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SUPPLY CHAIN DIGITALIZATION AND PERFORMANCE: A MODERATED MEDIATION OF SUPPLY CHAIN INTEGRATION AND SUPPLY CHAIN RESILIENCE

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ABSTRACT

This research investigated the relationships between Supply Chain Resilience (SR), Supply Chain Performance (SP), Supply Chain Integration (SI), and Supply Chain Digitalization (SD) in this global era of supply chain management. As we know everything is changing abruptly in this era where technology is the key to flourish in markets, the organizations are required to develop the strategies that focus to resilience in supply chain to enhance the association and performance within the organization. Questionnaire is drafted to collect the data of 106 respondents who are engaged in supply chain. This study observed that the supply chain integration and supply chain performance both are affected by supply chain digitalization and supply chain resilience impacts the integration in supply chain. Moderating effect of supply chain resilience between supply chain digitalization and integration is also highlighted while supply chain integration possesses mediation, it is also demonstrated through digitalization and supply chain resilience on supply chain performance. The findings would suggest that supply chain integration is the key driving force behind the performance of supply chain but this performance also need strategies related to resilience and technological development. This study would be helpful for strategy makers and research scholars as well.

Keywords: *Supply Chain Resilience SCR, Supply Chain Performance SCP, Supply Chain Integration SCI, Supply Chain Digitalization SCD, PLS-SEM, Moderation, Mediation, Structural Equation Modeling.*

INTRODUCTION

BACKGROUND OF THE STUDY

Globally, and locally supply chain has to face lot of hurdles due to the natural disasters, pandemics, political and economic uncertainty, and some unexpected factors such as corruption. Beside these independent factors there are factors which disrupt the transition phase of supply chain businesses and that is the technological advancement. This advancement possesses both pros and cons of it. The ever-changing environment also need the proactive strategies to meet the competitiveness and efficiency standards in operations of supply chain. Strategies regarding to modern technologies, resilient approach and the integrated system is much of concern. As we see the use of Artificial Intelligence has been made the necessity, supply chain digitalization is defined as the adoption of these new methods to pursue the operations like Internet of Things-IoT, and blockchain to improve the sharing of data in instantaneous, and decision making. Digitalization helps in integration to make the

data sharing and communication easier and less time consuming, it may lead to strong association among the partners engage in supply chain practices known as integration (Ivanov & Dolgui, 2020). Likewise supply chain integration defines in term of activities alignment and coordinated activities in the organizations involve in supply chain operations (Flynn et al., 2010). Resilience in supply chain is considered as to continue the production and its circulation in the existence of disruptions, it means if any uncertain condition occurred so the organizations must be adaptable and know how to continue the process with all these commotions. Resilience teaches to be opportunist, flexible, and adjustable in and circumstances to minimize the effect of risks and troubles. The interaction between resilience and digitalization is interconnected as the both thrive to be adaptable one adopts the new technology and other one accepts this change, this combination helps to enhance the performance and to subside the uncertainty with strong resilient behavior (Christopher & Peck, 2004). In uplifting the supply chain success investigating the variables and their interconnections is crucial. The prior researches have done a lot of work in this sector but the there is still a gap can be observed related to the study of supply chain digitalization and resilience and the combination of both and their effect on performance of supply chain and, also the need to explore the mediation and moderation analysis of supply chain integration and resilience respectively.

The Figure 1shows the model conceptually in the study showing the variables and their treatment as supply chain digitalization as independent variable, impacting the dependent variables includes; supply chain integration and supply chain performance. Mediator variable in the model is supply chain integration while supply chain resilience treated as moderator in the conceptual framework.

