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Empirical Research on the Mediating Impact of Integration between Supply Chain Management Practices and Supply Chain Management Performance

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Abstract: A growing institutional framework concerning Pakistan's pharmaceutical industry supply chain integration and supply chain management practices is significant for supply chain performance. Utilizing data from 171 pharmaceutical industry employees, a quantitative approach is employed to explore connections between SCMP, SCI, and SCP. The results also demonstrate significant positive correlations between certain SCMPs and SCP. Additionally, supply chain integration is identified as a crucial mediator, underscoring achieving integration within the supply chain to bolster performance. The study offers valuable insights for practitioners aiming to enhance the supply chain, stressing comprehensive SCMP and improved SCI.

Key Words: Supply Chain Integration (SCI), Supply Chain Management Practices (SCMP), Supply Chain Performance (SCP), Customer Relationship, Information-sharing

Introduction

The enduring notion of supply chain management offers additional benefits for improving an organisation's practices (Fu et al., 2022; Lee et al., 2022; Henry Jin, 2013 #554). By integrating previously autonomous organisations, supply chain practices may facilitate organisational collaboration (Shukor et al., 2021; Asamoah et al., 2021). The current study discovered that SCMP (Ataseven et al., 2020; Siagian et al., 2021) and SCP (Younis & Sundarakani, 2020) could improve supply chain performance. SCMP is becoming a crucial requirement to comprehend to remain competitive and fight for cost-effective expansion (Baisa et al., 2023). As such, SCMP must explain how supply chain management improves the performance of individuals and systems (Kumar & Gupta, 2021). SCM seeks to increase a company's profitability and competitiveness by fusing its internal operations with external relationships with clients, vendors, and other channel participants. As a result of building various SCMPs effectively, this could be accomplished (Thaloor Ramesh & Nattanmai Swaminathan, 2024). Numerous organisations recognise the significance of SCM but are uncertain about which SCMP comprises a comprehensive set; consequently, they lack clarity on what to implement (Kumar & Gupta, 2021). Moreover, given numerous instances where SCMP initiatives have not achieved the intended improvements in performance, it is uncertain if supply chain management practices (SCMP) might have a beneficial effect (Baisa et al., 2023).

The literature suggests empirical investigation among SCMP and supply chain performance, but little study has examined SCI's mediating role. Previous research has investigated the correlation between SCMP and performance, with studies conducted exclusively by Suki et al. (2023) and others that focus on

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the relationship between SCI and supply chain performance (Chen et al., 2021). The gaps currently exist in the literature are listed below. Although SCI, SCMP, and SCP have been studied, there is still a need for a more integrated model that investigates the intricate connections between the three. However, the issue of how SCMP mediates SCI and SCP remains unclear. The current research lacks empirical evidence on SCMP, performance, and integration, plus the SCMP components are significant for SCI and SCP. Additionally, managers need answers to relations among SCMP, SCP, and SCI mediating roles, which could ultimately lead to supply chain efficiency. The current study provides more insights that could help managers make appropriate use of various components of SCMP for SCI and SCP. Additionally, most research tends to focus excessively on SCP rather than firm performance. Therefore, this study specifically focused on SCP and expanded on our past research (Baisa et al., 2023) by offering a larger sample size and a comprehensive methodology for investigating SCI's mediating role.

In general, this study talks about a research project that answers the demanding concept above. In this paper, the major goal is to show how the three main concepts—SCMP, SCI, and SCP—are connected. This work fills in important theoretical gaps because there aren't any empirical studies that look at the mediating effect of SCI at the same time. Through a quantitative study of Pakistan's pharmaceutical industry, the studies try to fill this gap (Bhutta et al., 2021). Scholarly study on SCMP and its application in underdeveloped nations, particularly Pakistan, appears to be limited. Furthermore, The existing body of scholarly research is inadequate to substantiate a theoretical stance with empirical support (Asif et al., 2020) on how SCMP affects performance, namely SCP.

The pharmaceutical sector in Pakistan is a prominent driver of the nation's progress. It provides the public with accessible and affordable healthcare and contributes to the economy via exports and employment opportunities. Pakistan's emergence as a global pharmaceutical industry could be attributed to its commitment to quality innovation. Due to the pharmaceutical industry's economic significance in Pakistan, it provides optimal subjects for research. Furthermore, through the exportation of pharmaceutical products, it generates foreign currency in addition to fulfilling healthcare requirements. In Pakistan, the industry's supply chain implementation is firmly established, and numerous domestic enterprises have embraced Pakistani SCMP, reflecting the impact of global business (Singh et al., 2020).

