

The Conceptual Model of Supply Chain Risk, Green Supply Chain Management Practices and Organizational Performance among Malaysian Manufacturing Sector

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Abstract

The manufacturing sector has recently looked for organisational performance outcomes concerning economic and environmental performance to provide a competitive edge. Economic performance is perceived as a long-run objective for the organisation, whereas environmental performance supports the success of economic performance. However, the existence of the supply chain risks will be affected both economic and environmental performance. Therefore, organisations need to discover an appropriate strategy to reduce the supply chain risks and improve organisational performance. The principal objective of this study is to perform a conceptual model to examine the mediating role of GSCM practices on the relationship between supply chain risks and organisational performance. This study also proposes the hypotheses as a guide and direction to achieve the objective. The originality of this study is on its investigation of the relationship among supply chain risks, green supply chain management practices, and organisational performance simultaneously, which has not been noticed among previous scholars. This conceptual framework is expected to be used by the Malaysian manufacturing sector to improve organisational performance since this sector is the highest contributor to the Malaysian gross domestic product.

Keywords: *Economic, environmental, performance, supply chain risks, green supply chain management practices.*

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INTRODUCTION

The Malaysian manufacturing sector has become the most important industry to the Malaysian economy as this sector remains the second-largest sector contributing to Malaysia. According to the Malaysian Gross Domestic Product report in the Second Quarter of 2021, there has been a strong growth

of 16.1% compared to the first quarter of 2021 (Department of Statistics Malaysia, 2022). Besides being a vital source for the Malaysian economy, the manufacturing sector also plays a significant role in sustaining the environmental condition. A green activity in the manufacturing industry can contribute to Malaysian sustainability. Hence, the manufacturing sector has improved its organisational performance by

focusing on economic and environmental performance to sustain and contribute to Malaysian growth.

For Malaysia to move forward in a global competitive edge, a highly integrated supply chain is a prerequisite among manufacturing companies. Many factors have been found to contribute to organisational performance, and one of the main factors is supply chain management (Chen, 2018; Mutuerandu, 2014; Salazar, 2012; Li et al., 2004). The organisation's performance will increase if the supply chain has been well-managed by the organisation. In other words, supply chain management will influence the company's operation and success. Nonetheless, organisations have to be concerned about the risk in the supply chain from every direction (Olson & Wu, 2010) because the supply chain risks will reduce the organisation's performance. The risks in the supply chain will disturb the operation's routine and decrease organisational performance. It has been proven that supply chain risks have been significant and can negatively affect organisational performance (Bavarsad et al., 2014; Hendrick & Singhal, 2005).

According to the study by Punniyamoorthy et al. (2013) and Ibrahim and Razak (2018), the supply chain risks can be divided into several risks such as manufacturing risk, logistic risk, information risk, supply risk, demand risk, and environmental risk. The study by Punniyamoorthy et al. (2013) also has categorised the pandemic and the man-made disaster as the element of environmental risk in the supply chain risks, which has a negative deviation that affects the organisation's performance in terms of financial and non-financial performance. The novel Coronavirus disease, also known as COVID-19, is a major tragedy for the global economy. Specifically, economic activities were disrupted in Malaysia, and the manufacturing sector saw a decline in production by -17.2% in 2020 (Department of Statistics Malaysia, 2021). Twelve years ago, supply chain risks were mentioned in Trade and Economic Section (2012) on the Japan Tsunami in 2011, which disrupted the performance of Malaysian automobile and manufacturing company, PROTON Holdings, where this company recorded a sale dropped (-2.3%) and the production loss (-6.9%) compared to 2010. Since PROTON Holdings has a good supply chain network with Mitsubishi Corporation (MC) and Mitsubishi Motor Corporation (MMC) in purchasing component parts, the Tsunami in Japan disrupted their supply chain activity affected the economic performance of PROTON Holdings.

Concerning environmental performance, Malaysia was ranked 75th out of 180 global environmental indexes in 2018, which is lower than neighbour countries such as Singapore (49th) and Brunei (53rd) (Environmental Performance Index, 2018). Schaltegger and Burritt (2014) highlighted that supply chain risks could disturb the supply chain activity and impact the environmental performance. Therefore, the Malaysian manufacturing sector must discover the best strategy to improve economic performance and environmental performance from supply chain risks (Ibrahim and Razak, 2018; Yaakub & Mustafa, 2015).