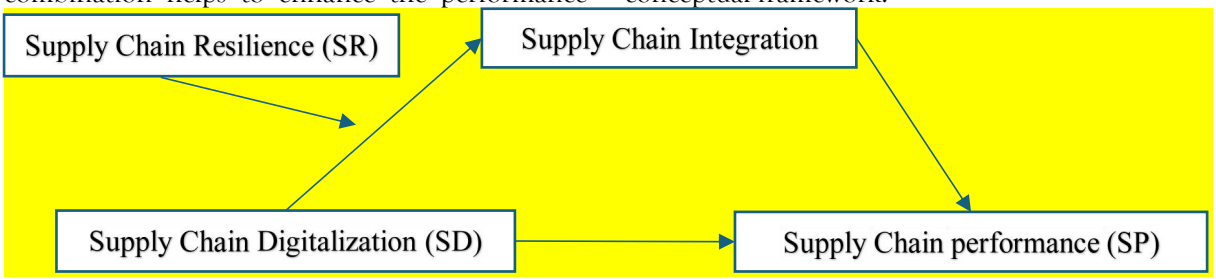

FIGURE 1 CONCEPTUAL MODEL

LITERATURE REVIEW

INTRODUCTION

In this era where everything is changing frequently ana spontaneously it makes the supply chain processes complex. It rises the need to observe the variables which are important to maintain the efficiency and effectiveness of supply chain processes. Literature suggests that supply chain resilience, performance, integration, and digitalization have coming forward as the variables to be explored and have great influence on supply chain. These variables include the necessities of modern world requirement such as spontaneous disruptions caused by uncontrolled factors, increasing customer demands, and innovations in technology. The literature is done by using thematic approach to provide the understanding related to these variables that how they interact with each other and what are their impression on supply chain management.

SUPPLY CHAIN RESILIENCE

Christopher & Peck, 2004 in this study supply chain resilience is defined as, "the capability of a supply chain to prepare for, respond to, and recover from disruptive events while maintaining its core functions." This ideology draws the attention towards the mounting occurrence of disruptions including; natural disasters, instability in politics and economy and the pandemics. As after the occurrence of Covid-19 the setting of work environment has completely shift to other methods to keep the work going. It has shown the resilient behaviors of many industries by being flexible and adaptable to change. This behavior helps organizations to be able to minimize the risks and continue their operations (Ponomarov & Holcomb, 2009). It also involves redundancy that organization must have additional inventory to be proactive for any uncertainty in future (Sheffi & Rice, 2005). Association with frequent communication with partners in supply chain is

helpful in better usage of shared information among the partners (Tang, 2006). Resilience work well with the technology so it is required to remain attached with the digitalization, it helps in decision making (Ivanov & Dolgui, 2020).

SUPPLY CHAIN PERFORMANCE

This construct includes multiple dimensions related to efficiency and effectiveness of operations driving the supply chain. Supply chain performance emphases on the cost efficiency, reliable delivery, satisfaction of customers and responsiveness of supply chain (Gunasekaran et al., 2004). If the supply chain performance observed to be stable it leads to competitive advantage and stable profit for longer period (Mentzer et al., 2001). There are factors that may affect performance such as unaligned goal setting, supplier relationships are not on good terms and difficulty in adoption of emerging technologies (Hohenstein et al., 2014). It is suggested that to enhance the performance the operations must be integrated with one another to keep the pace high and to achieve better outcomes (Christopher, 2000).

SUPPLY CHAIN INTEGRATION

Integration in SCM is defined as the collaborations and association with the partners engage in supply chain. This collaboration helps in enhancing the supply chain performance (Flynn et al., 2010). It is divided in to three types of integration, first one is internal, second is supplier and third and the last is customer. Internal organization involves the connections among the departments within the organizations while external integration includes supplier and customer relationship (Stevens, 1989). All these integrations are important to bring harmony inside and outside the organization and help the organization in making customer satisfied, efficient operations and innovation (Frohlich & Westbrook, 2001). This integration involves many challenges as it is crucial for organizations to share their confidential information and building of trust among partners (Zhao et al., 2008).

SUPPLY CHAIN DIGITALIZATION

Digitalization is considered as leaving the old methods and using the new methods this transition from new to old is also existed in supply chain, known as supply chain digitalization. It is defined as the transition of traditional methods of supply chain to the updated method which involves technological advancement adoption (Schrauf & Berttram, 2016). Technologies involves the big data analytics, blockchain, Internet of Things (IoT), and artificial intelligence -AI. This advancement improves the visibility to supply chain by providing present information related to inventory, demand trends and shipments schedule (Ivanov et al., 2019). Digitalization also incorporated the tools that can predict and anticipate the unannounced spontaneous uncertainty, it would help firms to be proactive and responsive at the time of emergence. It also helps in bridge the gap among partners through communication, and minimizing the lead time (Queiroz et al., 2020). Nothing comes with pros only cons are always there, like digitalization may incur huge installation cost, risk of cybercrime needs to be catered also organization will need skilled employees to manage the system and softwares (Wamba et al., 2018).

