Research in Management of Technology and Business Vol. 3 No. 1 (2022) 1012-1020


**RMTB**

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/rmtb
e-ISSN : 2773-5044

# The Impact of Supply Chain Responsiveness on Sustainable Performance: A field Study of Manufacturing Companies in Malaysia

**Istimaroh[1], Noor Aslinda Abu Seman[1]***

[1]Faculty of Technology Management and Business,
Universiti Tun Hussein Onn Malaysia, Johor, 86400, MALAYSIA

*Corresponding Author Designation

DOI: https://doi.org/10.30880/rmtb.2022.03.01.070
Received 31 March 2022; Accepted 30 April 2022; Available online 25 June 2022

**Abstract**: The objective of this study was to analyze the impact of supply chain responsiveness (SCR) on sustainable performance (SP) in Malaysian manufacturing firms. This study used a questionnaire to collect 231 replies. Statistical approaches such as descriptive statistics, correlation, and bootstrapping were used. Cronbach's Alpha and factor analysis were used to validate the data gathering appropriateness of instrument. The research findings validated the assumption that SCR has a positive effect on company SP. The current study results demonstrated that the primary hypothesis was accepted, as did the alternative, which asserts that the supply chain responsiveness variables (Operations System Responsiveness, Logistics Process Responsiveness, and Suppliers Network Responsiveness) impact SP. The findings also revealed that a greater level of Operations System Responsiveness provides a higher level of SP for businesses, which is based on reduced pricing, high delivery dependability, high product innovation, and low time to market. It was also discovered that a greater level of Suppliers Network Responsiveness results in a higher level of SP for a firm, which is based on low pricing and high delivery reliability. This research has significant implications for practitioners. Based on the present levels of different particular impact SCR and its dimensions, this analysis gives appropriate suggestions on the opportunity for development. Furthermore, the study makes appropriate recommendations on the scope for development based on existing levels of many important SCR criteria that directly effect a SFP, in order to make the businesses more sustainable.

**Keywords**: Supply Chain Responsiveness, Sustainable Performance, Manufacturing Company.

*Corresponding author: naslinda@uthm.edu.my*

## 1. Introduction

Recently, the problem of sustainability has emerged as a critical concern in the manufacturing industries throughout the world. For this reason, industrial organizations that formerly focused solely on financial advantages are increasingly recognizing the need to protect and preserve the environment through the adoption of supply chain management (SCM) strategies (Mallak *et al.*, 2018). According to Asamoah *et al.* (2021) that the concept of supply chain responsiveness (SCR) is one of the main SCM initiatives that have been on the agenda of ethicists, strategists, researchers, and practitioners.

Yu *et al.* (2019)) referred supply chain responsiveness in the implementation of a manufacturing strategy that has no negative environmental effects. They necessarily involve the conscious integration of environmental management initiatives throughout the life cycle of a product and cover critical manufacturing issues such as the design of green products with reusable and recyclable content, pollution control and environmental protection, environmental regulatory compliance, and waste management. Supply chain responsiveness is based on the assumptions that manufacturing organizations create harmful pollutants in their effort to meet consumer needs. Hence, it actually encourages them to understand their reasonable degree of pollution on natural resources, stakeholders, and the environment in general (Mohammaddust *et al.*, 2017). Organizations now conduct the business in a challenging environment. In this condition, the role of supply chain management in business strategy is evolving. This may be used in the improvement of its Supply Chain Responsiveness (SCR), which is the capacity to respond quickly and the extent to which the supply chain can handle changes in customer demand.

Supply chain responsiveness is the coordination of production, inventory, location, and transportation among supply chain actors to achieve the greatest balance of responsiveness and efficiency for the market being supplied. Supply Chain Responsiveness (SCR) has become increasingly crucial in establishing new competing opportunities in a quickly changing increasingly competitive market (Kim & Lee, 2010). What was once a theoretical process now a competitive weapon, and there is a need to construct supply chains for companies that are substantially more flexible and responsive than the present ones (Thatte *et al.*, 2013; Rajagopal *et al.*, 2016). It has now become a critical issue in researching the effect of Supply Chain Responsiveness (SCR) on Sustainable Performance from the aspect of supply disruption and changing customer requirements.

