ACADEMIA International Journal for Social Sciences
Volume 5, Issue 3, 2026 ISSN-L (Online): 3006-6638

The Relationship of Supply Chain Agility and Resilience on Hospital Performance: A Case of Secondary Health of Karachi

Fatima Faheem
fatimafaheem007@gmail.com
Dow university of Health Sciences

Hiba Syed
hibasyed774@gmail.com
PhD scholar/Lecturer, University of Karachi

Corresponding Author: Hiba Syed hibasyed774@gmail.com

Received: 03-02-2026 **Revised:** 18-02-2026 **Accepted:** 05-03-2026 **Published:** 22-03-2026

ABSTRACT

The current study aims to determine the impact of SC agility and SC resilience on quality, lead time *and reduced complaints in the hospitals located in Karachi. In order to collect data from the hospital supply chain workers in Karachi, Pakistan, the study employed a survey using a self-administered questionnaire and a purposive sample approach. The data was analyzed using structural equation modelling (SEM). The present study revealed that SC agility has significant and positive impact on lead time, quality, and reduced complaints i.e., hospital performance. Similarly, there is a positive and significant impact of SC resilience on quality, lead time and reduced complaints i.e., hospital performance. The analysis of the sample is essentially time-limited because the study only interviewed SCM professionals using a cross-sectional methodology. The study data was gathered from a single city, hence might portray a limited picture. The study identified the factors influencing hospital performance and according to the observations, Pakistani hospitals must put comprehensive emphasis on the dimensions of supply chain agility and resilience in order to combat disrupting conditions and assurance of sustainable performance.*

Keywords: *Hospital performance, SC resilience, SC agility, Resource-based view (RBV) theory, Dynamic capability theory*

INTRODUCTION

The huge global investment in public procurement has raised awareness of SP in the healthcare business. Furthermore, the COVID-19 pandemic has revealed the global healthcare supply chain's vulnerabilities and inadequacies (Tukamuhabwa et al., 2021). As a result, some argue that SC cooperation is an important component of supply chain agility (SCAG). Globally, health care has become a fiercely competitive and fast expanding industry. Healthcare facilities are crucial for universal health coverage and are a vital component of the healthcare system in achieving the SDGs (Swain & Kar, 2018).

COVID-19 has had an impact on nearly all industries and production systems (Singh et al., 2020), and it has also had a considerable impact on global SC operations and produced large stock distortions (Ivanov, 2021). As a result, supply shortages and logistical restrictions were severe (Wang et al., 2020). Despite extraordinary efforts to increase drug availability in Pakistan and other developing countries, inadequacies in supplier performance have persisted. These inadequacies include a shortage of Slow deliveries, outdated critical drugs, poor quality of medicines, cost escalation, supply of wrong specifications, and cost changes (Aslam et al., 2022). Despite a growing body of literature, few empirical studies have focused on the role of SCA and resilience in individuals to support coordinated task performance under demanding operational conditions (Chen et al., 2019).

Objective of the study

- To determine the effect of SC resilience on lead time, reduced complaints and quality.
- To determine the effect of SC agility on lead time, reduced complaints and quality.

Research questions

Q1. What is the effect of SC resilience on lead time, reduced complaints and quality?

Q2. What is the effect of SC agility on lead time, reduced complaints and quality?

Significance of the study

Despite the fact that the majority of research on this topic has been undertaken in the developed world, academics and practitioners can learn even more from this study, which is being conducted in a poor country, Pakistan.

Hypotheses

H1a: Supply chain resilience has a significant effect on Lead time.

H1b: Supply chain resilience have a significant effect on reduced complaints.

H1c: Supply chain resilience has a significant effect on Quality.

H2a: Supply chain agility has a significant effect on Lead time.

H2b: Supply chain agility have a significant effect on reduced complaints.

H2c: Supply chain agility has a significant effect on Quality.

LITERATURE REVIEW

According to the RBV, continuous great performance is connected to organizational strategic resources. It states that organizations are made up of a mix of real and intangible resources, such as physical, human, and organizational capital (Barney, 1991). The RBV focuses on an organization's internal resources or skills to manage uncertainty rather than using possibilities supplied by a changing external environment (Rumelt, 1982). The agile SCS is necessary for the rapid introduction of new products in response to changing consumer expectations, as well as a quick response to changes in volume and delivery speed requirements (Stewart & Ivanov, 2019). SCRES is a capability that permits a supply chain that has been interrupted to reassemble and become more powerful than before. Indeed, SCRES is more than a reactive skill, as it helps SC member companies to confront obstacles and adversity while also seeing different business opportunities (Ribeiro & Barbosa-Povoa, 2018).

