International Review of Management and Marketing

ISSN: 2146-4405

available at http: www.econjournals.com

International Review of Management and Marketing, 2025, 15(2), 157-170.

The Impact of Supply Chain Integration via Mediator—Supply Chain Resilience—on Improvement in the Performance of Manufacturing Sectors

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Received: 11 October 2024 **Accepted:** 15 January 2025 **DOI:** https://doi.org/10.32479/irmm.18191

ABSTRACT

The aim of this study is to develop an integrated model of the economic value of the of the supply chain integration (SCI) through resilience, in Jordan's manufacturing sector, focusing on how internal integration, supplier integration, and customer integration drive firm performance, with particular emphasis on the mediating effect of supply chain resilience. Data were collected from 300 managers of various manufacturing firms through a structured questionnaire, and linear regression and SEM were used to test the hypothesized relationships. The results indicated that internal integration significantly improves operational efficiency and cost reduction, supplier integration improves the efficiency of purchasing cost, and customer integration enhances responsiveness to market trends. Supply chain resilience is important in enabling firms to maintain stability in performance despite disruptions. The findings have implications for practical investment in integration and resilience to achieve strategic performance by Jordanian manufacturers. This research extends the literature on how SCI influences performance in a developing economy, with an emphasis on the need for a balanced approach between integration and resilience. Future studies should investigate these dynamics across different contexts to better comprehend the interplay between SCI and resilience.

Keywords: Supply Chain Integration, SC Resilience, Firm Performance, Manufacturing Sector
JEL Classifications: L23, M11, D24

1. INTRODUCTION

SCM has been very crucial in ensuring business continuity and profit maximization with the view to minimizing supply chain disruption, meeting customers' demand, and reducing loss of revenues. Integrated supply chain practices help for more effective internal collaboration and SC firm interaction. In recent years, Cousins et al. (2019) and Min et al. (2019) have also determined that SCI enhances resilience and firm performance, particularly in dynamic environments. According to Zhang et al. (2023), firms with higher levels of supply chain integration are much better at handling disruptions to achieve improved operational performance. Similarly, Wang and Li established in 2024 that SCI has a positive effect on supply chain resilience, which again eventually leads to improved firm performance during crises.

Different studies indicate that SC integration is positively related to improved profitability, market share, and customer satisfaction of a firm, as revealed by various research conducted by Alfalla-Luque et al., (2015); Flynn et al., (2010); Kumar et al., (2017); Mofokeng and Chinomona (2019); Zhao et al., (2013). The manufacturing industry, in turn, also views that through strategic control integration, organizations would be warranted to enable improvement in the competitiveness and profitability of firms. This was also agreed to by Elmuti et al. (2008); Lii and Kuo, 2016; Sundram et al. (2016).

One of the main reasons why SC is implemented is because it allows increasing the flow and quality of the goods across an SC, according to Wiengarten et al. (2016). Consequently, this will reduce costs and enhance effectiveness simultaneously Siagian

et al. (2021).In addition, SC integration offers a firm an opportunity to deal with inventory and capital resource management (Ataseven et al., 2018). However, SC integration may also prove to be a challenging task for firms on their own.(AlSagheer and Ahli, 2011; Awad, 2010; Kumar et al., 2017; Richey et al., 2009).

For example, it is difficult to coordinate activities across the supply chain, and it is not easy to integrate different suppliers (Christopher and Lee, 2004; Sundram et al., 2016). Besides, SCs are often very complicated and fragmented; hence, it is pretty difficult to do tracking and manage inventories (Diabat et al., 2016; Mirabelli and Solina, 2022). Earlier works have argued that the right level of integration is perhaps the most challenging issue: at an optimal level within the internal departments of firms or external between firms and its customers & suppliers (Seo et al., 2014; Zhao et al., 2015).

Academic research has shown that the link between SC integration and firm performance is ambivalent, particularly related to practical problems. Thus, some previous studies have reported a significant relationship between the two variables (Tarifa-Fernandez and De Burgos-Jiménez, 2017; Wiengarten et al., 2019). While others have reported an insignificant or contingent relationship (Danese and Romano, 2013; Fabbe-Costes and Jahre, 2008). contingent (Wong et al., 2011), or curvilinear relationship (Terjesen et al., 2012).

The literature may note conflicting findings because different dimensions of integration and methodologies have been used to investigate the relationship. Indeed, Han et al. (2020); Tiwari (2020); Wong et al. (2011) have used different sizes because of various definitions of SC integration or varied operational definitions of firm performance. For instance, some studies measure it by some dimensions only, such as He et al. (2014), while some measure it by unidimensional constructs like Marquez et al. (2004). Other studies, however, use the broad perspective of measuring it by dividing it into internal and external (supplier and customer integration), such as Du et al. (2018) and Flynn et al. (2010). Delic et al., 2019. Hence, based on these inconclusive findings of the previous studies, there is a need for more empirical investigation to establish the cause–effect relationship between SC integration and performance.

Customer integration would not cause the necessary results in such an uncertain environment to enhance SC efficiency or flexibility of a firm (Kalyar et al., 2019). Likewise, different contextual factors influence the benefit of supplier collaboration (Kim, 2013; Koufteros et al., 2007). Supplier reliability and performance are crucial factors in determining a firm's success in integrating supply chain management (Lee et al., 2007; Tiwari, 2020). Noticeably, over the past decade, there has been a rising call for a test of the mediating effects of other variables, such as instrumental factors that determine SC integration success. Among these, SC resilience appears to be one of the critical elements in the realization of expected benefits from integration (Ji et al., 2020; Piprani et al., 2020). In SC, resilience is referred to as the ability of the firms to adapt to the disruptions in their supply chains, recover, and hence continue to operate in a sustainable way (Cheng and Lu, 2017; Ji et al., 2020). Many studies have been conducted on the relationship between SC integration and SC resilience, establishing that the former enhances the latter (Ju et al., 2020; Piprani et al., 2020; Siagian et al., 2021).