The rest of this paper is divided into the following sections: Section 2 focuses on the review of the literature and the development of hypotheses. The third section focuses on the research methodology. Section 4 provides insights into the analysis and results, as well as a discussion of the empirical findings. Finally, Section 5 discusses the conclusion, implications of the results, and future research directions.

## 2. Literature Review

### 2.1 Supply Chain Responsiveness

Supply chain responsiveness refers to the capacity of the supply chain to respond the market conditions that are rapid or unpredictable (Thatte *et al.*, 2013). Qrunfleh & Tarafdar (2013), also described the capacity of the supply chain in the company to adapt effectively and quickly to changing customer needs and expectations. In other words, Kim and Lee, (2010) said the capability of an organization to be responsive derives from the firm itself, its SC partnerships, and its coordination of activities. Therefore, the supply chain responsiveness scope exists among all the other participants engaged in the supply chain management system.

The grade of the supply chain responsiveness system according to (Singh, 2015), is determined by the speed with which the supply chain system may adjust its output within the space of the four

categories of external flexibility: product, volume, mix, and delivery, in order to adapt to external stimuli (Braunscheidel and Suresh, 2009). Therefore, in order for the supply chain to remain competitive, it must be able to adapt to challenges such as reducing lead times for production and delivery, shortening the product life cycle, and increasing product diversity (Gilal *et al.*, 2017). Furthermore, the increasing degrees of uncertainty in the supply chain and the frequency of product launches have raised the relevance of time-to-market, which assists organizations in avoiding inventory obsolescence. Hence, supply chain is a crucial problem in determining corporate performance (Hum *et al.*, 2018; youb & Abdallah, 2019).

This fact was heavily reinforced in previous literature (Chan *et al.*, 2018; Jahre and Costes, 2015b; Moyano-Fuentes *et al.*, 2016; Qi *et al.*, 2017). Moreover, Thatte *et al.* (2013) maintain further that the level of responsiveness in the supply chain increases as speed and more particularly flexibility increase. Researchers extend these components to develop the responsiveness of our supply chain constructs based on (Sukati, 2011) , Thatte *et al.* (2013), Qrunfleh and Tarafdar (2013), and Gilal *et al.* (2017) who identify diverse supply chain components of flexibility and responsive. As the three key components of supply chain responsiveness, this paper identify operations system responsiveness, logistics process responsiveness, and supplier network responsiveness. Literature ( ex. Sukati (2011) and Thatte *et al.* (2013) ) stressed the need to respond to supply chains (rather than individual organizations). This was the main reason behind the study of the supply chain responsiveness. In addition, all the dimensions have been explained in next paragraph.

The operations system responsiveness is the ability of a company's manufacturing system to respond to customer demand changes. The responsiveness of the operating system includes both production and service operations. In a conceptual survey, Sukati (2011) and Thatte *et al.* (2013) stress that responsiveness operations at every chain node constitute an important part of responsiveness in the supply chain. It also argues that each supply chain entity needs to deliver the product or service on a timely and reliable basis to meet the end-customer needs.

Responding to logistical processes is defined by the ability of a company to exit its customer demand, transport, distribution, and warehousing system. Response in the logistics process is an important part of the success of a responsive strategy for the supply chain (Thatte *et al.*, 2013b). Logistics and distribution management includes transportation activities of goods from suppliers to suppliers to distribution canters (Sundram *et al.*, 2018). Those activities include warehousing, packaging and transport, planning and administration of transport, inventory management, reverse logistics, and tracking and delivery of orders.

The responsiveness of the supplier's network is defined as the capacity of leading suppliers to deal with changes in demand in their companies. The presence of responsive and flexible partners on and off the focal point is a key to responsiveness (Thatte *et al.*, 2013b). The ability of companies to respond quickly to customer demand depends on suppliers' reaction time to change their volume.

### 2.2 Sustainable Performance

Sustainable performance implies the long-term competitive advantage in economic returns that companies gain by taking into consideration the effect on the global environment and human rights of society and not immolating stakeholder requirements (Paulraj, 2011). The triple bottom line (TBL), which integrates economic, environmental, and social performance, is extensively used to operational sustainable performance (Chavez *et al.*, 2020). Economic performance is defined as productivity and financial returns on assets. When a company invests its resources more effectively than its competitors, it earns a higher-than-average return. Economic performance is measured by financial measures such as an increase in return on assets (ROA), return on investment (ROI), market share, and profit (Hourneaux *et al.*, 2018). The environmental dimension of the TBL analyzes the effect of activities companies on natural systems.

