THE IMPACT OF SUPPLY CHAIN INTEGRATION ON OPERATIONAL PERFORMANCE THROUGH RESILIENCE UNDER COVID-19 PANDEMIC

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COVID-19 has now unleashed a global supply chain crisis across a huge number of organizations, stemming from a lack of understanding and flexibility of the multiple layers of their global supply chains. In addition to the lack of efficient management through unpredicted events and occasions. Drawing on extended resources based view and resilience theory, this paper attempts to shed the light on the mediating role of resilience between supply chain integration and organizational performance represented in quality, cost and delivery performance during the COVID-19 pandemic. 224 questionnaires were collected and analyzed through process macro technique proposed by Andrew Hayes to test the mediating role of resilience. The results indicated that resilience can significantly mediate the relationship between supply chain integration and quality, cost and delivery performance. Therefore, this paper contributes to both extended resources based view and resilience theory. As it empathize on how organizations can acquire a unique bundle of resources through integration, which will allow them to maintain a desirable level of performance during market disruption through building resilience. The results will practically guide organizations to invest in building resilience in order to be able to cope with unexpected events that disrupts the business environment such as COVID19.

Keywords: Supply chain integration, supply chain resilience, operational performance

INTRODUCTION

Supply chain integration (SCI) one of the collaboration types that make managers meet the new challenges of the global competitive environment and the unexpected crises, as SCM is a strategic concept for increasing the collaboration between the chain members within the value chain (Jonsson *et al.*, 2011). The integration between supply chain members whether the upstream or downstream is considered the key to improving the companies' performance and added value to the network (Ataseven and Nair, 2017). However, with the appearance of COVID-19 pandemic, the interaction between supply chain members was disrupted (Inoue and Todo, 2020). This research focuses on the importance of resilience in mediating the relationship between SCI and operational performance represented in quality performance (OPQ), cost performance (OPC) and delivery performance (OPD) during COVID-19.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Based on the extended resource-based prospect, organizations need to acquire resources through forming alliances in order to enhance performance (Mishra *et al.*, 2018). This means that SCI can help the organization gain the needed resources for maintaining competitive advantage (Xu *et al.*, 2014). SCI plays an important role in creating value, which leads to performance improvements (Ataseven and Nair, 2017). Flynn *et al.* (2010) confirmed that SCI is an effective technique that improves the performance of an organization. Lo and Yeung (2006) clarified that SCI significantly impacts operational performance. On the other hand, Soares *et al.* (2017) found that

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supply chain integration can improve operational performance significantly. Operational performance is considered one of the critical factors that determine the competitive advantage of a company or a supply chain in a specific time, moreover it affects business performance measures such as market share and customer satisfaction (Li *et al.*, 2006).

Drawing on resilience theory, organizations need to resume normal operations quickly through building resilience in order to recover from disruptive events such as COVID-19 pandemic (Koronis and Ponis, 2018). As it negatively affected supply chains integrations (Inoue and Todo, 2020). Resilience is an important enabler of Supply chain performance because building resilience prevents disruptive shocks from occurring and assists in establishing and maintaining acceptable levels of performance (Jüttner and Maklan, 2011).

Based on the above arguments, this paper argued that SCI could lead to an increase in operational performance through resilience. Thus, the research hypothesis is formulated as:

Resilience mediates the relationship between SCI and operational performance (quality, cost and delivery).

Figure 1 shows the hypothesized relationship.

Figure 1. Research model

METHODOLOGY

The quantitative approach of the study was based on survey methods. The questionnaire was divided into four main sections, general information, supply chain integration, supply chain resilience and operational performance represented in quality, cost and delivery. All scales were adapted from previous research, SCI was adapted from The impact of asymmetry on performance. SCR scales were adapted from Supply chain capabilities, risks, and resilience. Operational performance scales (quality, cost and delivery) were adapted from (Phan *et al.*, 2019). Scales was originally in English a back-translation process was conducted to ensure the accuracy of the translation. The questionnaire was distributed in the Egyptian market, participants were mainly working at a senior level position. Sample characteristics are illustrated in table 1.

Table 1. Sample characteristics

Characteristics	Criteria	Frequency	Percentage
Size	Large	33	14.7
	Medium	71	31.7
	Small	55	24.6
	Very small	65	29
Location of the firm	Cairo	97	43.3
	Alexandria	109	48.7
	Other	18	8
Core activity	Industrial	97	43.3
	Service sector	58	25.9
	Commercial/ trader	69	30.8
Years of experience on the senior position	Less than 1 year	80	10
	From 1 year to 2 year	157	19
	From 3 years to 4 years	145	18
	From 5 years to 6 years	193	24
	More than 6 years	20	3

Pretest was conducted to ensure face and content validity. Followed by a pilot testing with 105 participants in order to further ensure the validity and reliability of the data collection instrument. Factor loadings, average variance extracted, composite reliability were calculated using exploratory factor analysis. In addition, Cronbach's alpha was also calculated to ensure scales of reliability. Finally, the square root of the average variance extracted to ensure discriminant validity (Fornell and Larcker, 1981). Tables 2 and 3 show the results of the pilot study, which clearly indicates that all indicators are above their cutoff points (Hair *et al.*, 1998).