Therefore, from the above literature gap and practical problems, it is necessary to study how SC integration and SC resilience influence firm performance. In this respect, this paper tries to explore the impact of SC integration on firm performance within Jordan's manufacturing sector. We examine in particular the manner in which SC resilience mediates the relationship between SC integration and firm performance.

This study therefore investigates the impact of SCI on firm performance in the Jordanian manufacturing industry, focusing on the role of SC resilience as a mediator. In addition, by investigating the lacuna in empirical research on SCI and SC resilience in developing economies, this study also tries to provide some insight into how Jordanian manufacturers may improve their performance through strategic integration and resilience-building initiatives.

These results have particularly significant implications for practitioners and policymakers in underlining a balanced development approach: integration of supply chain processes should be combined with the build-up of resilience to overcome disruptions.

To conduct this empirical study, we collect data from Jordanian firms operating in the manufacturing sector. The suitability of Jordan and its manufacturing sector stems from the fact that the industry contributes a major share of the country's GDP (Allan et al., 2018; Jum'a et al., 2021). Additionally, after the COVID-19 crisis and global problems in logistics and supply chain operations, Jordan has faced difficult challenges in terms of its supply chain (Al-Hyari, 2020; Siagian et al., 2021). Our study is crucial in the Kingdom and the industrial sector, particularly in developing countries like Jordan, as it provides valuable insights.

This paper is organized in the following way. In Section 2, the necessary literature on the subject is reviewed, also including the concepts of SCI, SC resilience, and the hypotheses developed. Section 3 contains the research methodology for this study; Section 4 presents analysis results; Section 5 is a discussion, putting findings into the existing literature framework; and Section 6 summarizes key insights, practical implications, limitations, and suggestions for future research in the conclusion of the paper.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Supply Chain Integration

The concept of SC integration refers to "The strategic collaboration with key SC partners, and effective and efficient management of intra- and inter-organizational activities related to the flow of products, services, information, finance and joint decision-making are identified as SC integration" (Jajja et al., 2018, p. 120).

In related literature, three types of SC integration exist based on their level of integration: Suppliers, customers, and internal

processes (Flynn et al., 2010; Jajja et al., 2018; Ju et al., 2020; Perdana et al., 2019). The first type is internal process integration, which means integrating a firm's internal processes. A firm that has internal process integration is able to communicate and coordinate with its various divisions effectively (Flynn et al., 2010; Huo et al., 2016). The company also spreads information across different sections (Chang et al., 2016). For example, the functional units share sales forecasting, production planning, and inventory levels through organizational management information systems (Jajja et al., 2018). In the same way, these sections collaborate rather than being in isolation to enhance their processes and products (Huang et al., 2014). It has also been established that internal integration can lead to external integration at higher levels (Cheng and Lu, 2017).

A firm with supplier integration communicates well with its suppliers and has a high level of trust. The firm also shares information with its suppliers and is involved in its decision-making process (Fawcett and Magnan, 2002; Kumar et al., 2017; Piprani et al., 2020). Buyers consider developing the managerial and technological capabilities of key suppliers a strategic step (Jajja et al., 2016). These complementary capabilities allow both parties to design, produce, and deliver products. Mechanisms of designed and developed ease and efficiency provide for easy sharing of product design and development information, production plans, levels of inventory, marketing plans, and distribution procedures (Lau et al., 2010). This in turn helps the firm to have a greater understanding of the supplier's capabilities and appreciation of the supplier's perspective, whereby joint product development and planning help ensure that the final product meets the buyer's quality standards and is delivered on time (Fawcett and Magnan, 2002; Zhao et al., 2015). Integration of suppliers has been demonstrated to include improved quality, reduced costs, and shorter lead times (Huang et al., 2014; Mofokeng and Chinomona, 2019).

The third one is the integration of customers wherein both the customers and the manufacturers engage each other in terms of the inventories, production planning, demand forecasting, order tracking, and the delivery of the produced products. According to (Wong et al., 2011) Customer participation can range in form from idea generation towards management and delivery of produced products. There are several ways involved in understanding the customers and engaging them in the development of the product and the process (Lau et al., 2010). According to Zhao et al. (2011), the involvement of key customers in product design and decision making can help the firms in understanding customer challenges and hence reduce ambiguities in the expectations of the customers.

2.2. Supply Chain Resilience

In a supply chain, resilience refers to the ability of an SC to handle disruptions and recover from them after they have occurred (Bahrami et al., 2022; Sabahi and Parast, 2020). In recent years, SC resilience has received increasing attention as businesses have become more reliant on global SCs (Spieske and Birkel, 2021; Tukamuhabwa et al., 2015). A resilient SC is one that is capable of rapidly adapting to changes in the environment and rapidly recovering from disruptions (Behzadi et al., 2020). For a firm to avoid significant disruptions to its supply chain, it needs to adapt quickly to environmental changes by actively modifying its response tactics to those changes. Traditionally, the ability to build up SC resilience has been demonstrated to have a positive impact on customer service (Scholten et al., 2014; Wong et al., 2020). Consequently, businesses are able to improve their financial performance, risk management, and market presence by increasing their SC resilience (Gu et al., 2021; Shashi et al., 2018; Yang et al., 2018). To maintain a cooperative relationship with their SC partners and manage SC resilience, businesses must work across departments as well as with their partners in the SC (Wong et al., 2020). Data gathered from various functions are also shared and processed as part of the business planning and coordination processes (Dhanaraj and Parkhe, 2006). The ability to build trust between departments and SC partners, share information, and make collaborative decisions are all facilitated by SC resilience (Dubey et al., 2021). A resilient SC allows firms to act quickly on opportunities and market trends (Wong et al., 2020). According to Kamalahmadi and Parast (2016), SC resilience can be broken down into three phases: anticipation (proactively planning and thinking), resistance (preserving structure and function), and recovery and response (efficient and timely responses).