Previous research has increasingly considered environmental performance as a strategic concern, with reductions in energy usage, hazardous material usage, and waste discharge being measured (Glavas & Mish, 2015; Atan *et al.*, 2018). Beyond economic concerns, social performance assesses how companies contribute to the public and society (Mani *et al.*, 2018). In addition to the shareholders, it demonstrates corporate social responsibility to a variety of stakeholders, including workers and communities (Valle *et al.*, 2019). According to Chen and Baumgartner (2014) and (Paulraj, 2011), social performance in this research primarily consists of advantages to the community and to employees, such as increasing their welfare and enhancing their health and safety.

## 3. Research Methodology

### 3.1 Research model and hypotheses

*(a) Research Model*

A study model is constructed to analyze the hypothesized relationships between the dimensions of supply chain responsiveness and sustainable performance in order to completely understand how supply chain responsiveness drives sustainable performance. According to the study model, the three dimensions of supply chain responsiveness have a direct effect on the extent to which companies may establish a competitive advantage in sustainable performance. Furthermore, the effect of sustainable performance may be determined by the firm's profit and industry. This is due to the fact that medium and larger companies have more resources and may have established better skills that they may employ to gain a competitive edge in sustainable performance. Similarly, the extent to which enterprises may obtain a competitive advantage may differ for manufacturing firms.

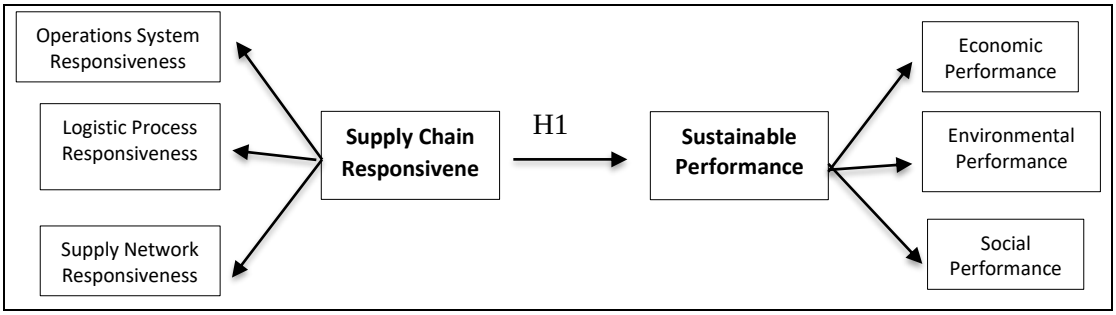


**Figure 1: Research Model**

Figure 1 depicts the research model investigated in this study. Following that, the hypothesized pathways are described in detail.

*(b) Hypothesis Model*

The performance of the firm refers to how well a company meets its commercial and financial targets ( Qrunfleh and Tarafdar, 2013; Fadaki *et al.*, 2019). The supply chain was considered an important way to increase sustainable performance (Çankaya and Sezen, 2019). Other researcher such as Ayoub and Abdallah, (2019a) concluded that supply chain responsiveness would improve the demand and export performance of a business. The higher speed of responsiveness to the supply chain, the more the focal firm can respond to market demand. Gilal *et al.*, (2017) said that the supply chain responsiveness has increased the product development and capacity of the supply chain also have responded to consumer demand efficiently. Therefore, it can be related positively to sustainable performance. The hypothesis is established as follows:

*H1: Supply chain responsiveness has a significant effect to sustainable performance*

### 3.2 Sample

The questionnaires were distributed for Managers of supply chain, operations, and production, as well as general and vice-general managers who have experience and involvement with production companies in Malaysia. The data were gathered over a period of about three months (May-July 2021). During the investigation, self-chatting and courtesy calls were made, and respondents were often reminded to achieve a better response rate (Fan & Yan, 2010). The population size of this study comprise of a total of 2,600 companies. They include the food industry, petrochemical and chemical industry, plastic and rubber industry, computer industry, electronic and optical manufacturing, automotive and component industry (FMM, 2018). Only manufacturers who use green practices were chosen to achieve the study's objectives. Around 451 questionnaires were distributed according to the sample size suggested by Krejcie & Morgan (1970), with a total of 299 respondent replied for return rate, and 231 sample of respondent were usable for this analysis. In some cases, 68 questionnaires have been removed due to straight-line responses and missing values which are over 50%.