The achievement of certain clinical or administrative objectives can be used to determine hospital performance. Return on investment (ROI), return on asset (ROA), market share, and, most importantly, net revenue per discharge may all be used to quantify financial results (Mandal, 2018). With good planning, lead time may be managed and used to manage the hospital's supply chain and inventory (Kim et al., 2021).In the healthcare industry, LT has been associated with improved clinical operations, higher quality and efficiency, and a shorter time between placing an order and receiving the product by eliminating inefficiency and waste in workflow procedures (Kochan et al., 2018). Suppliers or client elements that share similar patterns of behavior or an organizational culture are easier to handle and

have reduced complains (Lim et al., 2018). Delivering the care a patient needs, when they need it, in a way that is economical, secure, and effective is what quality in healthcare involves (Lim et al., 2018).

Although many studies have defined SCRES (Ali et al., 2021; Ozdemir et al., 2022); Mandal (2020) provided a more elusive definition: "The capacity of a supply chain to anticipate and react to adversity, to recover quickly from setbacks, and to continue running with the required degree of reliance and command over its structure and operations is the concept of supply chain resilience". It is suggested that such resiliency is critical for healthcare services because supplying patients with uninterrupted treatments is critical for saving their lives (Friday et al., 2021). The need of agility increases exponentially in maintaining coordination and collaborative efforts in order to consistently improve the patient experience (Rungsrisawat & Jermsittiparsert, 2019).

According to Alzoubi et al. (2022), the elapsed time from order to delivery is referred to as lead time reduction. The mechanism for time-based competitiveness is lead-time reduction inside the supply production-distribution chain (Agarwal et al., 2007). Furthermore, management of global commercial companies recognizes quality improvement as a need for success in the competitive international marketplace (Chen et al., 2013). Additionally, health organizations that can promptly recover from SC disruptions and allocate enough time to identify the best responses to SC disruptions through contingency planning may ensure SP in the form of less customer complaints, shorter LT, and higher quality (Tukamuhabwa et al., 2021).Customer complaints will decrease as service quality improves, and customer satisfaction will rise as a result (Alkalha et al., 2019).

Conceptual framework

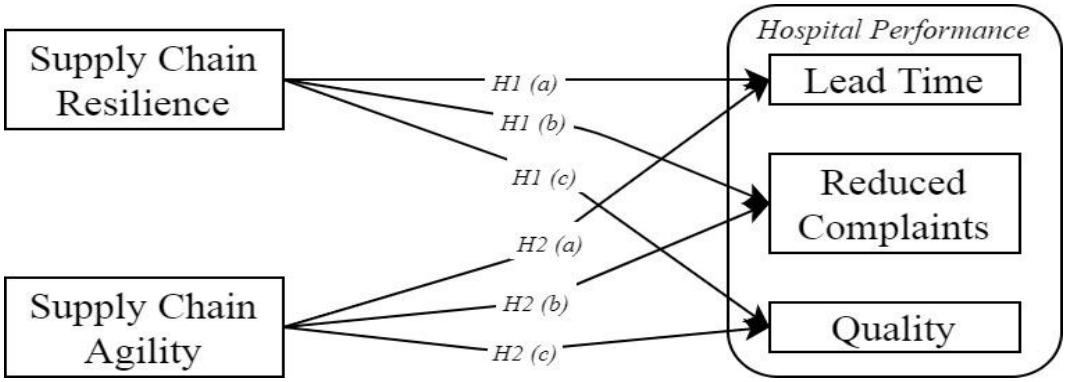

Figure : Research Model

METHODOLOGY

The deductive method requires investigating and comprehending the theory before formulating a hypothesis based on it (Sprenger, 2011). As a consequence, the deductive approach was used in this study since it made it easier to identify the variables' causality. Furthermore, quantitative choice has been effectively used in a number of research since it is very easy to execute (Cavana et al., 2001).

As a result of the fact that the goal of the research was to explain things, the study had an explanatory purpose, which enabled it to make a contribution to the development of a practical idea and provide a sound, logical knowledge. The cross-sectional horizon is based on data collection at a particular point in time or across a set period of time (Saunders et al., 2007). There is now access to medical care for 100% of people living in urban areas and 92% of those living in rural areas (Afzal & Arshad, 2022). Therefore, SC professionals and non-medical staff of the hospitals in Karachi, Pakistan are being chosen as a study's target population.

Sample size determination

However, Cohen (1988); Krejcie and Morgan (1970) suggested a minimum sample of 384 responses from the sample population based on 95 percent confidence interval (cited by Memon et al. (2020). Therefore, the study has aimed to collect 397 responses from the sample population based on the aforementioned discussion on sample size determination. Non-probability sampling techniques include approaches such as snowball sampling, convenience sampling, and purposive sampling, among others (Beck, 2013).