2.3. Firm Performance

Various studies have yet focused on the firm performance with respect to the SCI. According to Johnson et al. (2023) companies that integrate their supply chains more effectively report higher customer satisfaction and financial performance. The finding not effectiveness is based on a firm's performance outcomes (Chong et al., 2011). Operational and financial accomplishments remain a focus of business management. Financial performance can be assessed by comparing a firm to similar businesses, taking market share, return on sales, and return on investment (Zhao et al., 2021). Organizational actions are undertaken by Lee and Park (2023). SCI enables firms to innovate and sustain their competitive edge. Performance evaluation is done with both qualitative and quantitative techniques where the organizational performance is tracked on a weekly, monthly, quarterly, course, or yearly basis. Operational efficiency includes maximum output with minimum consumption of internal resources.(Wong et al., 2021).

In today's world, it is becoming gradually more challenging to choose the right performance measurements when it comes to the interconnectedness and complexity of SCs (Flynn et al., 2010).

Ince et al. (2013) suggest that financial and market performance should be considered when evaluating an overall firm's performance. An increase in sales profit margins and ROI are two measures of financial performance. On the other hand, market success is obtained through sales growth, market share growth, and other productivity changes. The manufacturing industry uses measures such as quality of products and materials, order fulfillment, customer satisfaction, delivery time, and flexibility in calculating operating performance (Tarigan et al., 2021).

Basically, firm performance in the SC literature is measured with different dimensions like actual performance data and views expressed by managers (Ataseven and Nair, 2017; Chang et al., 2016; Fabbe-Costes and Jahre, 2008).

2.4. Hypotheses Development

2.4.1. Supply chain integration and firm performance

The view that, the resource-based view, contends SC integration to be an invaluable, inimitable, and proprietor social resource that offers competitive advantages (Eisenhardt and Martin, 2000; Jajja et al., 2018). Argues that SC integration is a differentiation means and an edge in boosting firm performance (Eisenhardt and Martin, 2000; Jajja et al., 2018). The integration capability can be considered as a resource that provides competitive advantages according to the RBV (Barney, 2012). Building integration capability and integration processes with internal and external partners is nontrivial and non-imitable (Huo et al., 2016). When working on the development of shared products using cross-functional teams of collaborators, architectural capabilities are required. In this kind of work setting, process capabilities ensure the sharing of information and communication (Huo, 2012).

It is also apparent that firms can improve competitiveness by acquiring resources or capabilities from outside the firm's boundary walls (Gnyawali et al., 2006). A study by Huang et al. (2014) shows that inter-firm integration facilitates the flourishing of joint knowledge, partner assets, and relationship governance.

For instance, through a close strategic partnership, suppliers can be better placed in responding to the changing needs of manufacturers (Zhang and Huo, 2013). The reason to establish long-term partnership is that it reduces transaction costs because of an enhanced level of shared trust and commitment, which increases collaboration, thereby reducing opportunistic behavior (Xu et al., 2014). Hence, a very close strategic alliance will help in sharing information and resources to improve decision-making, planning, and operational efficiency (Juan et al., 2021). According to (Ataseven et al., 2018; Schoenherr and Swink, 2012) integration with key customers can provide insight into market trends or new opportunities that allow fast and effective reactions to the needs of customers.

Therefore, this way, SC integration can result in superior firm performance. However, there were numerous studies that tested performance measures and dimensions of SC integration, and results were not consistent, pointing to a positive effect of SC integration on firm performance (Cheng et al., 2020; Flynn et al., 2010; Jajja et al., 2018; Lau et al., 2010; Vickery et al., 2013; Zhao et al., 2015).

For example, Cheng et al. (2020) in their findings conclude that only supplier integration is significant in determining influence on operational performance. On the other hand, Devaraj et al. (2007) stated that the effect of customer integration in comparison to the supplier integration on performance is not significant. On the other hand, Swink et al. (2007) indicate that performance in terms of operational performance in a manufacturing plant is not influenced by customer integration and supplier integration. While Flynn et al. (2010) actually indicate that internal integration is the only one that affects operational performance towards the positive side.

More empirical evidence on firm performance measures is, however, mixed. For instance, Rosenzweig et al. (2003) found a positive relationship of integration intensity with ROA but no relationship of customer satisfaction with sales growth. Vickery et al. (2003) offer a contradictory result: no statistically direct significant correlation with financial performance. In summary, when looking at all integration-performance linkages collectively, internal versus external integration goes with different kinds of performance outcomes.

In contrast, several other researchers found positive association between all dimensions of SC integration and firm performance, Droge et al. (2004); Kalyar et al. (2019); Munir et al. (2020); Srinivasan and Swink, (2015). Ataseven et al. (2018) noted that previous studies have shown that internal, supplier and customer integration significantly affect financial and operational performance including its dimension's delivery, cost, flexibility and quality separately. According to Zhao et al. (2015), supplier integration helps firms reduce purchase costs and often enhances performance. Flynn et al. (2010) and Zhao et al. (2015) showed that customer integration can be used by firms to understand customer expectations better and the opportunities available in the marketplace. Similarly, Chen et al. (2018) have also reported that customer and supplier integration influences overall firm performance positively. Based on the previous discussion, we hypothesize the following:

H_1: Internal process integration positively impact on firm performance.

H_2: Supplier integration positively impact on firm performance.

H_3: Customer integration positively impact on firm performance.

2.4.2. Supply chain integration, resilience and performance

Tukamuhabwa et al. (2015) assert that the two major theories applied in explaining SC resilience are RBV and dynamic capabilities. Capabilities can, therefore, be formed through the combination of available resources and exploiting them, as cited by Kim in (2009) based on the RBV logic. According to the literature, integration acts to facilitate the firm in responding faster to the rupture and being responsive to the environment, as reported (Hohenstein et al., 2015; Ju et al., 2020).

