

THE IMPACT OF SUPPLY CHAIN VULNERABILITY ON SUPPLY CHAIN PERFORMANCE DURING THE COVID-19 PERIOD WITH SPECIAL REFERENCE TO GENERAL TRADE IN GAMPAHA DISTRICT

S. T. Dilshani^{1,*} and M. A. D. A. Samali²

¹Department of Business Management, Faculty of Management Studies, Rajarata University of Sri Lanka, Sri Lanka

²Department of Marketing Management, Faculty of Management Studies, Open University of Sri Lanka, Sri Lanka

*Corresponding author (email: thilinidadilshani1997.1.3@gmail.com)

INTRODUCTION

The supply chain performance is dependent on the businesses' resilience and capacity to face internal and external obstacles. The researchers used a variety of theoretical frameworks, such as supply chain vulnerability, supply chain uncertainty, supply chain disruption, and supply chain risk, to identify potential or likely supply chain internal and external disturbances (Abeysekara et al., 2019). This study has identified supply chain performance using the theoretical framework of supply chain vulnerability. Supply chain vulnerability can be defined as a function of specific supply chain characteristics. Losses suffered by companies result from the supply chain's vulnerability to a given supply chain disruption. Today it is a relatively new and unexplored area in research management, but its importance is growing (Peck, 2005).

According to the Cranfield University School of Management (2002), they found that

- Supply chain vulnerability is a critical business issue.
- The least number of research has been undertaken into supply chain vulnerabilities.
- Awareness of the subject is poor.
- There is a need for a methodology to manage supply chain vulnerability.

Vulnerability in the supply chain can also be measured and managed at various levels, such as the entire economy, industry, supply chain, or focal firm (Wagner & Neshat, 2012). The researchers concentrated on general trade in the Gampaha district, identifying supply chain vulnerabilities by considering the focal firm. COVID-19 has disrupted the global supply chain, exposing dangerous gaps and vulnerabilities, according to Liu et al. (2016). While the pandemic has short-term and long-term effects on the retail supply chain (RSC), organizations must develop strategies to survive and operate in this situation regardless of the spread of the coronavirus. The impact of supply chain vulnerability on supply chain performance during the COVID-19 period was studied in this study, with particular reference to general trade in the Gampaha district, because Sri Lanka's unique tactic was that not all districts were subjected to the same level of lockdown and many Sri Lanka have endured economic challenges in recent months as a result of a protracted lockdown period that began on March 20th in Colombo and Gampaha districts and lasted until the middle of April. While Colombo and Gampaha experienced the most severe lockdown, the other areas experienced significantly less (Hettiarachchi et al., 2020). And some research in this area has been conducted in developed countries using a different model to measure supply chain vulnerability. Some

research found a significant impact of supply chain vulnerability on supply chain performance. This research aims to determine the impact of supply chain vulnerability on supply chain performance during the COVID-19 period, with a focus on general trade in the Gampaha district.

METHODOLOGY

This study falls under the basic research category. Basic research is used to generate a body of knowledge to improve understanding of specific problems that frequently occur in organizations and to seek solutions (Sekaran, 2003). Furthermore, the research approach is quantitative because quantitative research develops statistics through large-scale survey research using tools such as questionnaires or structured interview procedures (Sekaran, 2003). And the unit of analysis was used to collect responses from general trade retailers in the Gampaha district. refers to the level of data aggregation achieved during the data analysis stage (Sekaran, 2003). This study aimed at supply chain performance leads to data collection from general trade retailers. As a result, the unit of analysis for this research study was a retailer. An online questionnaire

According to Sekaran (1975), the researcher chose a sample size of 150 male and female retailers from various age groups, genders, and income levels in the Gampaha district. When it comes to conceptual framework is a model that shows how one theorizes or logically constructs the links between identified factors that are significant to the problem (Sekaran, 2003). It also illustrated how the research study addressed its questions and objectives. The dependent variable was supply chain performance. By taking into account the dimensions of the bullwhip effect, order fulfilment, supply base optimization, and ICT integration, supply chain vulnerability is identified as the independent variable in this study.