Data collection instrumentation

Variable Name	N Items	Likert Type	Source(s)
SC Agility	7	5-Point	(Dubey, Bryde, et al., 2021; Eslami et al., 2021)
SC Resilience	7	5-Point	(Dubey, Gunasekaran, et al., 2021; Mandal & Saravanan, 2019)
Lead Time	6	5-Point	(Owago et al., 2021)
Reduced Complaints	7	5-Point	(Owago et al., 2021)
Quality	7	5-Point	(Owago et al., 2021)

Table 3.1: Data collection instrumentation

Data collection procedure

There are other data collection methods accessible, but survey technique has emerged as one of the most popular (Goddard & Villanova, 2006). Additionally, this approach may be used on structures that merely contain items and has no data assumption constraints (Hair et al., 2011).

Ethical considerations

The current study followed these ethical principles and made sure that the participants were not in any way injured.

RESULTS AND FINDINGS

The results, the discussion on the findings of the research and structural model will be discussed in the following section which makes up chapter 4 of the project.

Demographic profile

The following table 1 shows the demographic profile of 397 respondents.

Table 1: Demographic Profile (n=397)

		Frequency	Percent
Gender	Male	194	48.9
	Female	203	51.1
Education	Undergraduate	103	25.9
	Masters	100	25.2
	Postgraduate	89	22.4
	Others	105	26.4
Age	25 to 34	104	26.2
	35 to 44	107	27.0
	45 to 54	98	24.7
	55 and above	88	22.2

The number of total respondents were 397 out of which 194 (48.9%) were males, whereas 203 (51.1%) were females. The qualification of 100 (25.2%) respondents was masters, while 89 (22.4%) of the respondents were post graduates and 105 (26.4%) had other educational background. The respondents who were in between 25-34 years of age were 104 (26.2%), 107 (27%) fell in between 35-44 years of age whereas respondents ageing in between 45-54 and 55 and above were 98 (24.7%) and 88 (22.2%) respectively.

Measurement model

The statistical technique for assessing whether indicators that have theoretical relatedness with the construct are actually related to that paritcular construct is known as measurement model in PLS-SEM (Hair et al., 2011). following table 2 provides the result of measurement model for construct and convergent validity assessments using PLS algorithm technique.

Table 2: Measurement Model

	Loadings	Alpha	CR	AVE
LT2 <- Lead Time	0.777	0.878	0.917	0.735
LT3 <- Lead Time	0.881			
LT4 <- Lead Time	0.926			
LT5 <- Lead Time	0.839			

Q3 <- Quality	0.829	0.872	0.913	0.723
Q4 <- Quality	0.877			
Q5 <- Quality	0.885			
Q6 <- Quality	0.809			
RC2 <- Reduced Complaints	0.864	0.852	0.901	0.694
RC3 <- Reduced Complaints	0.864			
RC4 <- Reduced Complaints	0.821			
RC5 <- Reduced Complaints	0.780			
SCA1 <- SC Agility	0.727	0.904	0.926	0.679
SCA2 <- SC Agility	0.721			
SCA3 <- SC Agility	0.915			
SCA4 <- SC Agility	0.790			
SCA6 <- SC Agility	0.876			
SCA7 <- SC Agility	0.893			
SCR1 <- SC Resilience	0.862	0.910	0.929	0.687
SCR2 <- SC Resilience	0.822			
SCR3 <- SC Resilience	0.793			
SCR4 <- SC Resilience	0.837			
SCR5 <- SC Resilience	0.798			
SCR6 <- SC Resilience	0.859			

Hair et al. (2014) recommended that outer loadings should be higher than 0.70 for acceptable construct validity while alpha and CR coefficients should be higher than 0.70 and 0.80 respectively for acceptable internal consistency of the construct and lastly, AVE should be higher than 0.50 for acceptable convergence between indicators and latent constructs (Hair et al., 2019; Shiau et al., 2019). Herein, above table showed that all indicators have loadings higher than the recommended threshold and therefore, construct validity has been achieved. Furthermore, all constructs have substantial internal consistency based on the acceptable coefficients of alpha and CR while considerable correlation has been manifested between indicators and constructs based on the acceptable AVE coefficients. Therefore, convergent validity has also been achieved.