This would enable managers to better understand focal areas that require some kind of attention, hence reducing coordination and transaction costs (Brusset and Teller, 2017). The results reveal a positive relationship between the constructs of integration and resilience (Ju et al., 2020). As Brandon-Jones et al. (2014) remarked, enhanced SC visibility can be ascertained through both SC connectivity and information exchange. System-wide insights could point out bottlenecks and other potential pitfalls, enabling firms to take preventative action before disruption actually occurs. For Jüttner and Maklan (2011), transferring risk and knowledge between SCs increased SC resilience.

Internal integration, according to this line, is the integration of all internal functions and thus helps in faster decision-making and improved communication (Siagian et al., 2021). According to Liu and Lee (2018), integration of the customers and internal processes has a significant improvement on SC resilience while integration of logistics collaborators has no statistically significant impact. On the contrary. (Ali et al., 2021) clarify SC disruption has been

stated to be the cause of suffering for firms. According to (Khanuja and Jain, 2019) (SCI) is the way of the company that is well-tuned and the departments are communicating without problems. According to the latest studies by Brown et al. (2023), internal SCI is a factor that increases agility in the organization, thus, it makes the performance and the resilience of the organization in an uncertain environment better.

The aspect of disruptions can only be averted and customer service can be improved through the adoption of an integrated SC that coordinates their activities among numerous SC partners. With an integrated supply chain, communication and collaboration are improved, hence the resilience of the SC to adapt to the change of condition according to (Pettit et al. in 2013). Propose that;
H_4: Internal process integration positively impact on SC resilience.
H_5: Supplier integration positively impact on SC resilience.
H_6: Customer integration positively impact on s SC resilience.

SC disruption reduces its effectiveness and competitiveness because it halts the normal activities of the SC and breaks the information, materials, and money flow within the SC (Ramezankhani et al., 2018). Due to this fact, coping with SC disruptions as fast and efficiently as possible is necessary (Yu et al., 2019). In that respect, highly resilient firms are able to recover from an event and consequently reduce the impact of SC disruptions (Belhadi et al., 2021; Tukamuhabwa et al., 2015).

As represented by the dynamic capability view, a firm has to develop the resilience of its SC to handle environmental uncertainties (Chowdhury and Quaddus, 2017). That is to say, the ability of a firm to identify or respond to environmental changes is a prime factor for success. Firms that can promptly respond to the changes in the environment are more likely to survive and prosper than those that cannot (Kamalahmadi and Parast, 2016; Sabahi and Parast, 2020). With today's climate getting more and more unstable, it is imperative that the SC must be able to adapt itself to it (Gölgeci and Kuivalainen, 2020). Past studies have reported that there exists a positive relation between resilience and various dimensions of performance. (Altay et al., 2018; Bahrami et al., 2022; Chowdhury and Quaddus, 2017; Liu and Lee, 2018). SCI is about the relationship between a company and its customers. In the study, Smith et al. (2023) described how customer integration had a positive influence on demand forecasting accuracy, customer satisfaction, and market performance. It enables companies to comprehend and satisfy the customer's wishes which, in turn, makes the supply chain more flexible.

For instance, Chunsheng et al (2020) proved that with a resilient SC, a financial performance is heightened. For "by a resiliency boosting in SC, firms can experience performance increase," a study was conducted by Altay et al., (2018) claimed. Wieland and Wallenburg, 2013 also covered that higher resilience of SC can add customers value if the SC invests in agility and robustness. SC resilience will make sure that despite disruptions, business processes are easily and promptly implemented and that the final products and services will satisfy customer expectations (Gu et al., 2020). Firm profitability will also be growing, leading to improved performance and customer service experience (Govindan et al., 2015; Wong et al., 2020). Thus, we hypothesize:
H_7: SC resilience positively impact on firm performance.

2.4.3. Mediating effect of supply chain resilience

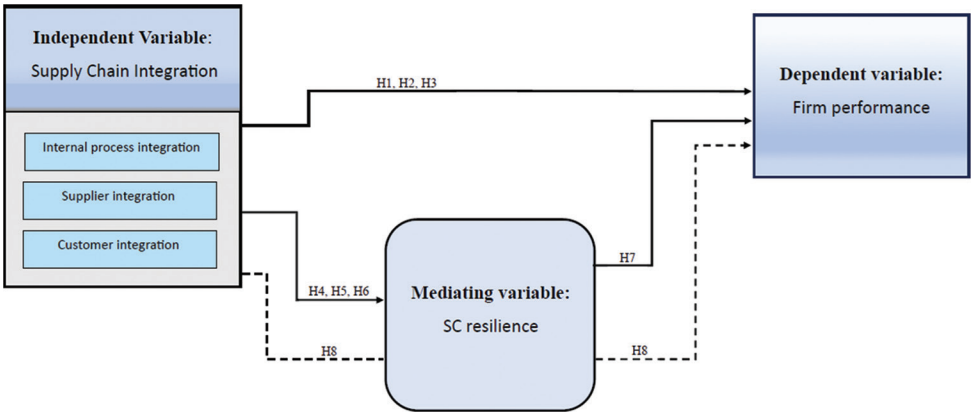
As hypothesized in H4, H5, and H6, we argue that the integration among internal information, suppliers, and customer's impacts SC resilience directly. In other words, SC resilience is defined as the ability of the firm to act in response to sudden environmental circumstances to reestablish operations from disruption (Adobor and McMullen, 2018; Ponomarov and Holcomb, 2009). Additionally, resilience in a SC relates to the view of containing disruptions through the available capacity of the system to quickly reallocate resources (Kamalahmadi and Parast, 2016). Success in an integrated SC depends on how effective the communication and collaboration and the sharing of relevant information are, either between internal units or with partners and the customers (Chowdhury and Quaddus, 2017). This allows them to respond to disruptions and recover fast (de Sá et al., 2019). Supply chain resilience is very critical post-pandemic.