THEORETICAL BACKGROUND

The theory of Resource-Based View (RBV) provides the conceptual framework for the variables including; supply chain digitalization (SD), supply chain integration (SI), supply chain performance (SP), and supply chain resilience (SR). For better understanding theoretical framework provide pathway for the exploration of relationships and their interconnections. The theory of RBV is based on that how firms can control their tangible and intangible assets, including digital technologies and integrative proficiencies, to gain competitive advantages (Barney, 1991). While, Dynamic Capabilities Theory stresses upon the supply chain resilience (Teece et al., 1997). Another theory named Institutional Theory also plays a part in knowing how external pressures, such as regulatory changes or industry norms, effect the embracing of digitalization and integration practices within supply chains (DiMaggio & Powell, 1983). Lastly, Systems Theory helps to add the concept of interconnectedness of components relating to association and collaborations (Bertalanffy, 1968).

HYPOTHESES DEVELOPMENT

H1: Supply Chain Digitalization (SCD) has direct relation to Supply Chain Integration (SCI). Supply chain digitalization enables instantaneous

data allocation, enhances communication, it helps in enabling integration at vast level among supply chain partners (Ivanov et al., 2019).

H2: Increase in Supply Chain Digitalization (SCD) adoption may lead to enhance Supply Chain Performance (SCP). By implementing advanced technologies, digitalization enhances operational efficiency, helps in minimizing lead times, and improves decision-making, by this means boost the performance (Queiroz et al., 2020).

H3: According to prior literature, Supply Chain Integration (SCI) positively impacts Supply Chain Performance (SCP). Integration confirms continuous collaboration, and enhances responsiveness to customer demands, subsequently improved performance (Flynn et al., 2010).

H4: Supply Chain Resilience (SCR) possesses positive linkage with Supply Chain Integration (SCI). Resilience allows firms to adopt collaborative behavior and augment their adaptive capabilities, consequently strengthen integration (Christopher & Peck, 2004).

H5: Supply Chain Resilience (SCR) and Supply Chain Digitalization (SD) jointly influences Supply Chain Integration (SCI) positively. Firms considered as resilient equipped with digital tools can better adapt to uncertain conditions (Ivanov & Dolgui, 2020).

H6: Supply Chain Integration (SCI) performs a role of mediator between Supply Chain Digitalization (SCD) and Supply Chain Performance (SCP) (Frohlich & Westbrook, 2001).

H7: Supply Chain Integration (SCI) also mediates the association between Supply Chain Resilience (SCR) and Supply Chain Performance (SCP) (Ponomarov & Holcomb, 2009).

H8: The interaction between Supply Chain Resilience (SCR) and Supply Chain Digitalization (SCD) together influences Supply Chain Performance (SCP) positively through Supply Chain Integration (SCI) (Wamba et al., 2018).

GAP ANALYSIS

Many researches have been conducted on the constructs mentioned in the study, but there are some gaps that are significant to highlight. Following the research gaps:

Limited Understanding of the Interaction Between Resilience and Digitalization

Prior researches and studies have focused on supply chain resilience and supply chain digitalization individually but the examination of their combined effect on supply chain integration and performance. This exploration may help to comprehend the problems and their origin which lead to decline in performance. This combination is also required to be observed in different scenarios.

Inadequate Focus on Mediating and Moderating Relationships

Studies has shed the light on direct or positive linkage between all the constructs but the mediation and moderation are yet to discover. In this investigation supply chain resilience is treated as moderator and supply chain integration is measured as mediator to evaluate the behavior of the constructs. This will discover more factors which may lead to enhance performance of supply chain operations.

Scarcity of Empirical Studies in Emerging Economies

Developed economies have already done the researches on these phenomena while using these constructs, it is observed the emerging and developing economies are not studied as required. Emerging economies as they have limitations related to implementation of digitalization, infrastructure and political instability need investigation on these constructs to have understandings to solve the issues and simultaneously enhance the performance in the presence of all disruptions.