### 3.3 Questionnaire and Measures

In this study, the researcher created a survey questionnaire to collect the necessary data for the investigation. The constructs' question items were developed from previous studies to ensure the measuring instrument's validity and reliability. The supply chain responsiveness construct consisted of nine questions taken from Qrunfleh and Tarafdar, (2013), Gilal *et al.* (2017), and Ayoub and Abdallah, (2019). The modified elements of these constructs represented the major substance of the definitions of the constructs. Furthermore, the altered supply chain responsiveness constructs were widely employed in the supply chain management literature. Finally, the sustainable performance construct included sixteen questions derived from Rashid *et al.* (2017) and Iranmanesh *et al.* (2019) to reflect the company's profile, which included economic, environmental, and social performance. Participants were asked to rate their degree of agreement or disagreement with the included questions on a six-point Likert scale, with 1 indicating strong disagreement and 6 indicating strong agreement.

## 4. Results and Discussion

### 4.1 Results

#### *(a) The Result of Validity and Reliability*

Exploratory factor analysis was used to kick off construct validity studies (EFA). With the Promax rotation approach, principal component analysis was used. As predicted, the EFA result revealed four distinct structures. Four questions were deleted because their loadings were less than 0.40 or because they loaded on two variables. Furthermore, the two constructions' eigenvalues surpassed the minimal value of one (Hair *et al.*, 2010). Following that, the Cronbach's coefficient test was used to assess the dependability of the produced constructs. The two constructs demonstrated strong reliability, with values larger than 0.70. (Hair *et al.*, 2010).

Then, as a second phase, confirmatory factor analysis (CFA) was performed using Smart PLS, Version 3.2.9 to assess concept validity. The goal of running CFA was to guarantee that loadings of all question items exceeded 0.50, values of average variance extracted (AVE) for the four constructs exceeded 0.50, high values of composite reliability for the two constructs above 0.70, and model fit indices were within acceptable limits (Fornell & Larcker, 1981). To obtain the necessary values, four items (RLP1, SECP4, SEVP6, and SSP4) were eliminated.

The structural model had indices that were both highly fitting and acceptable. The convergent validity and unidimensionality indices revealed that the model fit was adequate. Obtaining standardized regression coefficients for the final question items that were greater than double their standard errors

offered additional support for convergent validity (Henseler, 2017). Furthermore, the factor loadings for all of the question items surpassed 0.50. Similarly, getting values of AVE greater than 0.50 for the two constructs offered additional support for convergent validity (Fornell & Larcker, 1981). By attaining values greater than 0.70 for each of the two constructs, the composite reliability gave additional evidence for construct reliability. Table 1 presents the research constructs' averages and standard deviations, as well as the standardized factor loadings of EFA and CFA and the final constructs' reliability values.

**Table 1: The Result of Validity & Reliability**

| Construct | Items | Loading | CA | CR | AVE |
|---|---|---|---|---|---|
| SCR | ROS1 | 0.790 | 0.799 | 0.824 | 0.700 |
| | ROS2 | 0.769 | | | |
| | ROS3 | 0.806 | | | |
| | RLP2 | 0.835 | 0.772 | 0.831 | 0.622 |
| | RLP3 | 0.839 | | | |
| | RSN1 | 0.814 | 0.766 | | |
| | RSN2 | 0.726 | | 0.818 | 0.599 |
| | RSN3 | 0.780 | | | |
| SP | SECP1 | 0.838 | 0.746 | | |
| | SECP2 | 0.783 | | 0.854 | 0.662 |
| | SECP3 | 0.861 | | | |
| | SECP5 | 0.737 | | | |
| | SEVP1 | 0.794 | 0.760 | 0.845 | 0.578 |
| | SEVP2 | 0.758 | | | |
| | SEVP3 | 0.828 | | | |
| | SEVP4 | 0.683 | | | |
| | SEVP5 | 0.766 | | | |
| | SSP1 | 0.737 | 0.735 | | |
| | SSP2 | 0.741 | | 0.834 | 0.557 |
| | SSP3 | 0.788 | | | |
| | SSP5 | 0.718 | | | |

Discriminant validity was used to confirm that the study's constructs were distinct. The results showed that the square root of each AVE value for all constructs was greater than the absolute correlation value between each construct and the others. This meant that discriminant validity was well confirmed (Fornell & Larcker, 1981). Assuring that the maximum shared squared variance (MSV) and average shared squared variance (ASV) values for each construct were smaller than the AVE value provided additional evidence of discriminant validity (Hair *et al.*, 2010). Table 2 shows the discriminant validity results.

