to assess each variable. Modifications were made to enhance the applicability of these scales to the study population in light of previous research. The survey inquiries are composed of two fundamental sections. The initial section of the survey comprised participant demographics and items formulated using a Likert-type scale. A Likert scale, according to Sekaran (2016), is one method for determining the extent of agreement or disagreement among individuals. Individuals are expected to possess greater autonomy in expressing their thoughts and emotions using a five-point Likert scale, which concurrently measures the range of their perspectives and sentiments. One can express their firm opinions by utilizing a five-point scale (options) ranging from "strongly agree" (the highest value) to "strongly disagree" (the lowest value). To ensure the dependability of each variable, the researcher assigned a score to each item using a 1-to-5-point scale. A score of 1 indicated strong disagreement, 2 indicated disagreement, 3 indicated neutrality, 4 indicated agreement, and 5 indicated strong agreement. Data for each research variable is gathered through the use of standardized questionnaires. Each participant received a survey via email.

Table 1: Measurement of Variables.

Variable	Measurement	Source
Supply Chain Performance	1. "SC cycle efficiency (Percentage of time in which inventory is active/moving in the SC over total time spent in the SC)." 2. "SC flexibility (Average time required for the SC to respond to an unplanned 20% increase in demand without service or cost penalty)." 3. "Order fulfillment lead-time (Average time between order entry and time of order delivery)." 4. "Perfect order fulfillment (Orders delivered (i) complete, (ii) on the date requested by the customer, (iii) in perfect condition, and (iv) with the correct documentation, over total number of orders)."	(Tsanos et al., 2014)
Innovativeness in Supply Chain Integration	1. "We frequently try out new ideas in the context of the SC." 2. "We seek out new ways to do things in our SC." 3. "We are creative in the methods of operation in the SC." 4. "We often introduce new ways of servicing the SC." 5. "We have increasingly introduced new processes in the SC in the last five years."	(Panayides et al., 2009)
Innovativeness in Internal Integration	1. "We have a high level of responsiveness within our plant to meet other departments' needs." 2. "We have an integrated system across functional areas of plant control." 3. "Within our plant, we emphasize information flows among purchasing, inventory management, sales, and distribution departments." 4. "Within our plant, we emphasize physical flows among production, packing, warehousing, and transportation departments."	(Seo et al., 2014)
Innovativeness in External Integration	1. "We work throughout our SC as an adversarial chain." 2. "We work as a partner with our suppliers rather than having an adversarial relationship." 3. "We believe that cooperative relationships will lead to better performance than adversarial relationships." 4. "We believe that a firm should work as a partner with its surrounding community."	
Information System Capability	1. "The information systems applications we have in the SC support us in introducing new products and services in our markets." 2. "Share information with our suppliers and customers." 3. "Monitor changes in our market condition." 4. "Respond to changes in the market." 5. "Model possible future outcomes and identify alternative courses of action."	(Sabherwal & Chan, 2001)

DATA ANALYSIS

Descriptive Analysis

Table 2: Gender of Respondent.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	165	65.7	65.7	65.7
	Female	86	34.3	34.3	100.0
	Total	251	100.0	100.0	

400 numbers questionnaires were circulated, and 251 were returned. Demographic characteristics are explained in Table 2. Table 2 shows that out of 251 respondents, 165 (65.7%) are male employees, and 86 (34.3%) are female employees from SMEs. This implies that most respondents are male employees who gave responses from different cities in Pakistan in the SMEs sector.

Table 3: Position of Respondent.

		Frequency	Percent	Valid Percent	Cumulative Percent
	CEO	15	5.9	5.9	5.9
	Manager	149	59.4	59.4	65.3
	Owner	87	34.7	34.7	100.0
	Total	251	100.0	100.0	

The respondent's position was divided into 3 categories: CEO, manager, and Owner. It can be viewed in the above table 3 represents 251 respondents: 14 (5.9%) have a CEO, 149 (59.4%) employees have a manager, and 87 (34.7%) employees have an owner. This shows most respondents are managers as shown in table 3.