Literature Review & hypothesis development:

SCMP

Recently, supply chain management practices (SCMP) are operational functions that influence the efficiency and effectiveness of a supply chain within a corporate framework (Bahar et al., 2021). SCMP is made up of numerous components, including information sharing, process flow, outsourcing, and supplier alliances, as described by Doumbia et al. (2021). Das and Hassan (2022) classify SCMP as quality management, customer relationship, and procurement. According to Waiyawuththanapoom et al. (2023), personalisation through delayed operations and technological innovation are essential elements of SCMP. This suggests that supply chains need information exchange between trading partners to function properly. As a result, many firms across industries view standard operating procedures (SCMP) as a prescription for success. (Mohd Jamal et al., 2020) identified six distinct components of SCMP: customer service management, supply chain features, geographical closeness, information sharing, a firm's capability, and SCI.

SCI

Supply chain integration (SCI) is a term that describes not just operations within the organisation but also those among its suppliers, consumers, and other members (Bimpizas-Pinis et al., 2022). There is a significant role that the integration of SCI plays in linking a company with its customers and suppliers. Das and Hassan (2022) describe how this is achieved through the integration of the tasks, locations, interactions, functions, and procedures of these entities. Service-centric integration consists of two distinct phases: internal integration and external integration using trading partners. Building strong connections between various activities that take place within an organisation, such as purchasing, the management of raw materials, and operations, is an essential part of internal integration (Shukor et al., 2021). While forward integration and backward coordination are two types of external integration, forward

integration is the more common type. From the perspective of Bimpizas Pinis et al. (2022), forward integration refers to the physical movement of products between suppliers, producers, and clients.

SCP

Supply chain performance entails identifying appropriate performance metrics to evaluate key criteria critical for any business activity. This evaluation should be an integral part of any business plan, employing methods such as Supply Chain Performance (SCP) or other relevant techniques (Kumar & Gupta, 2021). SCP, as a methodical approach, assesses supply chain operations efficiency (Asamoah et al., 2021). An additional benefit of SCP measurement is its promotion of collaborative integration among various supply chain members within a particular industry (Baisa et al., 2023). By implementing effective supply chain performance (SCP) monitoring, firms can attain financial stability (Singh et al., 2020). Singh et al. (2020) stress the need for ongoing enhancement of supply chain procedures and emphasize the need for an efficient SCP measuring process. Further, Nazari-Ghanbarloo (2022) points out that measuring supply chain performance (SCP) could be challenging because those responsible for measurement often focus solely on their areas of responsibility, neglecting supply chain performance. (Kamble and Gunasekaran, 2020) suggest that performance evaluation should encompass a perspective that transcends organizational boundaries. Supply chains are designed to ensure that all players share goals centered on the client and collaborate to provide services meeting customers' criteria. To stimulate universal optimization across new supply chain processes, to conduct an evaluation of SCP across all companies involved.

SCP & SSP

Suppliers' strategic partnership practices aim to foster meaningful relationships with supply chain members (Singh et al., 2020). Therefore, the strategic relationship strengthens the skills of the company and promotes the integration of collaborative efforts among trading partners in the supply chain. A successful supplier relationship leads to opportunities for members of the supply chain to engage in collaborative problem-solving and planning activities with one another. Therefore, implementing strategic supplier partnership techniques over extended time helps an organization establish robust, integrated, and cooperative relationships to achieve continuous performance. Hence, proposed that

H1: Strategic supplier partnership has a positive relation to SCP

Customer relationship & SCP

A business can implement customer relationship practices to meet important customer criteria such as managing customer relationships, resolving client complaints, and attaining customer satisfaction (Baashar et al., 2020). A firm that can differentiate its product from competitors by providing meaningful customer relationships can increase consumer satisfaction and loyalty, resulting in a solid customer base (Alshurideh et al., 2023). Mass customization and individualized service have made relationship management practices even more important. Hence, fostering robust rapport with consumers is critical for achieving SCP and enhancing coordination among supply chain participants. This leads to the hypothesis that:

H2: Customer relationship is a positive connection with the SCP

Information-sharing & SCP

Numerous researchers have underscored the significance of information-sharing systems (Alzoubi and Yanamandra, 2020). Components of a supply chain can work together if they share information frequently. At some point in the future, partners in a supply chain will be able to better understand and precisely react to customers' requirements. Furthermore, a supply chain is sped up plus precise decision-making is made feasible; and made possible through the distribution and interchange of information that is both effective and efficient (Doumbia et al., 2021). A source of competitive advantage would be seen in this aspect. Therefore, hypothesis derived as:

H3: Sharing information is a positive connection with the SCP



SCI & Information-quality

Information quality must be ensured that the information is processed and transmitted accurately, sufficiently, quickly, and with complete reliability. It is crucial to ensure that the information meets these criteria, and there must be no compromise on its trustworthiness. Trustworthiness is another distinguishing feature of information quality. Numerous research studies imply that efficient information quality management within and throughout an organization could give businesses a competitive edge (Alshurideh, 2022). Alshurideh (2022) describes supply chain partners can effectively coordinate their activities thanks to the information quality sharing and practices that they engage in with one another. When it comes to information quality procedures, organizations ought to consider them. Consequently, this will not only increase the efficiency of decision-making but will also assist in acquiring the most effective supply chain operating solution (Singh et al., 2020). Consequently, hypotheses were created:

H4: Information quality is a positive connection with supply chain integration

Postponement & SCI

A postponement is the process of delaying particular processes until a later stage to either add more value or raise the level of satisfaction experienced by customers (Phares & Richey Jr., 2021). Postponement requires organisations to be more flexible, integrated, and responsive towards customer needs to meet the dynamic demands of the market and differentiate their products (Kumar & Gupta, 2021). The success of postponement methods largely depends on a firm's ability to integrate internally among all departments and externally with partners globally. In summary, postponement could help supply chain businesses reduce inventory levels, which can increase service level performance (Phares & Richey Jr., 2021).

Based on previous research, one could hypothesise that implementing postponement methods in supply chain management may lead to benefits such as higher value for the product, improved customer satisfaction, increased flexibility, and reduced inventory levels. This technique works well when the organisation can integrate internal and external departments. Hence, it is hypothesised that:

H5: Postponement is a positive connection with the SCP

The SCI Mediating Effect

This study's principal objective demonstrates that SCI partial mediating connection among SCMP and SCP. It also suggested that SCMP's powers within SCI enable them to influence SCP. By implementing various supply chain approaches, pharmaceutical businesses can enhance SCP by bringing together diverse enterprises in the supply chain. The success of an organization's SCMP initiatives may depend on its ability to integrate its processes internally and externally (Abdallah et al., 2021). According to research (Singh et al., 2020), SCI acts as a mediator between the independent factors of SCMP and the dependent variable of the supply chain. Therefore, the following was proposed:

H6: The SCI acts mediating role exists between SCMP and SCP

Figure 1

Conceptual framework



Research Method

The pharmaceutical company serves as the major unit of analysis for this study with its principal focus. This decision was made to reduce heterogeneity in SCMP, which is the primary rationale for concentrating solely on the pharmaceutical industry. Choosing organizations from a variety of pharmaceutical industries may present challenges when it comes to regulating particular aspects of supply chain architecture, such

as supply chain development. Ten pharmaceutical companies were randomly drawn from the Industrial estate in Peshawar, Pakistan. To improve the response rate, numerous steps were implemented, such as ensuring that companies would receive results via mail and conducting frequent follow-up phone calls. After all efforts, 171 questionnaires were obtained, overall 72.5% response rate. The questionnaires that had a valid return rate of 71% were retained after the partial survey was removed from consideration.

Measurement Scale

Using the SCMP scale that was designed by Li et al. (2006) the SCMP was quantified. This scale includes information quality, SSP, information sharing, postponement, and customer relationship as SCMP's primary dimensional construct. The suggested method for measuring SCMP includes a total of five elements that are seen as being essential for the implementation of SCMP. According to Espino-Rodríguez & Taha (2022), the SCI instrument pieces that were deployed comprised customer integration, internal integration, and supplier integration. A construct measuring SCP dimensions was taken from Eng (2006), utilising 4 items. The constructs all utilised a Likert scale (seven points), with 1 signifying strongly disagree and 7 representing strongly agree.