The resource-based view (RBV) theory is utilised as the guiding principle in this study because the RBV is strongly connected with the competitive advantage that explains the organisation's performance. Barney (1991) discussed that tangible and intangible resources play a significant role in the organisation's competitive advantage. The study by Shaaran et al. (2021) highlighted that unique resources also contribute to the organisation's competitive advantage. The RBV theory can be attached to the supply chain management field and integrates all the supply chain activities (Aziz et al., 2015). In this study, supply chain risks can relate to an intangible resource that distracted the organisation's performance. Therefore, the RBV theory becomes the backbone to investigate the interaction of supply chain risks, green supply chain management practices, and organisational performance.

Previous studies investigated the relationship between supply chain risks, strategy, and firm performance (Ali & Shukran, 2015); however, their study only concentrated on economic performance. It shows that there is still limited study focus on the relationship of supply chain risks, strategy towards economic performance, and environmental performance. On the other hand, previous literatures discussed green supply chain management practices as a role of strategy to improve both economic and environmental performance (Su et al., 2014; Meera & Chitramani, 2014; Rozar, 2013; Hajikhani et al., 2012; Lin & Sheu, 2012; Xu, 2011; Chen et al., 2010; Sarkis, 1995). Because of that, this study will execute the green supply chain management practices as an appropriate strategy to achieve high economic and environmental performance. This study also evaluates green supply chain management practices as a mediating variable of the effect of supply chain risks towards organisational performance, and it has been supported by Kirchoff et

al. (2016), Zailani et al. (2012) and Zhu et al. (2012). Therefore, green supply chain management practices are added to this conceptual model to play a significant mediating role in the relationship between supply chain risks and organisational performance. That relationship was not examined in Su et al. (2014) study as they only tested the direct effect of supply chain risk and organisational performance in the Chinese manufacturing industry.

Accordingly, this study aims to perform a conceptual model to examine the role of green supply chain management practices as a strategy to improve organisational performance from the effect of supply chain risks in the Malaysian manufacturing sector. At the same date, this study also proposed the hypotheses as a guide and direction regarding to supply chain risks, green supply chain management practices, and organisational performance.

2.0 LITERATURE REVIEW

This study reviews previous scholars' discussion regarding several variables such as organisational performance, economic performance, environmental performance, green supply chain management practices, supply chain risks, manufacturing risk, logistic risk, supply risk, information risk, demand risk, and environmental risk for hypothesis development.

2.1 Organisational performance

There have been some debates to clarify either financial or non-financial indicator is the most appropriate to determine organisational performance (Wang et al., 2015). Gavrea et al. (2011) described that the performance measurement focuses on both financial and non-financial indicators since the organisation's objectives have become more complex. Both financial and non-financial indicators are widely discussed for continuous performance improvement. Besides, financial and non-financial performance are the best indicators to measure organisational performance because the measurement of financial performance will contribute to long-run objectives of the business life, whereas non-financial performance supports the success of financial performance (Wang et al., 2015; Kaplan and Norton, 1996). To achieve a competitive edge, the firm recently needs to focus on achieving economic and environmental performance as their performance indicator.

In operation management, when practitioners effectively manage supply chain

management practice to achieve a competitive advantage, they are required to have performance measurements as a reference to monitor the level of their organisation. Hence, this study adapted the performance measurement applied in green supply chain management literature. Since supply chain risk affects both economic and environmental performance, economic performance (Chien, 2014; Laosirihongthong et al., 2013; Zhu et al., 2012; Zhu & Sarkis, 2004) and environmental performance (Tachizawa et al., 2015; Chien, 2014; Laosirihongthong et al., 2013; Green Jr. et al., 2012; Zhu et al., 2012; Zhu & Sarkis, 2004) are included as indicators for organisational performance.

2.2 Economic performance

Economic performance becomes the main priority for the manufacturing sector. Due to that, the manufacturing companies focus on improving their economic performance. A study by Ventakraman and Ramanujam (1986) highlighted that financial performance is a part of the economic performance achievement of firms. Thus, the indicator to measure financial performance is an indicator of economic performance. Based on the research by Sellers-Rubio (2010), there are seven components to measure economic performance: net income, earnings before interest and tax, assets, total debt, equity, investment, and the number of employees. While Bavarsad et al. (2014) measure economic performance based on eight elements: inventory costs, transportation costs, distribution costs, product costs, sales growth, return on investment, the ratio of net profit, and market share, Cankaya and Sezen (2019) measured economic performance based on four elements: sales growth, profits growth, improvement in return on assets, and improvement in earnings per share.