**Table 2: Discriminant Validity**

| Construct | SCR | SP |
|---|---|---|
| SCR | 0.721 | |
| SP | 0.356 | 0.709 |

*(b) The Results of Hypothesis*

This study examined the proposed research model Figure 1 using structural equation modeling (SEM). The structural model has a good fit (Hair *et al.*, 2010) and the results are reported in Table 3. The structural model reveals that supply chain responsiveness is positively and significantly related to sustainable performance ($\beta$=0.122, p>0.023), thus lending support for H1.

**Table 3: The Hypothesis Result**

| Hypothesis | Original Samples | Mean Value | STDV | T-Value | P-Value | Result |
|---|---|---|---|---|---|---|
| H1 : SCR - SP | 0.122 | 0.119 | 0.053 | 2.282 | **0.023** | Supported |

As depicted in Figure 1, specifically, this study used bias-corrected bootstrapping with 10,000 resamples to estimate direct effects and their significance. Table III presents the results of the analysis using estimates of direct paths. The bootstrap results indicate that the direct effect of supply chain responsiveness on sustainable performance is significant.

4.2 Discussions

Supply chain responsiveness also had a positive and significant impact on sustainable performance, showing that manufacturers may increase their sustainable performance by improving their responsiveness. The findings are consistent with the findings of (Qrunfleh and Tarafdar, 2013), who discovered that supply chain responsiveness had a positive impact on company performance. The conclusion is also similar to the findings of Ayoub and Abdallah (2019), who found that particularly supply chain responsiveness, have a positive impact on market performance. Both studies used manufacturing enterprises from the United States and Jordan as examples. The findings of this study add to the current literature by giving empirical data on the effect of supply chain responsiveness on sustainable performance in a developing country context.

Eventually, the findings demonstrated that supply chain responsiveness had a positive effect on sustainable performance. This conclusion suggests that the supply chain responsiveness will enhance sustainable performance of the firm. The result is consistent with the findings of (Qrunfleh & Tarafdar, 2013), who discovered a positive impact between supply chain responsiveness and company performance. It is also consistent with Rajagopal *et al.* (2016) and Gilal *et al.* (2017), who both emphasized the importance of supply chain responsiveness in boosting competitive advantage and product development. The current study, on the other hand, adds to the work of other researchers by being the first to give empirical data for the involvement of supply chain responsiveness in the sustainable performance relationship.

This research has made a significant contribution to the field of knowledge in various ways. The total contribution has been the development and testing of a conceptual model for supply chain responsiveness practices and sustainable performance. Second, this study discovered evidence for a direct influence of supply chain responsiveness on sustainable performance, indicating that supply chain responsiveness is correlated to sustainable performance in a positive way. It is shown that the supply chain's high responsiveness enhances the company's performance sustainability. This may be explained by the fact that when firms are highly responsive in terms of operation, logistics, and supplier network, they are more flexible and rapid in incorporating consumer feedback into the development launch of new goods.

## 5. Conclusion

Presently, supply chain responsiveness has gained a lot of attention in manufacturing companies. Therefore, there is an essential need for the manufacturing industry to protect the environment while also promoting economic growth and social well-being. An increasing number of manufacturers realize the need of taking proactive actions to enhance their sustainability performance by implementing supply chain responsiveness into their business strategy. Supply chain responsiveness emerges to be a good strategy for increasing sustainable performance in this aspect.

The 231 manufacturers polled in this study provide their perspectives on the supply chain responsiveness practices already implemented in Malaysia, as well as their connection with sustainable performance. In summary, the findings suggest that Malaysian manufacturers believe that the supply chain responsiveness practices are the most important aspect that may greatly enhance sustainable performance. To gain a more in-depth insight, a survey should be conducted on manufacturers depending on the kind of industry in future work, such as automotive, power generation, electrical and electronics, and food sectors. Furthermore, in future studies, it would be interesting to investigate the moderating influence of other sorts of supply chain responsiveness practices, such as corporate ownership, industry type, and technical innovation.