As such, the SC becomes more visible, responsive, and flexible, boosting their resilience to enhance firm performance in different dimensions (Scholten and Schilder, 2015), (Magableh, 2021). For example, Asamoah et al. (2020) to SC performance. Other studies have shown that SC resilience significantly benefits customer-oriented performance via social network relationships. Scholten and Schilder (2015) reveal that information sharing between all the members of the SC reduces the recovery time following disruptions. Additionally, effective communication is emphasized by Kumar and Sharma (2021) to enable the firms to react promptly in cases of SC disruption.

It is well established that SC with strength in its network structure helps an organization lower the occurrence of risks of different kinds in the market and improves responsiveness to changes in demand (Manhart et al., 2020) through improvement in communication, coordination, and information sharing (Tiwari, 2020). Internal integration among firm units, for instance, is argued to increase the flow of information, knowledge, and communication within a firm (Chang et al., 2016; Hult et al., 2005). Thus helping a firm enhance its resilience through increasing the flows of information among the various functional departments within a firm. In the same way, the external integration with suppliers is deemed to increase the quantity of information shared among different actors in the SC; it also offers firms with the opportunity to access a wider range of resources and expertise outside their firm (Abeysekara et al., 2019; Kumar et al., 2017) which is essential during times of crisis and when firms are facing uncertainty (Wong et al., 2011). This coordination and collaboration enhance resilience by improving the effectiveness of decision-making and minimizing transaction costs both within the firm and across the supply chain, which represents good indicators of operational performance and profitability in the long term (Fawcett et al., 2008; Tiwari, 2020).

Apart from the above, several studies claim that resilience, or any of its indicators, mediates the relationship between SC

Figure 1: Research model proposed by author



integration and firm performance (Piprani et al., 2020; Siagian et al., 2021). Based on the above discussion, we propose the following hypotheses;

H_8: SC resilience mediates the relationship between SC integration and firm performance.

$H_{8\text{-}1}$: SC resilience mediates the relationship between Internal process integration and firm performance

$H_{8\text{-}2}$: SC resilience mediates the relationship between Supplier integration and firm performance

$H_{8\text{-}3}$: SC resilience mediates the relationship between Customer integration and firm performance

3. RESEARCH MODEL

The following model conceptualizes the relationship among SC integration, SC resilience, and firm performance. Most such models derive their origin in an empirical analysis into how the different types of integrations, namely (internal processes, supplier, and customer) to firm performance contribute to overall business success and ability to respond to disruptions. These are explained in hypotheses below on model (Figure 1):

4. RESEARCH METHODOLOGY

4.1. Sampling Method and Details

Therefore, a quantitative approach for this current study has been adopted. In this regard, 300 managers of industrial enterprises in Jordan were considered for data collection using a questionnaire. It was a purposive sample, and it included representation for firm size and type. Consequently, the relationships among the constructs of SC integration, SC resilience, and firm performance.

This would essentially be the quantitative approach, as it allows for statistical testing of the hypothesized relationships and generalization of findings across the manufacturing sector. For analyzing these complex variable relations, SEM was put in place, which also correspondingly fits the research goal in light of comprehending both direct and indirect effects, such as the mediating role of supply chain resilience. For that reason, SEM is the appropriate method since it explores multiple relationships simultaneously and may also capture the holistic view on how supply chain integration affects the firm's performance through resilience. Consequently, the SEM method was employed to test the relationships of SC integration, SC resilience, and firm performance. The SPSS program (version 27) was used to compute the descriptive statistics, while Smart PLS version 4.1.0.2 was used to perform the SEM analysis.

4.2. Validity and Reliability

4.2.1. Validity

The validity is expressed in this research by two major types: convergent and divergent. The researcher has used the following to perform necessary calculations to test the research hypotheses: Convergent validity is one of the most important features of its expression by standardized loadings. Divergent validity was observed by the method of Furnell and Larker, that compares the values of inter-correlation amongst the constructs with the square root of average variance, because the square root of AVE has to be higher than the inter-correlations.

4.2.2. Reliability

The reliability of the measurement model was tested by Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). Cronbach's alpha is about item relationships, CR is about measurement errors, and AVE is a variance explanation. The results are presented in tables.

The mentioned results concerning the loadings show that the minimum loading being observed was (0.714) related to the item coded (PERF1) belonging to the firm performance construct; given that this value was the smallest; all the other values were considered to be greater the minimum required (0.700) (Anderson and Gerbing, 1988; Hair et al., 2010) suggesting acceptable convergent validity for each construct.

The table also reflects the values of a substantial indicator for validity; namely the average variance extracted (AVE) which addresses the variance share of the items composing a construct; the smallest (AVE) proposed value must be (0.50). the provided values, satisfied this condition noting that the minimum observed AVE value was (0.607) for Integration Process construct, consequently the results show that the validity of the sub constructs has been met.

Table 1 also provides both the Cronbach alpha and composite reliabilities. Exploring the values of these two indicators it can

Table 1: Submits the values of items' loadings which deals the concept of convergent validity using the technique of CFA (confirmatory construct analysis)