Impact of Digitalization on Resilience in Dynamic Environments

Review of literature reveals that the relationship of digitalization and resilience is required to be explored. Digitalization plays a key role to bring flexibility and adaptiveness in an uncertain environment.

By investigating these gaps, this study will contribute to understanding the theories related to supply chain management and the way they work together and, also propose the practical implications of these relationships. It will assist both the practitioners and academic scholars for their decision making and adopting strategies.

RESEARCH METHODOLOGY

For the collection of data convenience sampling is used. Questionnaire is drafted on Google form comprising of two parts the one with demographic details and the other one with questions related to variables. This survey is conducted online and collected the sample of 106 respondents. For model analysis all the data collected is evaluated in SmartPLS 4.

Table 1 Measures Utilized

Code	Variables	Items	Source
SR	Supply Chain Resilience	4	Mohammad Bahrami (2022)
SP	Supply Chain Performance	7	Mohammad Bahrami (2022)
SI	Supply Chain Integration	3	AchmadWildanNabila(2022)
SD	Supply Chain Digitalization	5	Rameshwar Dubey (2023)

Constructs

The questionnaire has total 19 items presented in Table 1. It shows the variables with their respective number of items and the sources of these constructs. Four items are related to Supply Chain Resilience (SR) extracted form a source of Mohammad Bahrami (2022). Supply Chain Performance has seven items in total driven from Mohammad Bahrami (2022). While, Supply Chain Integration and Supply Chain Digitalization have three items taken from the source of AchmadWildanNabila (2022) and five items form Rameshwar Dubey (2023) respectively. All the items are coded with the range of 1 to 5 on a Likert Scale. Code 1 represent the strongly disagree and ranges to 5 which represent strongly agree respectively.

Sample and Data Collection

The study used a designed questionnaire to collect primary data from participants actively involved in supply chain operations. A total of 106 valid responses were obtained, representing a diverse group of professionals based on gender, age, education, and duration of supply chain usage. The questionnaire is drafted to collect the primary information from the people who are part of supply chain industry. The collected is divided in two section one is the demographic profile shown in Table 2 and the other one is to collect the information relating to constructs shown in Table 3.

TABLE.2
DEMOGRAPHICS

Items	Classification	Sample Amount	Percentage
Gender	Male	78	73.6
	Female	28	26.4
Age	20 – 29	42	39.6
	30 - 39	46	43.4
	40 – 49	12	11.3
	Above 50 years	6	5.7
Education	Undergraduate	8	7.5
	Graduate	61	57.5
	Masters	37	34.9
Duration of usage	Less than 1 year	14	13.2
	1 – 2 years	33	33.1
	3 – 4 years	29	27.4
	More than 4 years	30	28.3

Table 2 specify the demographics of the respondents including the gender, age, education and the duration of usage. It shows that 73.6% of the respondents were male, while 26.4% were

female. The majority of respondents (43.4%) were aged 30–39, followed by 39.6% aged 20–29, 11.3% aged 40–49, and 5.7% above 50 years. Most respondents (57.5%) were graduates, 34.9% held master's degrees, and 7.5% had undergraduate qualifications. Respondents had varying levels of experience with supply chain operations, with 33.1% having 1–2 years, 27.4% having 3–4 years, 28.3% having more than 4 years, and 13.2% having less than 1 year.

DATA ANALYSIS TECHNIQUE

Tools used for data analysis is SmartPLS 4. This software is well known to handle complex relationships with robustness and provide detailed evaluation of each construct. It has an acceptable range of sample size which is equal to above 100 responses to measure the model. To test hypothesis, Partial Least Squares Structural Equation Modeling (PLS-SEM) is used and measure the relationships in the model to find out the statistical significance and insignificance level (Hair et al., 2021).