## Acknowledgement

The researchers thank to the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, and Faculty of Economic Business, and Politics, Universitas Muhammadiyah Kalimantan Timur (Indonesia) that have provided all the necessary facilities for completing of this study.

## References

Abdul-Rashid, S. H., Sakundarini, N., Raja Ghazilla, R. A., & Thurasamy, R. (2017). The impact of sustainable manufacturing practices on sustainability performance: Empirical evidence from Malaysia. *International Journal of Operations and Production Management*, *37*(2), 182–204. https://doi.org/10.1108/IJOPM-04-2015-0223

Asamoah, D., Nuertey, D., Agyei-Owusu, B., & Akyeh, J. (2021). The effect of supply chain responsiveness on customer development. *International Journal of Logistics Management*. https://doi.org/10.1108/IJLM-03-2020-0133

Atan, R., Alam, M. M., Said, J., & Zamri, M. (2018). The impacts of environmental, social, and governance factors on firm performance: Panel study of Malaysian companies. *Management of Environmental Quality: An International Journal*, *29*(2), 182–194. https://doi.org/10.1108/MEQ-03-2017-0033

Ayoub, H. F., & Abdallah, A. B. (2019a). The effect of supply chain agility on export performance: The mediating roles of supply chain responsiveness and innovativeness. *Journal of Manufacturing Technology Management*, *30*(5), 821–839. https://doi.org/10.1108/JMTM-08-2018-0229

Ayoub, H. F., & Abdallah, A. B. (2019b). The effect of supply chain agility on export performance: The mediating roles of supply chain responsiveness and innovativeness. *Journal of Manufacturing Technology Management*, *30*(5), 821–839. https://doi.org/10.1108/JMTM-08-2018-0229

Baumgartner, R. J. (2014). Managing corporate sustainability and CSR: A conceptual framework combining values, strategies and instruments contributing to sustainable development. *Corporate Social Responsibility and Environmental Management*, *21*(5), 258–271. https://doi.org/10.1002/csr.1336

Braunscheidel, M. J., & Suresh, N. C. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. *Journal of Operations Management*, *27*(2), 119–140. https://doi.org/10.1016/j.jom.2008.09.006

Chavez, R., Yu, W., Jajja, M. S. S., Song, Y., & Nakara, W. (2020). The relationship between internal lean practices and sustainable performance: exploring the mediating role of social performance. *Production Planning and Control*, *0*(0), 1–17. https://doi.org/10.1080/09537287.2020.1839139

Del Valle, I. D., Esteban, J. M. D., & De Foronda Pérez, Ó. L. (2019). Corporate social responsibility and sustainability committee inside the board. *European Journal of International Management*, *13*(2), 159–175. https://doi.org/10.1504/EJIM.2019.098145

Fadaki, M., Rahman, S., & Chan, C. (2019). Quantifying the degree of supply chain leagility and assessing its impact on firm performance. *Asia Pacific Journal of Marketing and Logistics*, *31*(1), 246–264. https://doi.org/10.1108/APJML-03-2018-0099

Fan, W., & Yan, Z. (2010). Factors affecting response rates of the web survey: A systematic review. *Computers in Human Behavior*, *26*(2), 132–139. https://doi.org/10.1016/j.chb.2009.10.015

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. https://doi.org/10.2307/3150980

Gilal, F. G., Zhang, J., Gilal, R. G., Gilal, R. G., & Gilal, N. G. (2017). Supply Chain Management Practices and

Product Development: A Moderated Mediation Model of Supply Chain Responsiveness, Organization Structure, and Research and Development. *Journal of Advanced Manufacturing Systems*, *16*(1), 35–56. https://doi.org/10.1142/S0219686717500032

Glavas, A., & Mish, J. (2015). Resources and Capabilities of Triple Bottom Line Firms: Going Over Old or Breaking New Ground? *Journal of Business Ethics*, *127*(3), 623–642. https://doi.org/10.1007/s10551-014-2067-1

Henseler, J. (2017). Bridging Design and Behavioral Research With Variance-Based Structural Equation Modeling. *Journal of Advertising*, *46*(1), 178–192. https://doi.org/10.1080/00913367.2017.1281780