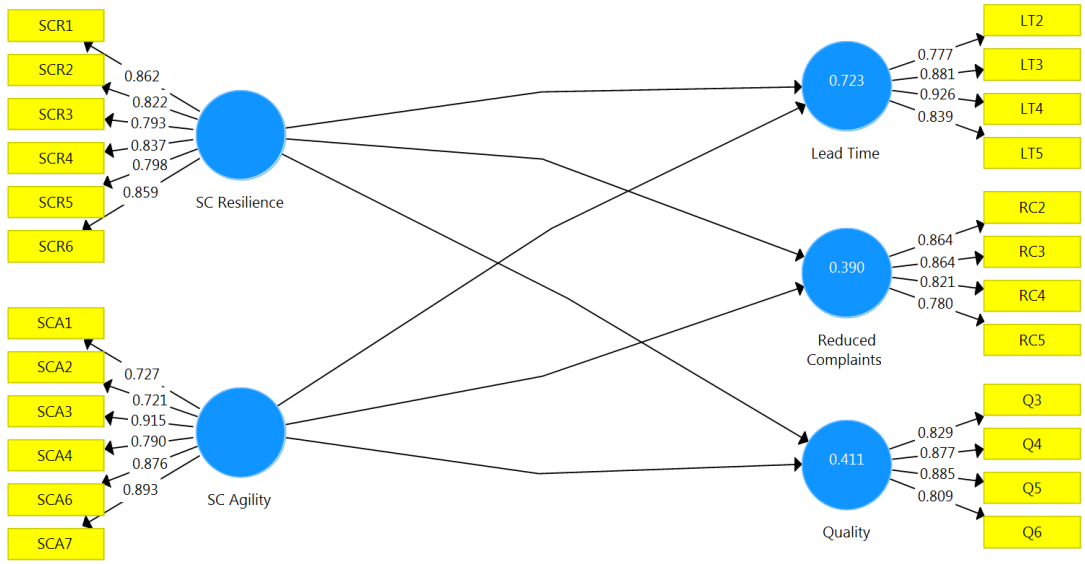

Figure 1: PLS Algorithm Illustration

Discriminant validity

Constructs that have theoretical unrelatedness should also have no convergence between each other in the structural model and the statistical estimations for assessing this theoretical assumption is known as discriminant validity (Campbell & Fiske, 1959; Cheung & Wang, 2017).

Fornell-Larkcer Criterion (FLC)

The following table 3 provides the result of Fornell and Larcker (1981) criterion for discriminant validity assessment using PLS algorithm technique.

Table 3: FL Criterion

	LT	QUAL	RC	SCA	SCR
Lead Time	**0.857**				
Quality	0.591	**0.851**			
Reduced Complaints	0.639	0.749	**0.833**		
SC Agility	0.797	0.623	0.564	**0.824**	
SC Resilience	0.808	0.582	0.608	0.782	**0.829**

Above table has shown that diagonally bold values (square root of AVE) are found higher than correlation between constructs manifesting that constructs shared higher variance than their correlation (Ab Hamid et al., 2017). Thus, constructs are different from each other achieving discriminant validity using FLC.

Crossloadings

The following table 4 provides the result of crossloadings method for discriminant validity assessment using PLS algorithm technique.

Table 4: Crossloadings

	Lead Time	Quality	Reduced Complaints	SC Agility	SC Resilience
LT2	**0.777**	0.502	0.440	0.746	0.657
LT3	**0.881**	0.526	0.475	0.643	0.626
LT4	**0.926**	0.545	0.666	0.663	0.664
LT5	**0.839**	0.453	0.599	0.666	0.799
Q3	0.501	**0.829**	0.638	0.477	0.579
Q4	0.493	**0.877**	0.792	0.471	0.516
Q5	0.538	**0.885**	0.640	0.584	0.475
Q6	0.475	**0.809**	0.485	0.578	0.413
RC2	0.572	0.732	**0.864**	0.523	0.550
RC3	0.569	0.515	**0.864**	0.513	0.523
RC4	0.555	0.594	**0.821**	0.334	0.500
RC5	0.428	0.653	**0.780**	0.493	0.447
SCA1	0.521	0.404	0.191	**0.727**	0.428
SCA2	0.640	0.303	0.238	**0.721**	0.539
SCA3	0.764	0.694	0.636	**0.915**	0.771
SCA4	0.626	0.494	0.578	**0.790**	0.680
SCA6	0.635	0.538	0.525	**0.876**	0.541
SCA7	0.724	0.548	0.465	**0.893**	0.820
SCR1	0.630	0.461	0.371	0.695	**0.862**
SCR2	0.640	0.583	0.520	0.753	**0.822**
SCR3	0.523	0.368	0.262	0.566	**0.793**
SCR4	0.769	0.503	0.593	0.663	**0.837**

SCR5	0.653	0.385	0.446	0.484	**0.798**
SCR6	0.741	0.540	0.699	0.690	**0.859**

It has been shown in the above table that indicators have higher loadings in their construct rather their crossloadings in other constructs providing that constructs have achieved considerable divergence from each other (Rönkkö & Cho, 2022) and thus, discriminant validity using crossloadings has been achieved.

Heterotrait-Monotrait (HTMT) ratio

The following table 5 provides the result of heterotrait-monotrait (HTMT) ratio for discriminant validity assessment using PLS algorithm technique.

Table 5:HTMT Ratio

	LT	QUAL	RC	SCA	SCR
Lead Time					
Quality	0.675				
Reduced Complaints	0.734	0.871			
SC Agility	0.888	0.679	0.604		
SC Resilience	0.883	0.641	0.658	0.837	

Henseler et al. (2016); Henseler et al. (2015) suggested that constructs should have HTMT ratio below 0.90 for acceptable degree of divergence between each other and therefore, above table showed that SC agility (SCA) and lead time (LT) has the highest HTMT ratio of 0.888. Thus, discriminant validity using HTMT ratio has been achieved.