Table I

Factor loading, CR, and AVE

| | Sub-items | Factor loading | Cronbach | AVE | CR |
|-------|-----------|----------------|----------|------|------|
| SCMP | SSP-1 | 0.81 | 0.89 | 0.87 | .93 |
| | SSP-2 | 0.80 | | | |
| | SSP-3 | 0.86 | | | |
| | SSP-4 | 0.73 | | | |
| | SSP-5 | 0.85 | | | |
| | SSP-6 | 0.76 | | | |
| | CR- 1 | 0.74 | | | |
| | CR- 2 | 0.81 | | | |
| | CR- 3 | 0.78 | | | |
| | CR- 4 | 0.54 | | | |
| | CR- 5 | 0.72 | | | |
| | IS-1 | 0.68 | | | |
| | IS-2 | 0.70 | | | |
| | IS-3 | 0.68 | | | |
| | IS-4 | 0.70 | | | |
| | IS-5 | 0.70 | | | |
| | IQ-1 | 0.59 | | | |
| | IQ-2 | 0.81 | | | |
| | IQ-3 | 0.74 | | | |
| | IQ-4 | 0.74 | | | |
| IQ-5 | 0.79 | | | | |
| POS-1 | 0.81 | | | | |
| POS-2 | 0.81 | | | | |
| POS-3 | 0.85 | | | | |
| SCI | SCI-1 | 0.76 | 0.82 | 0.85 | .89 |
| | SCI-2 | 0.86 | | | |
| | SCI-3 | 0.84 | | | |
| | SCI-4 | 0.75 | | | |
| SCP | SCP-1 | 0.88 | 0.94 | 0.86 | 0.88 |
| | SCP-2 | 0.92 | | | |
| | SCP-3 | 0.92 | | | |
| | SCP-4 | 0.85 | | | |
| | SCP-5 | 0.89 | | | |

**Table 2**

Correlation analysis

| | Mean | S.D | 1 | 2 | 3 |
|------|------|------|-------|-------|-------|
| SCMP | 3.22 | 1.19 | (.89) | | |
| SCI | 3.14 | 1.22 | .46** | (.82) | |
| SCP | 3.18 | 1.21 | .42** | .54** | (.94) |

Table 3

Model fit

| | $\chi^2 / \Delta\chi^2$ | CFI | RMSEA | TLI | RMR |
|-------------|-------------------------|------|-------|------|------|
| SCMP | 2.28* | 0.92 | 0.071 | 0.92 | 0.04 |
| SCI | 2.34* | 0.94 | 0.072 | 0.94 | 0.05 |
| SCP | 2.30* | 0.93 | 0.073 | 0.93 | 0.03 |
| Final model | 1.34* | 0.94 | 0.064 | 0.91 | 0.02 |

Hypothesis Testing

Using confirmatory factor analysis, or CFA, researchers thoroughly inspect discriminant & convergent validity. We generated and analyzed various measurement models to determine which model best fits the data. The expected four-factor models were initially constructed, and indices revealed data fit the model well ($\chi^2 / \Delta\chi^2$, RMSEA, GFI, χ^2/df , CFI). Nonetheless, the various items of the concerned factors had a very low loading, so we excluded that item in accordance (Baisa et al., 2023). Two stages of analysis were used to test the measurement model. In the first phase, conducted CFA-AMOS 25.0 and Maximum Likelihood Estimation, as described by (Abdallah et al., 2021). It is essential to carry out a CFA on the measurement model to determine whether or not it is acceptable before computing estimates using SEM. Table 3 provides a comprehensive presentation of the outcomes of the measurement model fit for several construct components. These outcomes include the estimated values of $\chi^2 / \Delta\chi^2$, CFI, RMSEA, TLI, RMR, and chi-square difference. Table 1 shows the Cronbach alpha, AVE, and CR values for a specific construct. SCMP, SCI, and SCP have Cronbach's alpha coefficients of 0.82, 0.89, and 0.94. On the other hand, AVE and CR values each have a predefined threshold. Factor loadings for individual constructs ranged from 0.59 to 0.92, indicating statistical significance ($p < 0.001$). The discriminant validity of AVE was tested by (Fornell and Larcker, 1981) using the measurements presented in Table 2, which shows latent variable square root greater than dimension relations. This analysis takes into account the validity of the constructs (convergent and discriminant) as well as the dependability of the constructs. With the use of measurement models (CFA) that are examples of second-order constructs, the evaluation of the second-order model fit was carried out. As can be seen in Table 3, the findings and analyses of the model fit (CFA) are satisfactory ($X^2 / \Delta\chi^2 = 1.34$, CFI = 0.94, and RMR = 0.02. The value of RMSEA = 0.064).