Normality Test

Table 4: Normality Test Result.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**Df**	**Sig.**	**Statistic**	**Df**	**Sig.**
SCP	.176	246	.000	.868	246	.000
ISC	.194	244	.000	.817	244	.000
INSCI	.188	251	.000	.810	251	.000
a. Lilliefors Significance Correction						

A normality test in table 4 is a statistical procedure that verifies that the sample used to gather data falls within the conventional normal distribution. Graphical and mathematical methods can be used to determine normal distribution. The standard distribution is like a bell-shaped curve for which the standard deviation is 1 while the

mean value is zero. This analysis uses three tests, namely the z-score Test, graphs, and the Shapiro wikis test, to determine the instrument's normality (Garson, 2012). All variables in the preceding table have a significant value of less than 0.05 using the K-S test. Therefore, the null hypothesis is rejected, and the distribution is supposed to be expected.

Reliability Test

An essential aspect of the data processing phase is thoroughly assessing the reliability and accuracy of the scale or questionnaire utilized. The reliability of each variable in the questionnaire is assessed using "Cronbach's Alpha Coefficient." The minimum acceptable value for the dependability coefficient is 0.70. Although the dependability coefficient of 0.60 is generally deemed satisfactory, it raises inquiries. Good reliability is typically characterized by a threshold exceeding 0.8. The Cronbach's Alpha Coefficient of 0.9, as displayed in Table 4, is above the permissible minimum of 0.70. The results demonstrate that each element of the utilized scale is dependable and valid. A reliability test score of 0.904 is considered excellent for additional study analysis given in table 5.

Table 5: Reliability Test.

Variables	**Cronbach's Alpha Value**
SC Performance	0.904
Innovativeness in SC integration	0.889
Information system Capability	0.875
Innovativeness in Internal Integration	0.899
Innovativeness in External Integration	0.894

Exploratory Factor Analysis

Table 6: KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.953**
Bartlett's Test of Sphericity	**Approx. Chi-Square**	821.453
	Df	3
	Sig.	.002

This study employs factor analysis to accomplish several objectives. Primarily, it minimizes the quantity of variables in statistical analysis. Additionally, it can be utilized to examine the connections among various components. Furthermore, it is necessary to generate a concise explanation of the analysis. The ultimate objective is to validate or challenge hypotheses to establish a structured and theoretical basis for the targeted research. This Test aims to ascertain the adequacy of the sample, which must be a minimum of 0.5 to proceed with authentic component research.

The KMO test yields a numerical outcome ranging from 0 to 1. When the level of sample adequacy reaches 0.90, it is classified into five categories: "superb," "meritorious," "middling," "mediocre," and "miserable." Utilizing Exploratory Factor Analysis (EFA) is not advisable when the number is below 0.5. The Kaiser-Meyer-Olkin score of 0.953 in Table 6 demonstrates excellent sample adequacy for additional exploratory factor analysis (EFA). Bartlett's Test is suitable for research projects that have larger sample sizes. The minimum acceptable threshold is considered to be an estimation of Bartlett's Test of sphericity below 0.05. Since the significance value in Table 6 is lower than the 0.05 threshold, it is considered statistically significant.

Communalities Factor Analysis

Table 7: Communalities.

	Initial	**Extraction**
SC Performance	1.000	.793
Innovativeness in Integration	1.000	.728
Information system Capability	1.000	.848
Extraction Method: Principal Component Analysis.		

Table 7 shows the amount of the difference (for example, the value of communality ought to be greater than > 0.4) and will be considered for further investigation. Those components whose value is less than 0.40 will be excluded from the additional process of exploratory component investigation) in the variables that the extracted components have represented. The above table shows satisfactory results with observed communality values of more than 0.4. Hence, the principal component analysis (PCA) achieves the extraction of commonalities.