Structural model

The statistical technique for assessing the theoretical relationship between latent constructs for hypothesis-testing is known as structural model in PLS-SEM (Ramli et al., 2018; Shiau et al., 2019).

Hypothesis-testing using path analysis

The following table 4.6 provides the result of hypothesis-testing using PLS bootstrapping at a recommended 5000 subsamples, two-tailed estimations and 5 percent probability level.

Table 6: Path Analysis

	Estimate	S. D.	t-Stats	Prob.	Decision
SC Agility -> Lead Time	0.424	0.055	7.651	0.000	Accepted
SC Agility -> Quality	0.431	0.065	6.678	0.000	Accepted
SC Agility -> Reduced Complaints	0.227	0.064	3.572	0.000	Accepted

SC Resilience -> Lead Time	0.477	0.058	8.240	0.000	Accepted
SC Resilience -> Quality	0.245	0.069	3.566	0.000	Accepted
SC Resilience -> Reduced Complaints	0.430	0.058	7.407	0.000	Accepted

Above table has shown that SC resilience has a positively significant effect on lead time ($\beta = 0.477$; $p < 0.01$) accepting hypothesis-1a, quality ($\beta = 0.245$; $p < 0.01$) accepting hypothesis-1b and reduced complaints ($\beta = 0.430$; $p < 0.01$) accepting hypothesis-1c. Moreover, SC agility has a positively significant effect on lead time ($\beta = 0.424$; $p < 0.01$) accepting hypothesis-2a, quality ($\beta = 0.431$; $p < 0.01$) accepting hypothesis-2b and reduced complaints ($\beta = 0.227$; $p < 0.01$) accepting hypothesis-2c.

Predictive relevance

The following table 7 provides the result of predictive power and relevance of all endogenous constructs in the structural model.

Table 7:Predictive Relevance

	R Square	R Square Adjusted	Q Square
Lead Time	0.723	0.721	0.517
Quality	0.411	0.408	0.294
Reduced Complaints	0.390	0.387	0.267

Above table showed that 72.3 percent predictability in lead time, 41.1 percent predictability in quality and 39 percent predictability in reduced complaints has been explained in the structural model with moderate relevance i.e. $Q^2 > 0.15$ (Hair et al., 2013).

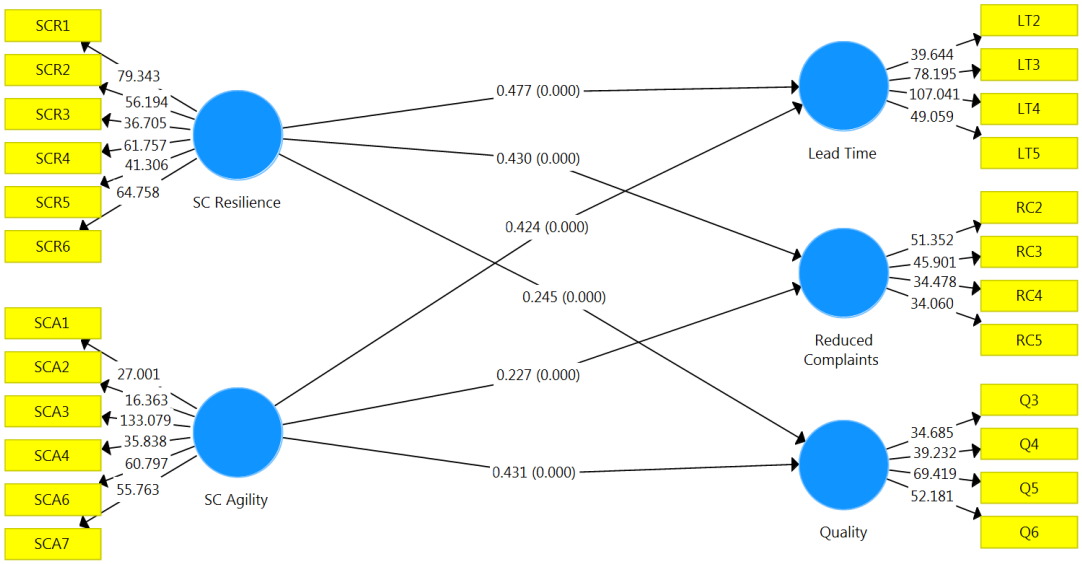

Figure 2: PLS Bootstrapping Illustration

DISCUSSIONS

The current study tested the relationship of SCA with LT. There is a positive and significant influence as per the findings. The results are in line with the previous work of Kim et al. (2021) who also revealed similar research results. Additionally, RC, shorter lead times, and improved quality are all indicators of performance in organizations with agile SC, which can promptly recover from SC disruptions and allocate enough time to determine the best mitigation solutions for supply chain disruptions (Tukamuhabwa et al., 2021).