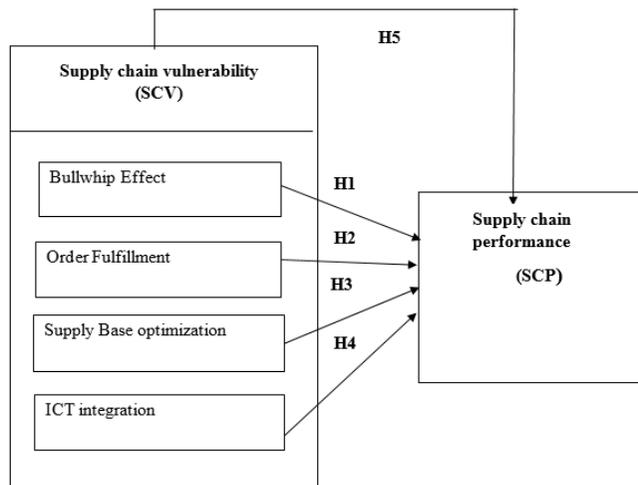


Figure 1 Conceptual framework

Hypothesis means a logically conjectured relationship between two or more variables expressed in the form of a testable statement (Sekaran, 2003). The researcher has developed directional and causal hypotheses to test the explanatory power of independent variables on supply chain performance.

H₁ - There is a significant impact of the Bullwhip effect on supply chain performance during the COVID-19 period.

H₂ - There is a significant impact of Order fulfilment on supply chain performance during the COVID-19 period.

H₃ - There is a significant impact of Supply base optimization on supply chain performance during the COVID-19 period.

H₄ - There is a significant impact of ICT integration on supply chain performance during the COVID-19 period.

H₅ - There is a significant impact of supply chain vulnerability on supply chain performance during the COVID-19 period.

RESULTS AND DISCUSSION

In this study, five hypotheses were tested to identify the impact of independent variables on the dependent variable. Also, correlation analysis and regression analysis were performed with the assistance of the Statistical Package for Social science (SPSS) version 25. KMO value in each dimension is greater than 0.8. The result of 0.8 and above value implies the adequacy of the sample size of the attribute to use as a single dimension. And also, the ANOVA table was significant at 0.000 ($p < 0.005$), Hence, the researcher can be told that this study is valid among the other research. According to Sekaran and Bougie (2016), the reliability test aims to examine whether the indicators regarding each construct are internally consistent and whether they can use to measure the same construct or dimension of research variables. To access the internal consistency of the variables, the researcher conducted a reliability test.

In this study, all the Cronbach's Alpha values were greater than 0.7, $p < 0.005$. Therefore internal consistency was excellent, and the research tool was reliable and will give credible results. The summary of the model in which the item of interest is the R^2 statistics, which is 0.418 with a statistical significance of $P < 0.05$. This suggests that 41.8% of the variants in the supply chain performance (outcome) were predicted from the level of supply chain vulnerability (predictors) and remain 58.2% of supply chain performance is described by the other factors which exist beyond the study. According to the results of the study, the adjusted R^2 was 0.402. There is no accepted rule to measure the goodness of R^2 and adjusted R^2 and the values of the study are a sufficient level, and the Durbin-Watson statistic was 1.624. This means that the independence of the observations has been met.

And also, Pearson's correlation analysis identifies the relationship between the independent variable (SCV) and the dependent variable (SCP). All the independent variables were significant at the level of 0.01. The level of significance between the independent variables and the dependent variable was determined using multiple regression analysis. It found that the impact of BWE, OF, SBO, and ICT integration on supply chain performance during the COVID-19 period, BWE and OF variables have a significant impact. Still, SBO and ICT integration variables have an insignificant impact on supply chain performance during the COVID-19 period.