Correlations Analysis

This Test measures the degree of correlations between the various parts of the investigation. It indicates the correlation's magnitude and polarity (positive or negative). The values that determine the polarity of the relationship are within the interval of -1 to +1.

Based on the data shown in Table 8, there is a strong positive correlation between SC performance and information system value (correlation coefficient of .739**), Innovation (correlation coefficient of .663**), and SC integration (correlation coefficient of .819**). The findings also demonstrate that SC performance (.739**), Innovation (.699**), and SC integration (.885**) have a substantial positive and moderate correlation with information system competence. The level of innovativeness has a significant and moderate positive correlation with SC performance (correlation coefficient = 0.663**), information system capability (correlation coefficient = 0.699), and SC integration (correlation coefficient = 0.742**). Finally, there is a strong positive correlation between SC Integration and SC Performance (r = .819**), Information System Capability (r = .885**), and Innovation (r = .742**).

Table 8: Correlations.

		SC Performance	Information system Capability	Innovativeness in SC Integration
SC Performance	Pearson Correlation	1	.739**	.663**
	Sig. (2-tailed)		.000	.000
	N	250	246	250
Information system Capability	Pearson Correlation	.739**	1	.699**
	Sig. (2-tailed)	.000		.000
	N	246	248	248
Innovativeness in SC Integration	Pearson Correlation	.663**	.699**	1
	Sig. (2-tailed)	.000	.000	
	N	250	248	255
** Correlation is significant at the 0.01 level (2-tailed).				

Regression Analysis

H1: *Innovativeness in SC integration has a significant positive impact on SC performance.*

The statistically notable difference in variance between the independent and dependent variables is demonstrated by the R-squared value of 0.526. Its other name is the determination coefficient. This suggests that DV and IV are somewhat different. After analyzing the variance, the model is judged statistically significant with a p-value of 0.002. Changed were the degrees of freedom modification. With the revised R2 value of 0.490, Table 9 demonstrates how vital this data is. Using creative SC integration, 49% of the variation in SC performance may be explained.

Table 9: Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error
1	.772[a]	.526	.490	2.53009
a. Predictors: (Constant) innovativeness in SC integration				

Table 10: ANOVA.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1205.953	1	1205.953	197.731	.002[b]
	Residual	1590.115	250	6.3605		
	Total	2796.068	251			
a. Dependent Variable: SC Performance						
b. Predictors: (Constant) innovativeness in SC integration						

Coefficients

According to Table 11, the p-value is less than 0.05, and the correlation coefficient is 0.663, indicating that creativity significantly and positively impacts SC integration and performance. The table of regression coefficients suggests that the significance threshold is P 0.05. Therefore, we confirm the original hypothesis (H1).

Table 11: Coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.258	0.700		10.362	.000
	Innovativeness in SC integration	0.459	0.033	0.663	13.948	.000
a. Dependent Variable: SC Performance						

H2: *The capability of the information system moderates the relationship between innovativeness in SC integration and performance.*

Table 12 demonstrates the model has statistical significance with a p-value of 0.002 and an R-squared value of 0.7644. The table's interaction row demonstrates the statistically significant and positive moderating effect of the information system's capabilities on the relationship between SC performance and innovativeness in SC integration. The computed regression coefficient (b) is 0.0156, with a standard error (S.E.) of 0.0066 and a p-value (p) of 0.0257, both of which are less than 0.05. SCP appears to have a statistically significant and beneficial effect regulating the relationship between "innovativeness in SC integration and SC performance". Therefore, the H2 hypothesis is acknowledged and confirmed in this particular scenario.

Table 12: Outcome Variable SC Performance.