The study also highlighted the influence of SCA on QLT. The results revealed a positive and significant influence. These findings are backed by the work conducted by Abdallah et al. (2021) who also suggested same outcomes. Furthermore, a research further expands its support and suggested that in regards of becoming more sensitive to rapid changes in the marketplace, technology, and laws as well as having a better level of operational expertise and service quality, highly agile firms have a competitive advantage (Berg et al., 2020)

The research further shed light on the impact of SCA on RC. There is a positive and significant relationship between two variables. This is supported by the previous research findings of Um (2017) who also found a positive and significant impact of SCA on RC. Moreover, in order to respond to patient requirements and reduce user complaints, the service sector, and notably healthcare businesses, has always had to priorities agility. In order to sustain coordination and collaborative efforts and continually improve the patient experience, agility is increasingly necessary (Rungsrisawat & Jermsittiparsert, 2019).

Furthermore, the relationship of SCRES and LT was tested. There is a significant and positive impact as per the findings. The results corroborate with the findings of Liu et al. (2018) who found a positive and significant relationship as well. Also,more than just a reactive talent, SCRES enables member organizations to face challenges, shorten lead times, and adversity while also recognizing new business possibilities(Khademi JolgehneJad et al., 2019).

Next hypothesis tested the influence of SCRES on QLT. The results declared a positive and significant influence. These findings are in line with the work of Um and Han (2020) who also suggested a similar influence. Furthermore, QLT is lowered by disturbances in supply, demand, logistical infrastructure, and process control. The ripple effect of disruptions affects the SC; hence this ripple effect needs to be addressed with resilience mechanisms else it may completely paralyze services, disturb quality, and cause the SC to slow down or even cease (Ivanov et al., 2019).

The study further emphasized on the relationship of SCRES and RC and tested it. The results announced a positive and significant relationship among the two. These findings are backed up by the work of Chowdhury and Quaddus (2021) who also revealed similar findings. Effective resilient SCI and synchronization among partners may minimize LT, increase revenues, eliminate excess inventory, and enhance customer service and RC (Alzoubi et al., 2022)

CONCLUSION AND RECOMMENDATIONS

Conclusion

The target audience of the study was chosen to be the SC professionals and non-medical personnel of the hospitals in Karachi, Pakistan. The data is collected using a purposive sampling technique, and it is assessed using PLS-SEM. The present study revealed that SCA has significant and positive impact on LT, QLT, and RC. Similarly, there is a positive and significant impact of SCRES on QLT, LT and RC. In the context of global SCM, SC risks must be effectively handled in order to keep a competitive edge.

Theoretical implications

This work adds to the academic discussion on the connections between SCR, SCA, and hospital performance through the theoretical perspectives of RBV and associated dynamic capabilities theory.

Managerial implications

To begin, those in charge of managing healthcare facilities need to create an environment that encourages the growth of social, intellectual, and physical capital.

Additionally, manufacturers with suitable short lead times should focus on communicating genuine demand information with their customers as soon as it is available. In addition, managers of the various businesses can determine the precise number of safety stockpiles or backorders. A corporation may use powerful software to guarantee that quality control and safety requirements are always maintained up to date, which is one of the most efficient methods to lower the amount of client complaints. The administration of healthcare institutions should establish clear objectives, a compelling vision, and core values that all staff members can work together to achieve. Therefore, problems with processes, flows, and networking should be addressed in order to increase quality. Health institutions should allocate resources for supply chain process re-engineering, such as hiring a multi-skilled workforce, keeping prequalified suppliers, or leveraging multiple sourcing, in order to increase their adaptive capacity—a crucial component of resilience.

Limitations of the study

Because we used a cross-sectional technique to gather information from SCM professionals, the study of the sample is essentially limited to one moment in time. Additionally, the study only included SC experts whose businesses are active in Pakistan in our sample.

Future research directions

Future studies have a tremendous chance to generate cross-country comparisons that take the highly disruptive circumstances into account. Finally, a larger sample size should be used in future research to get better findings.

REFERENCES

Ab Hamid, M., Sami, W., & Sidek, M. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. Journal of Physics: Conference Series,

Abdallah, A. B., Alfar, N. A., & Alhyari, S. (2021). The effect of supply chain quality management on supply chain performance: the indirect roles of supply chain agility and innovation. *International Journal of Physical Distribution & Logistics Management*, *51*(7), 785-812.

Afzal, S., & Arshad, A. (2022). System within System: World Health Organization Building Blocks and Public-Private Partnership in Healthcare sector of Pakistan. *Annals of King Edward Medical University*, *28*(1), 1-2.

Agarwal, A., Shankar, R., & Tiwari, M. (2007). Modeling agility of supply chain. *Industrial marketing management*, *36*(4), 443-457.

Ali, M. H., Suleiman, N., Khalid, N., Tan, K. H., Tseng, M.-L., & Kumar, M. (2021). Supply chain resilience reactive strategies for food SMEs in coping to COVID-19 crisis. *Trends in food science & technology*, *109*, 94-102.