Table 4

Empirical results

| Hypothesis | Path | Coefficient | Result | P |
|------------|----------|-------------|-----------|-----|
| H1 | SSP- SCP | 0.53 | Supported | *** |
| H2 | CR- SCP | 0.54 | Supported | *** |
| H3 | IS- SCP | 0.43 | Supported | *** |
| H4 | IQ- SCP | 0.32 | Supported | *** |
| H5 | PP- SCP | 0.34 | Supported | *** |

Table 5

Indirect, direct & total effects (H6)

| Effects | β | 95% bias-corrected | |
|----------|---------|--------------------|------|
| Direct | .119 | .023 | .219 |
| Indirect | .112 | .040 | .198 |
| Total | .231 | .105 | .348 |

Utilising second-order construct measurement models, the structural model was subsequently assessed. The findings indicate that strategic supplier partnerships have a positive relationship with SSP (H1), as supported by statistically significant standardised estimates of 0.53 (significant). Moreover, the H1, H2, H3, H4, and H5 hypotheses are supported significantly since path coefficients are recorded at 0.54, 0.43, 0.32, and 0.34, respectively. Hence, the study's results indicate that SCMP positively influences SCP. The study utilises Hayes & Preacher's (2017) comprehensive review for an examination of mediation's overall outcomes. This analysis encompassed both direct, indirect, and total effects. The indirect, direct, and total effects of SCMP on SCP via SCI were found to be significant at a 95% confidence level. These results show that SCI serves as the partial mediating relationship between SCMP and SCP, respectively H6 satisfied.

Discussion

This study provides insight into the relationship among SCMP practices, SCI, and SCP in the pharmaceutical industry of Pakistan. A deeper understanding of supply chain effectiveness and efficiency can be gained by examining the impact of various SCMPs on SCP as well as the mediating role played by SCI. Firstly, the results support the hypotheses regarding the positive relationships between SCMP and SCP. Several factors, including information sharing, information quality, strategic supplier partnership strategies, and customer interaction practices, had a substantial impact on SCP. In line with previous studies (Aslam et al., 2021; El Baz & Ruel, 2021; Jum'a et al., 2021; Saragih et al., 2020; Marbun et al., 2020),

A comprehensive supply chain management plan that addresses multiple aspects of SCMP is essential to improving the overall SCP. Moreover, the study reveals that SCI plays a crucial mediating role in the relationship between SCMP and SCP and is also in parallel with the study's findings (Shukor et al., 2021). This finding suggests that the effectiveness of SCMP in improving SCP is contingent upon the level of integration achieved within the supply chain. In other words, organisations that integrate their internal functions with external partners, such as customers, are more likely to experience enhanced performance outcomes as a result of their SCMP.

The partial mediation observed in the relationships between SCMP and SCP and also SCP further highlights the nuanced nature of the interactions between SCMP, SCI, and SCP. While these SCMP have direct positive effects on SCP, their impact is further enhanced by the mediating role of SCI. This suggests that to maximise performance benefits, organisations should not only concentrate on implementing individual SCMP but also aspire to a high level of integration throughout their supply chain.

Additionally, the findings underscore the importance of considering the specific context in which SCMPs are implemented. By focusing on the pharmaceutical industry in Pakistan, this study provides valuable insights that are relevant to the unique challenges and opportunities faced by organisations operating in this sector. The results suggest that the pharmaceutical industry in Pakistan has significant potential for improving SCP through the adoption of comprehensive SCMP and enhanced SCI.

Overall, the study contributes a body of knowledge on SCMP by shedding light on relationships linking SCMP, SCI, and SCP. By identifying SCI's mediating role and examining the specific SCMP that contributes to enhanced supply chain performance outcomes, research also offers valuable guidance to improve supply chain efficiency in the pharmaceutical industry and beyond.