Constructs	Sub construct	Item's				Construct's		
		Code	Mean	SD	loadings	CA	CR	AVE
Independent variable (supply chains)	Supplier Integration	SI1	4.15	0.90	0.794	0.898	0.900	0.663
		SI2	4.07	0.89	0.769			
		SI3	4.08	0.80	0.835			
		SI4	4.18	0.87	0.850			
		SI5	4.13	0.90	0.812			
		SI6	4.29	0.83	0.824			
	Integration process	IP1	4.13	0.93	0.741	0.870	0.875	0.607
		IP2	4.15	0.93	0.817			
		IP3	4.21	0.78	0.745			
		IP4	4.26	0.85	0.790			
		IP5	4.04	0.98	0.837			
		IP6	4.12	0.83	0.737			
	Customer integration	CI1	4.10	0.91	0.826	0.922	0.922	0.719
		CI2	4.20	0.80	0.853			
		CI3	4.07	0.98	0.853			
		CI4	4.21	0.93	0.867			
		CI5	4.06	0.95	0.832			
		CI6	4.19	0.95	0.855			
Mediator variable	Supply chain resilience	SR1	4.18	0.85	0.834	0.915	0.916	0.703
		SR2	4.03	0.99	0.800			
		SR3	4.21	0.84	0.870			
		SR4	4.15	1.00	0.849			
		SR5	4.16	0.86	0.836			
		SR6	4.18	0.87	0.841			
Dependent variable	Firm performance	PER1	4.18	0.86	0.714	0.934	0.936	0.629
		PER2	4.12	1.04	0.793			
		PER3	4.13	0.80	0.717			
		PER4	4.11	0.99	0.740			
		PER5	4.15	0.82	0.839			
		PER6	4.26	0.88	0.757			
		PER7	4.21	0.66	0.888			
		PER8	4.27	0.84	0.804			
		PER9	4.21	0.73	0.863			
		PER10	4.02	0.93	0.795			

Table 2: discriminant validity results using the method of Furnell – Larker

Constructs	Customer integration	Firm performance	Internal process	Supplier integration	Supply chain resilience
Customer integration	0.848				
Firm performance	0.661	0.793			
Internal process	0.412	0.595	0.779		
Supplier integration	0.627	0.661	0.510	0.815	
Supply chain resilience	0.712	0.614	0.674	0.573	0.839

Diagonal values in Bold reflects the square roots of AVE

be figured out that that the minimum value obtained of (CA) was (0.870) for Integration Process construct's items, while the minimum value composite reliability (CR) being revealed was (0.875) for Integration Process construct's items. The mentioned reliability values reflect high levels as it exceeded (0.70).

4.2.3. Discriminant validity

Table 2 The results of the discriminant validity are argued using the method of Furnell-Larker. This kind of validity assumes that the variables correlate to at least an acceptable minimum level. Thus, referring to the reported values, it can be depicted that the highest correlation value was detected between supply chain resilience and customer integration (0.712). The other important indicator of the extent of appropriateness of the discriminant validity results is the comparison of inter correlations with the square root of (√AVE) as shown diagonally in bold. The square root of (√AVE) is assumed to be greater than the inter-correlations for a given construct. This fact is confirmed by the figures included in the table; thus, it was decided that the method of Furnell - Larker expressed discriminant validity.

4.2.4. The descriptive statistics

Table 3 Descriptive statistics means and standard deviation normality. Normality was investigated based on the two basic indicators, skewness and kurtosis; skewness showed values ranging between (−1.58) and (−1.30), indicating the semi-normal behavior of data distribution since these values were confined between −3 and +3. The value of kurtosis indicator ranged and the highest reported value was about (4.53) represents the supplier integration and was less than top ceiling value should not be

exceeded (8). Kline (2005) so, the values of normality indicators suggest no issues about regarding normality.

Table 4 presents The study reveals that the maximum value of VIF (4.462) is <5, indicating no multi-collinearity issues in the data, which means the results of diagnosis show collinearity among predictor variables. (Brace et al., 2003).

The statement of hypothesis

H_1: Internal process integration positively impact on firm performance.

H_2: Supplier integration positively on firm performance.

H_3: Customer integration positive impact on firm performance.

H_4: Internal process integration positively impact on SC resilience.

Table 3: Constructs' means, standard deviations, normality indicators

Constructs	Means	SD	Skewness	Kurtosis
Suppler integration	4.15	0.7	−1.58	4.53
Internal process	4.15	0.69	−1.34	3.56
Customer integration	4.14	0.78	−1.30	2.46
Supply chain	4.15	0.68	−1.39	2.46
Supply chain resilience	4.15	0.75	−1.58	2.46
Firm performance	4.17	0.67	−1.23	2.46

Table 4: Means multi-collinearity detection among the different predictors (constructs)

Constructs	Firm performance	Supply chain resilience
Customer integration	3.091	3.888
Internal process	4.427	3.566
Supplier integration	4.462	3.858
Supply chain resilience	3.983	-

H_5: Supplier integration positively impact on SC resilience.

H_6: Customer integration positively impact on SC resilience.

H_7: SC resilience positively impact on firm performance.

H_8: SC resilience mediates the relationship between SC integration and firm performance.

The next table reviews the outcomes of hypotheses (1-7) illustrated the values in (Chart 1).

4.2.4.1. Results of testing the first main hypothesis

H_1: Internal process integration positively impact on firm performance

By Table 5, it's apparent that the impact value of Internal process integration on firm performance is 0.363, regarded as a statistically significant impact value as related P < 0.05 (0.000), hence, adopting the first main hypothesis that says internal process integration influences firms. performance.