Alkalha, Z., Reid, I., & Dehe, B. (2019). The role of absorptive capacity within supply chain quality integration. *Supply Chain Management: An International Journal*.

Alzoubi, H. M., Elrehail, H., Hanaysha, J. R., Al-Gasaymeh, A., & Al-Adaileh, R. (2022). The Role of Supply Chain Integration and Agile Practices in Improving Lead Time During the COVID-19 Crisis. *International Journal of Service Science, Management, Engineering, and Technology (IJSSMET)*, *13*(1), 1-11.

Aslam, H., Khan, A. Q., Rashid, K., & Rehman, S.-u. (2020). Achieving supply chain resilience: the role of supply chain ambidexterity and supply chain agility. *Journal of Manufacturing Technology Management*.

Aslam, M. S., Awan, T. H., Nasir, N., & Anwar, M. J. (2022). The Role of Thriving and Determinants of Adaptive Performance: A Moderated Mediated Model in the Health Sector of Pakistan. *iRASD Journal of Management*, *4*(1), 61-76.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, *17*(1), 99-120.

Beck, T. W. (2013). The importance of a priori sample size estimation in strength and conditioning research. *The Journal of Strength & Conditioning Research*, *27*(8), 2323-2337.

Berg, V., Birkeland, J., Nguyen-Duc, A., Pappas, I. O., & Jaccheri, L. (2020). Achieving agility and quality in product development-an empirical study of hardware startups. *Journal of Systems and Software*, *167*, 110599.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological bulletin*, *56*(2), 81.

Cavana, R. Y., Delahaye, B. L., & Sekaran, U. (2001). *Applied business research: Qualitative and quantitative methods*. John Wiley & Sons Inc.

Chen, D. Q., Preston, D. S., & Xia, W. (2013). Enhancing hospital supply chain performance: A relational view and empirical test. *Journal of Operations Management*, *31*(6), 391-408.

Chen, H. Y., Das, A., & Ivanov, D. (2019). Building resilience and managing post-disruption supply chain recovery: Lessons from the information and communication technology industry. *International Journal of Information Management*, *49*, 330-342.

Cheung, G. W., & Wang, C. (2017). Current approaches for assessing convergent and discriminant validity with SEM: Issues and solutions. Academy of Management Annual Meeting Proceedings, Briarcliff Manor, NY.

Chowdhury, M. M. H., & Quaddus, M. A. (2021). Supply chain sustainability practices and governance for mitigating sustainability risk and improving market performance: A dynamic capability perspective. *Journal of cleaner production*, *278*, 123521.

Chowdhury, P., Paul, S. K., Kaisar, S., & Moktadir, M. A. (2021). COVID-19 pandemic related supply chain studies: A systematic review. *Transportation Research Part E: Logistics and Transportation Review*, *148*, 102271.

Cohen, J. (1988). Statistical power analysis for the behavioural sciences. In (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.

Damić, M. (2021). User Perception of Integrated Health Care Quality: The Case of Croatia. *International Journal of Integrated Care*, *21*(S1).

Dong, S., Millar, R., Shi, C., Dong, M., Xiao, Y., Shen, J., & Li, G. (2021). Rating hospital performance in China: review of publicly available measures and development of a ranking system. *Journal of medical Internet research*, *23*(6), e17095.

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, *18*(3), 382-388.

Friday, D., Savage, D. A., Melnyk, S. A., Harrison, N., Ryan, S., & Wechtler, H. (2021). A collaborative approach to maintaining optimal inventory and mitigating stockout risks during a pandemic: capabilities for enabling health-care supply chain resilience. *Journal of Humanitarian Logistics and Supply Chain Management*.

Goddard, R., & Villanova, P. (2006). Designing surveys and questionnaires for research. In *The psychology research handbook: A guide for graduate students and research assistants* (pp. 114-125). SAGE Publications.

Gu, M., Yang, L., & Huo, B. (2021). The impact of information technology usage on supply chain resilience and performance: An ambidexterous view. *International Journal of Production Economics*, *232*, 107956.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, *19*(2), 139–152.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long Range Planning*, *46*(1-2), 1-12.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24.

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review*, *26*(2), 106-121.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: updated guidelines. *Industrial management & data systems*, *116*(1), 2-20.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*(1), 115-135.

Ivanov, D. (2021). Exiting the COVID-19 pandemic: after-shock risks and avoidance of disruption tails in supply chains. *Annals of Operations Research*, 1-18.

Ivanov, D., & Dolgui, A. (2021). OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. *International Journal of Production Economics*, *232*, 107921.

Ivanov, D., Tsipoulanidis, A., & Schönberger, J. (2019). Supply Chain Risk Management and Resilience. In *Global Supply Chain and Operations Management* (pp. 455-479). Springer.

Khademi JolgehneJad, A., Ahmadi Kahnali, R., & Heyrani, A. (2019). Factors Influencing Hospital Supply Chain Resilience (A Qualitative Study). *Journal of Hospital*, *18*(2), 61-73.