Hourneaux Jr, F., Gabriel, M. L. da S., & Gallardo-Vázquez, D. A. (2018). Triple bottom line and sustainable performance measurement in industrial companies. *Revista de Gestão*, *25*(4), 413–429. https://doi.org/10.1108/rege-04-2018-0065

Hum, S. H., Parlar, M., & Zhou, Y. (2018). Measurement and optimization of responsiveness in supply chain networks with queueing structures. *European Journal of Operational Research*, *264*(1), 106–118. https://doi.org/10.1016/j.ejor.2017.05.009

Iranmanesh, M., Zailani, S., Hyun, S. S., Ali, M. H., & Kim, K. (2019). Impact of lean manufacturing practices on firms' sustainable performance: Lean culture as a moderator. *Sustainability (Switzerland)*, *11*(4), 1093–1112. https://doi.org/10.3390/su11041112

Joseph, F. H. J., Barry, J. B., Rolph, E. A., & Rolph, E. A. (2010). *Multivariate data analysis*. Pearson Prentice Hall. https://dspace.agu.edu.vn:8080/handle/AGU_Library/13299

Kim, D., & Lee, R. P. (2010). Systems Collaboration and Strategic Collaboration: Their Impacts on Supply Chain Responsiveness and Market Performance. *Decision Sciences*, *41*(4), 955–981. https://doi.org/10.1111/j.1540-5915.2010.00289.x

Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, *30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Mallak, S. K., Ishak, M. B., Mohamed, A. F., & Iranmanesh, M. (2018). Toward sustainable solid waste minimization by manufacturing firms in Malaysia: strengths and weaknesses. *Environmental Monitoring and Assessment*, *190*(10), 575–581. https://doi.org/10.1007/s10661-018-6935-5

Mani, V., Gunasekaran, A., & Delgado, C. (2018). Enhancing supply chain performance through supplier social sustainability: An emerging economy perspective. *International Journal of Production Economics*, *195*, 259–272. https://doi.org/10.1016/j.ijpe.2017.10.025

Manufacturers, F. of M. (2018). *Manufacturing sector looks positive in 2018*. https://www.fmm.org.my/FMM_In_The_News-@-Manufacturing_sector_looks_positive_in_2018.aspx

Mohammaddust, F., Rezapour, S., Farahani, R. Z., Mofidfar, M., & Hill, A. (2017). Developing lean and responsive supply chains: A robust model for alternative risk mitigation strategies in supply chain designs. *International Journal of Production Economics*, *183*, 632–653. https://doi.org/10.1016/j.ijpe.2015.09.012

Paulraj, A. (2011). Understanding the relationships between internal resources and capabilities, sustainable supply management and organizational sustainability. *Journal of Supply Chain Management*, *47*(1), 19–37. https://doi.org/10.1111/j.1745-493X.2010.03212.x

Qrunfleh, S., & Tarafdar, M. (2013). Lean and agile supply chain strategies and supply chain responsiveness: The role of strategic supplier partnership and postponement. *Supply Chain Management: An International Journal*, *18*(6), 571–582. https://doi.org/10.1108/SCM-01-2013-0015

Rajagopal, P., Azar, N. A. Z., Bahrin, A. S., Appasamy, G., & Sundram, V. P. K. (2016). Determinants of supply chain responsiveness among firms in the manufacturing industry in Malaysia. *International Journal of Supply Chain Management*, *5*(3), 18–24.

Singh, R. K. (2015). Modelling of critical factors for responsiveness in supply chain. *Journal of Manufacturing Technology Management*, *26*(6), 868–888. https://doi.org/10.1108/JMTM-04-2014-0042

Thatte, A. A., Rao, S. S., & Ragu-Nathan, T. S. (2013). Impact of SCM practices of a firm on supply chain responsiveness and competitive advantage of a firm. *Journal of Applied Business Research*, *29*(2), 499–530. https://doi.org/10.19030/jabr.v29i2.7653

Yildiz Çankaya, S., & Sezen, B. (2019). Effects of green supply chain management practices on sustainability performance. *Journal of Manufacturing Technology Management*, *30*(1), 98–121.

Yu, W., Chavez, R., Jacobs, M., Wong, C. Y., & Yuan, C. (2019). Environmental scanning, supply chain integration, responsiveness, and operational performance. *International Journal of Operations & Production Management*, *39*(5), 787–814.