4.2.4.2. Results of testing the second main hypothesis

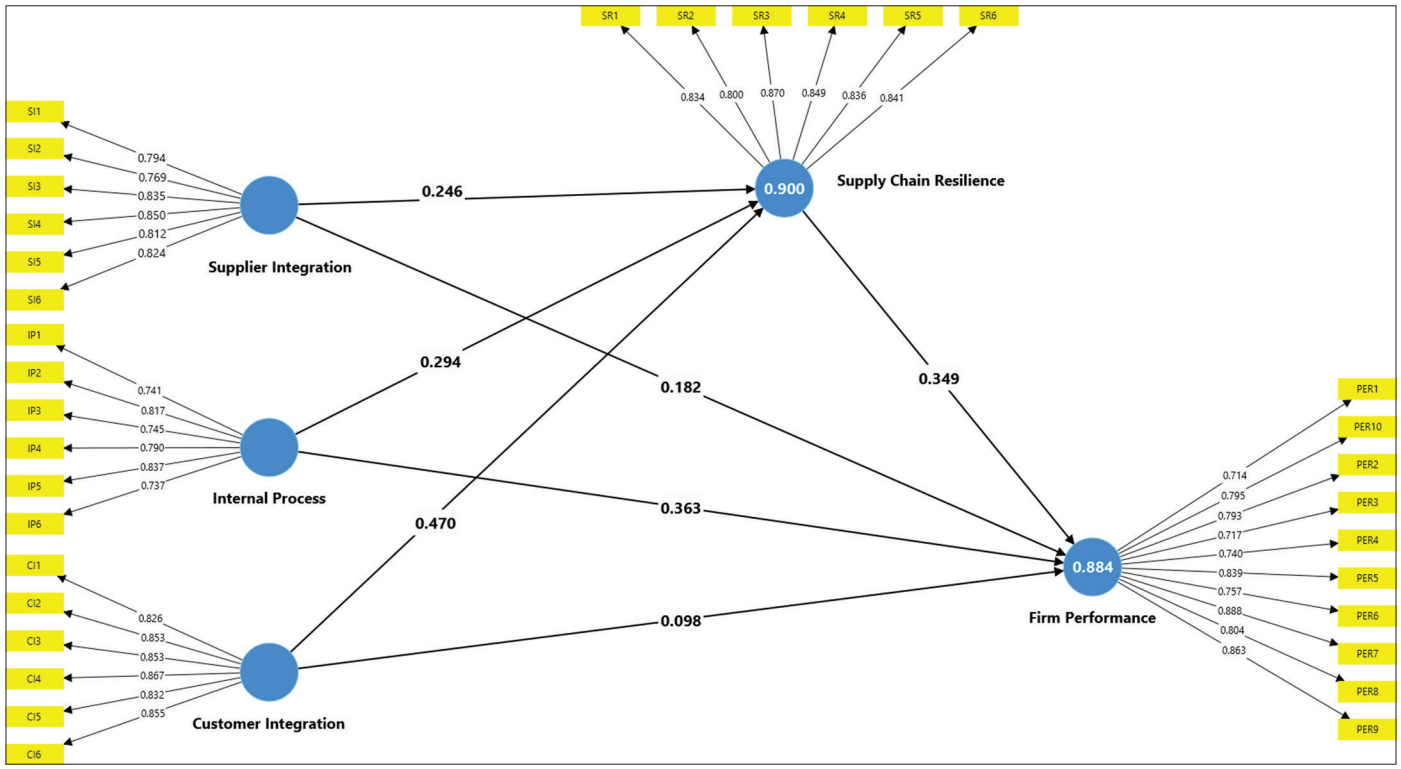
H_2: Supplier integration positively impact on firm performance

As noticed, Table 5 illustrates the results, which reveals that the effect value of the supplier integration on the firm's performance is 0.182; such effect value was considered statistically significant as the related P = 0.038 and <0.05. Based on the mentioned results, the second main hypothesis was supported.

4.2.4.3. Results of testing the third main hypothesis

H_3: Customer integration positively impact on firm performance

Chart 1: The impact value related in the structural model (source from software)



The value of customer integration to firm performance, referring to Table 5, was 0.098, regarded as a statistically significant impact value, the probability value related to this factor is 0.337 that was >0.05 so rejecting the third hypothesis.

4.2.4.4. Results of testing the fourth main hypothesis

H_4: Internal process integration positively impact on SC resilience

Table 5 shows the size of the impact value of Internal process integration on the supply chain resilience (SC resilience) that reached (0.294). It is a statistically significant effect value, as the related probability value (0.003) was <0.05 and guided to accept the fourth hypothesis.

The fourth main hypothesis was thereby supported.

4.2.4.5. Results of testing the fifth main hypothesis

H_5: Supplier integration positively impact on SC resilience

Table 5 below illustrates the size of the effect value of Supplier integration on supply chain resilience (SC resilience). The effect value that reached (0.246). It is a statistically significant effect value, as the probability value that associated with it equaled to (0.001), and this value was <0.05; it allows accepting the fifth hypothesis.

Therefore, the fifth working hypothesis was accepted.

4.2.4.6. Results of testing the sixth main hypothesis

H_6: Customer integration positively impact on SC resilience

Table 5 reveals the size of the impact value of Customer integration on supply chain resilience (SC resilience) at a value of impact of (0.470), therefore, the effect of (Customer integration) comes as statistically significant due to being smaller than 0.05 the associated probabilistic value of the effect equal to (0.000).

Upon this result, the sixth main hypothesis was adopted.

4.2.4.7. Results of testing the seventh main hypothesis

H_7: Supply chain resilience (SC resilience) positively impact on firm performance

Table 5 below shows the size of the effect value of supply chain resilience (SC resilience) on firm performance. The effect value was 0.349. This can be considered a significant effect value, as the probability value related to it was <0.05 (0.008), which means the adoption of hypothesis number seven.

Accordingly, the seventh hypothesis also received support.

Testing Hypothesis (8).

H_8: SC resilience mediates the relationship between SC integration and firm performance

This hypothesis was splitted into three sub hypotheses representing each component of the supply chain integration

H_{8-1}: SC resilience mediates the relationship between Internal process integration and firm performance

H_{8-2}: SC resilience mediates the relationship between Supplier integration and firm performance

H_{8-3}: SC resilience mediates the relationship between Customer integration and firm performance

H_{8-3}: SC resilience mediates the relationship between SC integration and firm performance

4.2.4.8. Results of testing hypostasis 8

H_{8-1}: Supply chain resilience (SC resilience) mediates the relationship between Internal process integration and firm performance

Table 6 reveals the mediation effect of SC resilience on the relationship between internal process integration and firm performance. The indirect impact value reported was 0.103. This value is statistically significant because the associated P = 0.030 was <0.05. The chain resilience-mediated percentage, caused by SC resilience, was estimated to be 22.10%; this was considered a partial mediation since its value was confined between 20.0% and <80.0% consequently, this hypothesis was approved.