Kim, Y., Lee, K.-H., & Choi, S. W. (2021). Multifaced Evidence of Hospital Performance in Pennsylvania. Healthcare,

Kochan, C. G., Nowicki, D. R., Sauser, B., & Randall, W. S. (2018). Impact of cloud-based information sharing on hospital supply chain performance: A system dynamics framework. *International Journal of Production Economics*, *195*, 168-185.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, *30*(3), 607-610.

Lim, J., Lim, K., Heinrichs, J., Al-Aali, K., Aamir, A., & Qureshi, M. (2018). The role of hospital service quality in developing the satisfaction of the patients and hospital performance. *Management Science Letters*, *8*(12), 1353-1362.

Liu, C.-L., Shang, K.-C., Lirn, T.-C., Lai, K.-H., & Lun, Y. V. (2018). Supply chain resilience, firm performance, and management policies in the liner shipping industry. *Transportation Research Part A: Policy and Practice*, *110*, 202-219.

Mandal, S. (2018). Influence of human capital on healthcare agility and healthcare supply chain performance. *Journal of Business & Industrial Marketing*.

Mandal, S. (2020). Exploring the impact of healthcare agility and resilience on sustainable healthcare performance: Moderating role of technology orientation. *International Journal of Sustainable Strategic Management*, *8*(1), 3-23.

Memon, M. A., Ting, H., Cheah, J. H., Thurasamy, R., Chuah, F., & Cham, T. H. (2020). Sample size for survey research: review and recommendations. *Journal of Applied Structural Equation Modeling*, *4*(2), 1-20.

Novais, L., Maqueira, J. M., Ortiz, Á., & Bruque, S. (2021). Strategic simulation models as a new methodological approach: an application to information technologies integration, lean/just-in-time and lead-time. *Central European Journal of Operations Research*, *29*(4), 1185-1218.

Ozdemir, D., Sharma, M., Dhir, A., & Daim, T. (2022). Supply chain resilience during COVID 19 pandemic. *Technology in Society*, 101847.

Ramli, N. A., Latan, H., & Nartea, G. V. (2018). Why should PLS-SEM be used rather than regression? Evidence from the capital structure perspective. In *Partial least squares structural equation modeling* (pp. 171-209). Springer.

Ribeiro, J. P., & Barbosa-Povoa, A. (2018). Supply Chain Resilience: Definitions and quantitative modelling approaches–A literature review. *Computers & Industrial Engineering*, *115*, 109-122.

Rönkkö, M., & Cho, E. (2022). An updated guideline for assessing discriminant validity. *Organizational Research Methods*, *25*(1), 6-14.

Rumelt, R. P. (1982). Diversification strategy and profitability. *Strategic management journal*, *3*(4), 359-369.

Rungsrisawat, S., & Jermsittiparsert, K. (2019). Does human capital improve health care agility through health care supply chain performance? Moderating role of technical orientation. *International Journal of Supply Chain Management*, *8*(5), 792-803.

Sanatkar, M., Sadrossadat, S. H., Ghassemi, H., Ebrahim Soltani, A. R., Shaverdi, M. R., & Bagheri, H. (2019). The impact of a hospital ophthalmologic failures committee on patients' complaints to forensics medical council. *Tehran University Medical Journal TUMS Publications*, *77*(2), 108-114.

Saunders, M., Lewis, P., & Thornhill, A. (2007). Research methods. *Business Students 4th edition Pearson Education Limited, England*.

Shiau, W.-L., Sarstedt, M., & Hair, J. F. (2019). Internet research using partial least squares structural equation modeling (PLS-SEM). *Internet Research*, *29*(3), 398-406.

Sprenger, J. (2011). Hypothetico-deductive confirmation. *Philosophy Compass*, *6*(7), 497-508.

Stewart, M., & Ivanov, D. (2019). Design redundancy in agile and resilient humanitarian supply chains. *Annals of Operations Research*, 1-27.

Swain, S., & Kar, N. C. (2018). Hospital service quality as antecedent of patient satisfaction–a conceptual framework. *International Journal of Pharmaceutical and Healthcare Marketing*.

Tukamuhabwa, B., Mutebi, H., & Isabirye, D. (2021). Supplier performance in the public healthcare: Internal social capital, logistics capabilities and supply chain risk management capabilities as antecedents in a developing economy. *Journal of Business and Socio-economic Development*.

Um, J. (2017). The impact of supply chain agility on business performance in a high level customization environment. *Operations Management Research*, *10*(1), 10-19.

Um, J., & Han, N. (2020). Understanding the relationships between global supply chain risk and supply chain resilience: the role of mitigating strategies. *Supply Chain Management: An International Journal*.

Wang, Y., Wang, J., & Wang, X. (2020). COVID-19, supply chain disruption and China's hog market: a dynamic analysis. *China Agricultural Economic Review*.