R	R-sq	MSE	F	df1	df2	P
0.7644	0.6076	4.4905	116.3135	3	238	0.002
	Coeff	Std. Error	t-stat	p-value		
Constant	8.0882	1.3493	3.5434	0.0002		
INSCI	-0.1103	0.1304	-0.7465	0.3984		
ISC	0.1504	0.2264	2051	-0.0883		
SCP_1	0.0156	0.0066	2.4800	0.0257		
Outcome Variable SC Performance						
	R-sq	MSE	F	df1	df2	P
X*W	0.6076	4.4905	116.3135	3	238	0.002

DISCUSSION

This research shows a strong positive link between SC performance and the level of Innovation in SC integration. This aligns with previous findings that have also identified

a beneficial association between performance and aspects of SC integration. This study highlights that substantial Innovation in integrating SCs is vital for businesses to collaborate effectively with their partners, enhancing overall SC efficiency. Besides, discovering the indirect effects is evidence that the implementation of SCI is a responsive approach that relies on suitable SC management practices to level its performance.

The research indicates that SC performance and innovative integration in SC management are essential for Pakistan's small and medium enterprises (SMEs). It confirms that incorporating Innovation into the SC operations tremendously improves performance. Panayides et al. (2009) and Seo et al. (2014) suggested a positive relationship between the innovation level and the effectiveness of the SC; thus, companies that innovate will be more effective in overall SC operations. According to Kalyar et al. (2020), introducing Innovation is known to be one of the most appropriate tools to enhance performance in SCs.

Adebanjo et al. (2018) conducted qualitative case studies among logistics companies in Singapore and Australia to show how SCI could stimulate new ideas. Due to the findings of the previous study and other research, it is evident that SC integration closely relates to business achievement in SMEs. According to the empirical data, an integrated innovation can be a critical factor in making a SC perform well. This is in line with the hypothesis (H1) of this study, indicating a connection between creative SCI and improved SC management performance in the manufacturing sector of Pakistan.

The primary purpose of this research was to investigate the role of information systems in building a tie between Innovation in SCI and SC efficiency. Reports show that information systems are one of the factors that significantly influence Innovation in the framework of the product chain. Information System Agility positively impacts SC performance and Innovation in SCI, which, in turn, improves various aspects of the SC. Monitoring market trends has become much easier, and better data on suppliers can be obtained this way. Increased communication via technology is one factor that makes it possible for the organization to bring suppliers into the project at hand, collaborate effectively, and share knowledge, as Chin et al. (2014) mentioned. Tarafdar et al. (2017) pointed out that information systems significantly impact the bond between innovative SCI and SC performance, which is confirmed by the results of this study.

CONCLUSION

This study's findings align with Tarafdar and Qrunfleh (2017) claims that information systems affect the connection between innovative SC integration and performance. The research was conducted through quantitative analysis by collecting data from many sectors nationwide and was explicitly targeted at the owners, CEOs, and top executives. The study showed that Innovation in SC integration positively impacts performance, which is why innovative practices are fundamental in effective SC management. The prominent contribution of SC integration and information system management to SC efficiency indicates that institutions should think highly of Innovation. As Chin et al. (2014) argue,

SMEs with effective information systems are more responsive to customers and suppliers regarding SC integration, supplier participation in product lifecycle activities, and enhanced collaboration and information sharing. The study confirms the hypothesis of Tarafdar et al. (2017), which supports the strong correlation between information systems and the relationship between innovative SCI and SC performance.

IMPLICATIONS OF THE STUDY

The findings of this study offer important insights for managers, particularly those in charge of research and development, SC operations, and information systems in organizations within developing markets. The research underscores the importance of Innovation in boosting SC performance by integrating information systems and enhancing SC capabilities.

Companies should assess their capacity for strategic Innovation to improve their SC management and strengthen their internal SC networks. Fostering Innovation within the SC context requires introducing fresh and innovative ideas and techniques to plan and execute SC activities.

These activities include creating innovative methods for supervising and controlling SC operations, utilizing current approaches to improve these operations, and forming new strategic partnerships. Therefore, it is imperative for expanding enterprises to cultivate an environment that encourages and sustains Innovation.

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