Study Implication

The empirical investigation of SCMP suggests a direct causal link between SCMP and SCP. When proof of this connection, it should come as no surprise that policymakers and managers are encouraged to develop management and practical implications. Furthermore, consequence of this, a higher emphasis is placed on the SCMP, while the role of the SCI is ignored. The course of this investigation has yielded numerous theoretical advances. The first unique contribution of this study includes such as integrating the theoretical framework and providing empirical evidence of the impact of SCMP on SCP via mediating the effect of SCI, thus bridging a gap between the existing studies. The more thorough framework provided by the conceptually integrated approach makes it easier to understand the complex connection between SCMP, SCI, and SCP. Different ways to utilize SCP can be understood by deducing the functions of SCMP. Our second major contribution explains how SCI affects SCP by illuminating the ways in which SCI influences



each SCMP dimension. Consequently, it appears that the mediating effects of SCI on the various dimensions of SCMP in terms of their influence on SCP are not the same. Managers and researchers need to have a solid understanding of the procedure for decomposing the SCMP itself. As a result, managers and researchers ought to exercise caution before assuming that SCI is advantageous to clarify the connection between SCMP and SCP. The SCI partially mediates SCMP and SCP, according to Hair Jr. et al. (2017). When compared to previous work, this theoretical contribution is extremely uncommon. The importance of this information cannot be overstated when businesses are progressively stepping up their SCI processes (both internally and internationally). Given that integration between multinational corporations and small and medium-sized enterprises (SMEs) will further strengthen the competitiveness of the sector as a whole, it is indeed crucial in the case of Malaysia. Additionally, multinational corporations (MNCs) require the assistance of small and medium-sized enterprises (SMEs) to facilitate their production through outsourcing activities.

The ramifications for management are split in two. Based on the data, it appears that managers have the ability to make use of their current SCMP to boost SCI and, as a result, influence the degree of performance that their company achieves. Managers would be able to determine which SCMPs are profitable from the enhancement of SCI. On the other hand, the risk- and reward-sharing policies are not likely to encourage SCI. In light of the fact that these partially mediated activities do exert some influence on SCI, it is important to consider them as well. As a result of the fact that SCI is still relatively low in the industry, supervisors would encourage higher agreed-upon vision, information quality, and delay techniques to improve SCI and performance.

Managers should invest in both SCP and SCI if they are contemplating investing in SCMP. This will allow them to derive the greatest possible advantage from SCP. Because SCI acts as a mediator for the interaction between SCMP and SCP, the decision regarding investments should not be an autonomous activity that just takes into consideration practices or integration. If any budget allocation is made for the purpose of investing in activities related to SCMP, managers must bring this to the attention of the top management.

In a similar vein, the purpose of this research was to construct an empirical SCMP and integration model to enhance the performance of pharmaceutical companies that serve both corporate and retail clients. It is possible for the supply chain managers working for the manufacturing company to make use of these essential SCMPs and convert them into important success factors for pharmaceuticals. These vital success criteria would define the main result area for creating performance indicators for measuring the efficiency of organisational supply chain performance. The performance of the SCMP in the pharmaceutical business in Pakistan may be improved if managers are provided with a variety of options to choose from when picking the appropriate SCMP.

Limitations

A set of limitations applies to this study. One example is the selected case study concerning the pharmaceutical industry. As a result, generalization is likely not probable, when applicability to new industries is considered, given that the evidence is limited to a specific industry. In actuality, subsequent investigations may develop the focus to examine the framework put forth across different sectorial contexts, now that the mediating model has been validated. Response bias may have occurred, however, because the data were gathered from a single respondent within an organization. This is an additional limitation. Therefore, exercising caution is crucial when attempting to interpret the data. Moving forward, research endeavors should strive to collect information from a diverse range of company employees. Further, it is possible that no trends or changes were uncovered, as this study is based on the responses to a questionnaire survey that was performed at a singular point in time. Consequently, additional research could potentially enhance the applicability of the findings presently being disclosed. Further investigation could be conducted to expand the scope of the study and examine the relative implementation conditions across industries in terms of ownership structures, firm sizes, and various categories of business operations. Beyond this, further research may be undertaken to examine the potential synergies between knowledge management and total quality management practices, as well as to assess the influence of practices from other disciplines on SCI and SCP when combined with SCMP.

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