Table 1 Summary of Hypothesis testing result

Hypothesis	Correlation		Decision	Regression		Decision	Final Decision
	r	p		B	p		
Hypothesis 1	-0.415	0.000	Accepted	-0.251	0.035	Accepted	Fully supported
Hypothesis 2	0.536	0.000	Accepted	0.483	0.000	Accepted	Fully supported
Hypothesis 3	-0.378	0.000	Accepted	-0.176	0.178	Rejected	Partially Supported
Hypothesis 4	-0.304	0.000	Accepted	0.027	0.819	Rejected	Partially Supported
Hypothesis 5	-0.235	0.004	Accepted	-0.338	0.004	Accepted	Fully Supported

CONCLUSIONS AND IMPLICATIONS

Order fulfilment have an impact on supply chain performance because most general trade retailers refused to fulfil orders during the COVID-19 period. According to the study, retailers should fill customer orders using the cost-benefit analysis, JIT method, and Bin card system. According to the theoretical framework of RBV (Burney, 1991), general trade retailers should consider three types of resources: physical capital, human capital, and organizational capital. It means that having enough resources is the most important factor in dealing with a supply chain vulnerability when doing general trade business. Retailers should adapt to the stock recording system and have knowledge of inventory management and demand forecasting because this study discovered that poor order fulfilment and BWE significantly impacted supply chain performance during the COVID-19 period.

This study can be recognized as social science research because the results depend on the retailer's perceptions. They didn't always provide accurate information, and the researcher couldn't argue or change their behaviour or attitudes. It was a significant limitation when conducting this study. If future research can use supply chain vulnerability measurement tools, such as the analytical approach, to determine the level of impact of SCV. It may be reliable to increase the research's validity. Furthermore, the researcher encountered a literature gap in supply chain vulnerability studies and significant limitations in supply chain vulnerability measurement methods (Nowakowski, Werbińska-Wojciechowska, & Chlebus, 2015).

Keywords: Bullwhip effect, ICT integration, order fulfillment, supply base optimization, supply chain performance

REFERENCES

Abeysekara, N., Wang, H., & Kurupparachchi, D. (2019). Effect of supply-chain resilience on firm performance and competitive advantage: A study of the Sri Lankan apparel industry. *Business Process Management Journal*, 25(7), 1673–1695.

<https://doi.org/10.1108/BPMJ-09-2018-0241>

Burney, J. (1991). Barney (1991). Firm Resources and Sustained Competitive Advantage.pdf. *Journal of Management*, 17(1), 99–120.

Cranfield University School of Management. (2002). *Supply chain vulnerability*. <http://www.cranfield.ac.uk>

Hettiarachchi, D., Noordeen, N., Gamakaranage, C., Somarathne, E. A. R. B. D., & Jayasinghe, S. (2020). Ethical Responses to the COVID-19 Pandemic—Lessons from Sri Lanka. *Asian Bioethics Review*, 225–233. <https://doi.org/10.1007/s41649-020-00153-z>

Langsat, M. ., & Ishmail, N. (2018). Effect of supply chain vulnerability on supply chain performance of logistics firms in Kenya: a case of maersk Kenya limited Langat, M. C., & Ishmail, N. *The Strategic Journal of Business & Change Management*, 5(4), 1760–1780. <https://www.strategicjournals.com>

Liu, J., Liu, F., Zhou, H., & Kong, Y. (2016). An Integrated Method of Supply Chains Vulnerability Assessment. *Scientific Programming*, 2016. <https://doi.org/10.1155/2016/2819238>

Peck, H. (2005). Drivers of supply chain vulnerability: An integrated framework. *International Journal of Physical Distribution & Logistics Management*, 35(4), 210–232. <https://doi.org/10.1108/09600030510599904>

Roscoe, J. (1975). *Fundamental research statistics for the behavioral sciences* (Rinehart and Winston (ed.); 2nd editio).

Sekaran, U. (2003). *Research Methods for Business: A Skill-Building Approach* (4th Editio). John Wiley & Sons. [https://www.scirp.org/\(S\(vtj3fa45qm1ean45vvffcz55\)\)/reference/ReferencesPapers.aspx?ReferenceID=1906678](https://www.scirp.org/(S(vtj3fa45qm1ean45vvffcz55))/reference/ReferencesPapers.aspx?ReferenceID=1906678)

Sekarn, U., & Bougie, R. (2016). *Research methods for business: A skill Bulding Approach* (7th Edition). John Wiley & Sons Ltd. <https://books.google.lk/books?id=Ko6bCgAAQBAJ&printsec=frontcover#v=onepage&q&f=false>

Wagner, S. M., & Neshat, N. (2012). A comparison of supply chain vulnerability indices for different categories of firms. *International Journal of Production Research*, 50(11), 2877–2891. <https://doi.org/10.1080/00207543.2011.561540>