RESULTS

INTERPRETATION OF MEASURES

The Table 3 shows the reliability of constructs as well as the validity of these constructs by measuring the Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). All the variables known as constructs including Supply Chain Resilience (SR), Supply Chain Performance (SP), Supply Chain Integration (SI), and Supply Chain Digitalization (SD) possess factor loadings. The details of the constructs are mentioned below:

Outer loadings imitate the intensity of the relationship between each indicator and its corresponding latent construct. Generally, a loading above 0.7 is considered acceptable (Hair et al., 2021). An acceptable range for outer loading is above 0.7, which shows the strength of relationships between the constructs through their items (Hair et al., 2021). Supply Chain Resilience (SR) has all outer loadings exceed 0.75, indicating a robust relationship between the indicators. Supply Chain Performance (SP) reflects that majority of outer loadings surpass the 0.7 threshold, demonstrating acceptable indicator reliability. Further, Supply Chain Integration (SI) reveals outer loadings range from 0.774 to 0.882, showing that the items reliably measure the construct. While Supply Chain Digitalization (SD) shows an excellent reliability having Outer loadings above 0.8, with the highest at 0.911, reflecting strong reliability of the indicators. Cronbach's Alpha evaluates the consistency of the items within each construct. Threshold is considered as values above 0.7 are generally acceptable, while values above 0.8 specify good reliability (Nunnally & Bernstein, 1994). Cronbach's Alpha, values above 0.7 are considered acceptable, while values above 0.8 indicate good reliability (Nunnally & Bernstein, 1994). SR has 0.891 value showing an excellent internal consistency. While SP possesses 0.918 Cronbach's Alpha achieve the high reliability of the construct. SI is measured 0.766 value reflecting adequate internal consistency, and SD has 0.845 value it is also above the threshold shows good internal consistency. Composite reliability provides a more robust measure of internal consistency compared to Cronbach's Alpha. 0.7 is considered an acceptable value. All constructs (SR: 0.891, SP: 0.918, SI: 0.863, SD: 0.907) demonstrate composite reliability well above the threshold, indicating strong reliability of the measures. AVE measures the amount of variance taken by a construct due to measurement error. An AVE value of 0.5 or higher indicates adequate convergent validity. SR (0.671), SP (0.616), SI (0.678), SD (0.764), all constructs meet the AVE threshold, confirming that they capture sufficient variance from their indicators.

FIGURE 2 PATH ANALYSIS

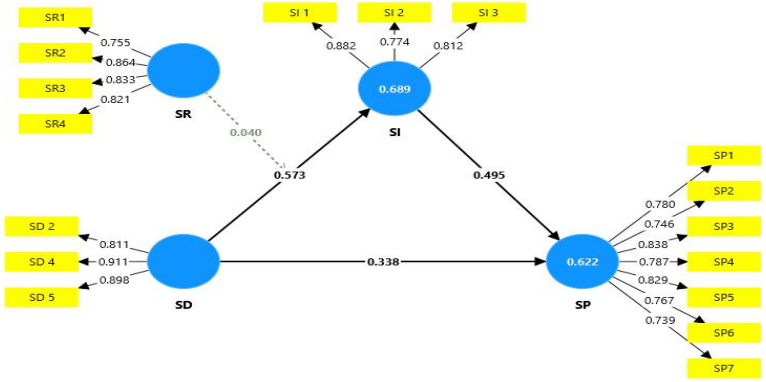

TABLE 3 MEASURES

Construct	Questions	Outer loadings	Cronbach Alpha	Rho C	AVE
SR	SR 1: "Our organization can easily restore material flow"	0.755	0.836	0.891	0.671
	SR 2: "Our organization would not take long to recover normal operating performance"	0.864			
	SR 3: "The supply would quickly recover to its original state"	0.833			
	SR 4: "Our organization can quickly deal with disruptions"	0.821			
SP	SP 1: "This organization has full visibility of our supply chain"	0.78	0.896	0.918	0.616
	SP 2: "This organization appropriately manages supply chain risk"	0.746			
	SP 3: "This organization's primary supply chain has the ability to minimize total product cost to final customers"	0.838			
	SP 4: "This organization's primary supply chain has the ability to deliver zero-defect products to final customers"	0.787			
	SP 5: "This organization's primary supply chain has the ability to minimize all types of waste throughout the supply chain"	0.829			
	SP 6: "This organization's primary supply chain has the ability to deliver right-sized lot sizes and shipping case sizes to final customers"	0.767			
	SP 7: "This organization's primary supply chain has the ability to eliminate late, damaged and incomplete orders to final customers"	0.739			