H_{8-2}: supply chain resilience (SC resilience) mediates the relationship between Supplier integration and firm performance

Table 6 below presents the mediating effect of supply chain resilience (SC resilience) on the relationship between Supplier integration and

Table 5: Standardized impact values and statistical significance for hypotheses 1-7

No.	impact direction			β	se	t	probe
H_1	Internal process integration	--->	Firm performance	0.363	0.079	4.577	0.000
H_2	Supplier integration	--->	Firm performance	0.182	0.087	2.073	0.038
H_3	Customer integration	--->	Firm performance	0.098	0.101	0.961	0.337
H_4	Internal process integration	--->	SC resilience	0.294	0.100	2.939	0.003
H_5	Supplier integration	--->	SC resilience	0.246	0.075	3.290	0.001
H_6	Customer integration	--->	SC resilience	0.470	0.095	4.962	0.000
H_7	SC resilience	--->	Firm performance	0.349	0.133	2.640	0.008

Table 6: Indirect effect of the mediator variables on the relation between supply chain integration and supply chain resilience

No.	Indirect effect of the impact direction			Indirect Impact				Total effect	Mediation	
	Independent	Mediator	Dependent	β	se	t	probe		(%)	type
$H8_1$	Internal process integration	SC	Firm performance	0.103	0.047	2.191	0.030	0.466	22.10	Partial
$H8_2$	Supplier integration	SC	Firm performance	0.086	0.042	2.041	0.041	0.267	32.21	Partial
$H8_3$	Customer integration	SC	Firm performance	0.164	0.071	2.328	0.020	0.261	62.83	Partial

firm performance. The indirect effect size observed was 0.086 this is a statistically significant effect size as the corresponding P = 0.041 was < 0.05. The mediating effect of chain resilience (SC resilience) reaches 32.21%; this percentage represented a partial mediation as it was restricted between 20.0% and <80.0%.

Based on the current findings, this hypothesis was supported.

H_{8-3}: Supply chain resilience (SC resilience) mediates the relationship between Customer integration and firm performance

Table 6 shows the mediating impact of supply chain resilience SC resilience on the relation between Customer integration and firm performance. The observed value of the indirect effect was 0.164 This value is regarded as statistically significant impact value since the probability value that related 0.020 was < 0.05 The mediation percentage reaches (62.83%); this percentage represented a partial mediation as it was restricted between (20.0% and <80.0%).

This result lead to support this hypothesis.

The findings show that internal and external integrations of SC improve the business performance; however, internal integration has a more significant impact on operational efficiency and cost savings. The internal integration significantly improves operational efficiency, especially by reducing the buy cost, while customer integration provides a better view of the market trends and consumer expectations, thus increasing the overall performance.

The study also reflects that SC benefits depend on the industry type, business size, and degree of environmental unpredictability, and all these affect the degree of optimum integration. SC resilience is an important mediator; businesses use it to effectively respond to interruptions and sustain operations with success.

5. CONCLUSION

SC integration has a multidimensional effect on business performance, which is driven by several elements. Internal and external integration improves both operational and financial performance, although benefits vary among different types of industries and levels of environmental instability. SC resilience mediates this relationship, suggesting that organizations must balance integration with resilience in order to achieve the highest level of performance. Future research should focus more on these dimensions and, in particular, their interdependence to shed light on the SC integration-performance linkage.

5.1. Recommendations

As summarized below, the results suggest that an optimal approach to SC integration and resilience involves a balanced strategy for the industrial organizations. Firms should focus on internal integration and ensure immediate operational efficiencies while steadily enhancing supplier and customer integrations to match market necessities as well as technological advancements. Companies should also consider contextual and situational factors when developing plans about their supply chain integration, ensuring that supply chains are tailored to conditions regarding an organization, industry, and environment: Finally, investment in SC resilience capabilities is crucial for the minimization of risks and sustainment of performance due to interruptions. This integrated holistic approach to SC integration and resilience will further enable manufacturing organizations to cut down on lean time, improve financial performance, and preserve a competitive advantage within an ever-changing global market.

5.2. Contributions

5.2.1. Contextual relevance

Contextual Relevance: The study contributes to the literature by providing an empirical investigation of the role of SC integration in firm performance within a context-the Jordanian manufacturing sector-that has not been addressed by prior literature.

5.2.2. Focus on SC resilience

It brings to the table SC resilience as a mediating variable and further discusses how critical it is in the continuity and betterment of a firm's performance in light of disruptions.

5.2.3. Empirical validation

It testifies to the findings on the positioning of the SC integration dimensions (internal, supplier, and customer) and firm performance, in which internal integration exerts the most influential positive impact.

5.2.4. Industry-specific insights

It presents Insight findings specific to the Jordanian manufacturing sector, where the fine line of balancing SC integration with resilience is highly embarked upon to optimize performance.

5.3. Practical Implications

5.3.1. Strategic SC integration

Jordanian manufacturing firms should be urged to kick-start with internal SC integration to effectively achieve operational efficiency and low cost in the short term. Supplier and customer integration will follow in a phased manner to be up-to-date with market requirements and technological advancements.

5.3.2. SC resilience investment

Companies need to have a strong strategy to develop SC resilience. SC resilience is crucial in reducing risk and maintaining stability in any kind of disruption.

5.4. Theoretical Implications

5.4.1. Extension of RBV

The current study is an extension to the RBV theory by introducing SC resilience as the focal resource in maximizing the competitive advantage through SC integration.

5.4.2. Consequences of SC integration

The previously mentioned debate in the literature continues to be driven by the fact that the impact of SC integration on business performance indeed depends on the exact dimension of integration studied and the existence of SC resilience.

This means that SC resilience plays an important role in mediating between the SC integration and the level of performance of the

firms. Basically, SC resilience comes in implementing the actual performance of the firm once the benefits of SC integration have been accrued.

5.5. Future Research

According to some studies, integration can reduce the ability of a firm to quickly respond to changed conditions. This calls for further research to completely understand the relationship between SC integration, resilience, and firm performance.

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