Table 2. Results of the pilot study

Constructs	Items	Factor loadings	KMO	Bartlett's Test	AVE	CR	Cronbach's Alpha
Supply chain integration	SCI01	0.926	0.842	0.000	0.803	0.942	0.912
	SCI02	0.867					
	SCI03	0.932					
	SCI04	0.858					
Supply chain resilience	SCR01	0.910	0.854	0.000	0.798	0.960	0.948
	SCR02	0.954					
	SCR03	0.886					
	SCR04	0.922					
	SCR05	0.868					
	SCR06	0.815					
Operational performance	Quality	OPQ01	0.860	0.000	0.903	0.974	0.964
		OPQ02					
		OPQ03					
		OPQ04					
	Cost	OPC01	0.805	0.000	0.841	0.955	0.935
		OPC02					
		OPC03					
		OPC04					
	Delivery	OPD01	0.864	0.000	0.927	0.981	0.973
		OPD02					
		OPD03					
		OPD04					

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Table 3. Discriminant validity of the pilot study

	SCI	SCR	OPQ	OPC	OPD	SQR-AVE
SCI	1.00	0.67	0.12	0.56	0.01	0.90
SCR	0.67	1.00	0.23	0.48	0.17	0.89
OPQ	0.12	0.23	1.00	-0.08	0.03	0.95
OPC	0.56	0.48	-0.08	1.00	-0.20	0.92
OPD	0.01	0.17	0.03	-0.20	1.00	0.96
SQR-AVE	0.90	0.89	0.95	0.92	0.96	

Regarding main study hypothesis testing, confirmatory factor analysis using AMOS was conducted to ensure validity and reliability on the 224 questionnaire collected. Based on the results illustrated in appendix B, all goodness of fit model criteria for all constructs were adequate. In addition, average variance extracted, the square root of average variance extracted when compared to the correlation matrix, factor loadings, composite reliability and Cronbach's Alpha shows ensures the validity and reliability of the questionnaire.

The developed hypothesis was tested through conducting mediation analysis using the macro process by (Preacher and Hayes, 2008). As the results are shown in Table 4 that there is no zero between the upper and lower boundaries, it can be concluded that resilience is significantly mediating the relationship between SCI and quality performance, SCI and cost performance and SCI and delivery performance. This concludes that the developed hypothesis is accepted.

Table 4. Mediation analysis

Indirect paths	BootLLCI	BootULCI	Significance
SCI -> SCR -> OPQ	0.1808	0.3972	Sig
SCI -> SCR -> OPC	0.1467	0.3353	Sig
SCI -> SCR -> OPD	0.0805	0.3231	Sig

CONCLUSION

This study focused on illustrating the mediating role of resilience between SCI and operational performance during COVID-19 pandemic. The results showed that resilience can significantly mediate the impact of SCI on the three operational performance dimensions; quality, cost and delivery. This will theoretically contribute to resilience theory and extended resources-based view as it shows the importance of enhancing adaptability through integration to enhance performance under COVID-19. In addition, the results of this study will practically help organizations adapt to market disruptions such as COVID-19. As it shows that supply chain integration can enable organizations to have access to unique resources that will allow them to enhance resilience and eventually achieve higher performance. In other words, instead of focusing on enhancing performance organizations must take advantage of their integration to build resilience in order to thrive in a dynamic business environment. This will eventually allow them to gain a competitive edge through maintaining high-performance levels during market disruption.

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Appendix B.1. Reliability and validity of the main study

Model fit	Factor loadings	AVE	CR	Cronbach's Alpha	Chi-square/df	P-value	GFI	TLI	CFI	RMSEA	RMR
SCI	SCI01	0.814									
	SCI02	0.681									
	SCI03	0.983									
	SCI04	0.680									
SCR	SCR01	0.858									
	SCR02	0.922									
	SCR03	0.935									
	SCR04	0.875									
	SCR05	0.818									
	SCR06	0.802									
Quality	OPQ01	0.539									
	OPQ02	0.978									
	OPQ03	0.887									
	OPQ04	0.791									
Cost	OPC01	0.896									
	OPC02	0.474									
	OPC03	0.955									
	OPC04	0.854									
Delivery	OPD01	0.967									
	OPD02	0.840									
	OPD03	0.998									
	OPD04	0.961									

Appendix B.2. Discriminant validity of the pilot study

	SCI	SCR	OPQ	OPC	OPD	SQR-AVE
SCI	1.00	0.67	0.12	0.56	0.01	0.90
SCR	0.67	1.00	0.23	0.48	0.17	0.89
OPQ	0.12	0.23	1.00	-0.08	0.03	0.95
OPC	0.56	0.48	-0.08	1.00	-0.20	0.92
OPD	0.01	0.17	0.03	-0.20	1.00	0.96
SQR-AVE	0.90	0.89	0.95	0.92	0.92	0.96