SI	SI 1: "Our company and the target customer have a high level of information sharing"	0.882	0.766	0.863	0.678
	SI 2: "There is a lot of information flow between suppliers in the same supply chain"	0.774			
	SI 3: "In the same supply chain, there is a greater level of technological dependency among providers"	0.812			
SD	SD 2: "We use artificial-driven big data analytics capability to tackle the carbon emissions issue"	0.811	0.845	0.907	0.764
	SD 4: "We use artificial driven big data analytics capability to recycle and reuse waste concretes to reduce the consumption of limestone"	0.911			
	SD 5: "We are flexible enough to respond to sudden changes in market demands by adjusting the configuration of production capability"	0.898			

The results signify that the model has strong reliability and validity of its all constructs. Each measurement meets the threshold level showing that all the constructs are aligned perfectly. The values of Average Variance Extracted (AVE) detect the convergent validity and in this model all the constructs achieve the significant variance. These results enable the model for further structural equation assessment through SmartPLS 4.

HETEROTRAIT-MONOTRAIT RATIO (HTMT)

The HTMT ratio is estimated in Table 4 shows the discriminant validity of the constructs, proving that constructs are distinct from one another. According to the study done by (Henseler et al., 2015) values below the threshold of 0.85 are known as strict or 0.90 considered as lenient specify acceptable discriminant validity. The HTMT values between constructs such as SD and SI (0.839), SI and SP (0.884), and SR and SI (0.843) indicate satisfactory discriminant validity under the lenient threshold of 0.90. The moderating term SR x SD exhibits low HTMT values with other constructs, suggesting that it is distinct and does not overlap with the primary constructs. These findings approve that the vriables in this study possess sufficient discriminant validity, allowing for the reliable explanation of relationships in the structural model.

TABLE 4

Heterotrait-Monotrait ratio (HTMT) - Matrix

Construct	SD	SI	SP	SR	SR x SD
SD					
SI	0.839				
SP	0.829	0.884			
SR	0.735	0.843	0.725		
SR x SD	0.445	0.435	0.600	0.651	

HYPOTHESIS TESTING

PLS-SEM gives the result of hypotheses testing showing the significance between the relationships. As shown in Table 5 beta values known as factor loadings, t-statistics and p-values.

DIRECT EFFECTS:

SD → SI (beta value = 0.573, p-value = 0.000): It reflects supply chain digitalization significantly and positively influences supply chain integration.

SD → SP (beta value = 0.338, p-value = 0.001): It reveals Supply chain digitalization directly

contributes to improving supply chain performance.

SI → SP (beta value = 0.495, p-value = 0.000): It signifies supply chain integration has a strong and significant impact on performance.

SR → SI (beta value = 0.377, p-value = 0.000): Represent supply chain resilience positively affects supply chain integration.

MODERATION EFFECT:

SR x SD → SI (beta value = 0.040, p-value = 0.000): It specifies the interaction of supply chain resilience and digitalization has a significant positive moderating effect on supply chain integration.

MEDIATING EFFECTS:

SD → SI → SP (beta value = 0.284, p-value = 0.000): It demonstrates supply chain integration significantly mediates the relationship between digitalization and performance, indicating that integration amplifies the effect of digitalization on performance.

SR → SI → SP (beta value = 0.186, p-value = 0.005): It shows supply chain integration also mediates the relationship between resilience and performance, showing that resilience drives performance indirectly through integration.

MODERATED MEDIATION EFFECT:

SR x SD → SI → SP (beta values = 0.020, p-values = 0.398): It presents the interaction of resilience and digitalization does not significantly influence supply chain performance through integration, as the p-value exceeds the threshold of 0.05.

TABLE 5 HYPOTHESIS TESTING

Hypothesis	Relationship	Beta	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
H1	SD -> SI	0.573	0.575	0.089	6.408	0.000
H2	SD -> SP	0.338	0.333	0.101	3.345	0.001
H3	SI -> SP	0.495	0.504	0.093	5.338	0.000
H4	SR -> SI	0.377	0.378	0.087	4.326	0.000
H5	SR x SD -> SI	0.040	0.041	0.048	4.851	0.000
H6	SD -> SI -> SP	0.284	0.287	0.056	5.062	0.000
H7	SR -> SI -> SP	0.186	0.195	0.066	2.834	0.005
H8	SR x SD -> SI -> SP	0.020	0.020	0.024	0.845	0.398

The outcomes of hypothesis examination demonstrate the important role of supply chain integration both directly influencing the performance in supply chain and treated as mediator between digitalization and performance also between the supply chain resilient and supply chain performance. While digitalization and resilience exclusively boost integration and performance, their interaction (moderation) shows a significant impact only on integration. However, the moderated mediation effect is not supported, indicating that the combined influence of resilience and digitalization on performance through integration is not statistically significant.

DISCUSSION

The results concluded from hypothesis testing provide a valuable understanding about relationships among supply chain resilience (SR), supply chain performance (SP), supply chain integration (SI), and supply chain digitalization (SD), all of which are critical components of modern supply chain management. This research intended to discover how these variables interact within dynamic and ambiguous environments, highlighting the requirement of digital technologies and resilient strategies in enhancing supply chain performance. The results confirm that digitalization suggestively augments both

supply chain integration (beta value = 0.573, p-value = 0.000) and performance (beta value = 0.338, p- value = 0.001). These findings align with prior research representing that digital technologies facilitate helps to make operations smoother, improved information flow, and better decision-making, which mutually contribute to better performance (Dubey, 2023). The positive linkage of supply chain integration on performance (beta value = 0.495, p-value = 0.000) further underlines the role of effective integration in pouring organizational success. Integration allows for the continuous availability of information and inventory, reducing inefficiencies and enhancing the overall performance of the supply chain (Nabila, 2022). likewise, supply chain resilience was found to positively influence integration (beta value = 0.377, p-value = 0.000), suggesting that resilient supply chains, capable of adapting to distractions, are better prepared to integrate diverse operations and respond effectively to challenges (Bahrami, 2022). The interaction between supply chain resilience and digitalization (SR x SD) was observed to suggestively moderate the relationship between digitalization and integration (beta value = 0.040, p-value = 0.000). This suggests that the existence of resilient strategies increases the benefits of digitalization, making supply chains more proactive and responsive to disruptions. Therefore, it acts as a critical enabler for the successful execution of digital technologies in supply chains, underpinning the need for organizations to nurture both digital capabilities and resilient practices to flourish in an increasingly unpredictable environment. Supply chain integration plays a significant mediating role in the relationship between digitalization and performance (beta value = 0.284, p-value = 0.000). This finding aligns with previous studies that emphasize the importance of integration as a mechanism that enhances the influence of digital technologies on performance (Tian, Ellinger, & Chen, 2010). Furthermore, resilience also impacts performance indirectly through integration (beta value = 0.186, p-value = 0.005), underscoring the crucial role of integrating resilient practices in driving performance. These results suggest that integrating both digitalization and resilience strategies can lead to enhanced supply chain performance. Interestingly, the moderated mediation effect of resilience and digitalization on performance through integration was not statistically significant (beta value = 0.020, p- value = 0.398). This indicates that while resilience and digitalization each have a direct impact on performance through integration, their combined effect does not significantly enhance performance in the way initially hypothesized. This may be due to the complex nature of moderating interactions in supply chain processes, it suggests that factors, including organizational culture or market conditions, could play a role in influencing these conclusions (Hair et al., 2021).

CONCLUSION

This research highlights the participation of supply chain integration significant in mounting the performance of supply chain. As this study revolves around performance so the digitalization and supply chain resilience are also in limelight in accelerating the performance. The findings propose that digitalization directly contributes to refining integration and performance, with resilience strengthening the effectiveness of technologies related to digitalization. The combined effect of resilience and performance treated as moderated-mediation is found statistically insignificant, it shows that their effect has better impact than the combine effect. This research may help the managers, strategy designer, and authorities while making decisions related to performance must consider these factors and indicators. It may help them to cope the uncertainty prevailed in the environment at any time without prior announcements. There is a need to use tools related to digitalization to keep organizations highlighted. In future more moderator and mediators would be identified as it is vast area to be studied still a lot left to be explored. Organizational culture, supply chain structure, or external market pressures can be the factors to impact the supply chain regarding its performance.

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