2.3 Environmental performance

Some management practices, such as green practice or other related factors, are appropriate for measuring environmental performance. Even though economic performance is highly influential in achieving a competitive advantage, Khor (2013) stated that environmental performance also influences firms regarding superior competition among organisations. Environmental performance concentrates on decreasing emissions and environmental pollutants (Green Jr. et al., 2012). Positive environmental performance can be seen based on the reduction of emissions, waste, pollution, and hazards in operation and production (Abd. Rahman et al., 2014).

2.4 Green supply chain management (GSCM) practices

In the era of the 2000s, the green supply chain concept is given attention by many researchers to discover the importance of the green supply chain and how to introduce the green supply chain practically. This has triggered the need to study the management of the green supply chain and introduce the concept of green supply chain management (GSCM) (Zhu et al., 2008; Baojuan, 2008; Srivastava, 2007; Zhu & Sarkis, 2004; Kogg, 2003; Zsidisin & Siferd, 2001).

The growth of GSCM literature has become the catalyst for GSCM practices. According to Diabat and Govindan (2011), GSCM is now considered a green practice due to its consistency in sustaining environmental performance at all levels of management and the entire supply chain. Groznik and Erjavec (2012) highlighted that the word 'green practice' is related to the green economy, aiming to improve three main things: social equity, environmental risk, and ecological problem. As mentioned by Field and Sroufe (2007), GSCM practices are identified by the business management team to support the high demand for environmentally-friendly products to improve environmental performance and reduce cost. This practice also plays an important role in reducing environmental risk, increasing the efficiency of ecology, and improving the organisation's economic performance (Kumar & Chandrakar, 2012; Zhu & Sarkis, 2004).

2.5 Supply chain risks

The changes in business activities are always unpredictable (Wahab et al., 2020) and the challenges in supply chain activities. Risk is characterised as uncertain events or occurrence which leads to negative outcome such as financial burdens, low performance of the organisation, late delivery, etc. (Moktadir et al., 2018). Risk also occurs in numerous research areas such as manufacturing, finance, insurance, supply chain management, etc. (Moktadir et al., 2018). Vilko (2012) categorised risk in several perspectives, where each perspective shows the differences. Qun (2010) signifies supply chain risks as possible challenges for supply chain breakdown. According to Christopher (2005), supply chain activities have a high possibility of risk involvement compared to other business areas. Inefficient flow of materials, delaying, and blocking information among supply chain partners are also a part of supply chain risks that the organisation need to consider (Punniyamoorthy et al., (2013). There are

several definitions of supply chain risks debates. According to the definition by Zhang and Song (2011), the supply chain risk is considered purely dangerous with the significance accurately affecting the actual business in the supply chain activity. The study by Bavarsad et al. (2014) and Tang (2006) defines supply chain risks as uncertain events that could negatively affect supply chain activities and reduce organisational performance. The definition of supply chain risks also has been discussed by Mangla et al. (2015). They defined supply chain risks as threats to the firm's performance and have a high possibility of disrupting regular operation activity. Based on previous scholars' definitions of supply chain risks, in this study, supply chain risks can be operationalised as unexpected events that negatively affect organisational performance in terms of economic and environmental performance. Specifically, this study has divided supply chain risks into six dimensions: manufacturing risk, logistic risk, information risk, supply risk, demand risk, and environmental risk, adopted from Punniyamoorthy et al. (2013).

2.5.1 Manufacturing risk

The manufacturing risk exists when machines are breakdown, a lack of water supply, power failure, or other facility problems (Gaonkar & Viswanadham, 2004). Bogataj and Bogataj (2007) indicate that disruption in the process occurs when the production is not produced on time, and the product does not meet the requirement in terms of quality and quantity. Buddress (2014) highlighted defect products, low productivity, and forecast error were under the operational or manufacturing risk.

2.5.2 Logistic risk

According to Gaonkar and Viswanadham (2004), the logistic risk occurs when transportations are delayed or unavailable to transfer or move the material either from inbound or outbound of supply chain activity. Besides that, based on Bogataj and Bogataj's (2007) explanations, the distance and location of the destination in the supply chain network play a significant role in logistic activity. As reported by Sodhi et al. (2011), the 11th September 2001 incident has led to the shutdown of the Ford operation in 5 plants due to air transportation's delay of several days. Hence, the company needs to identify logistic risks in the supply chain to maintain organisational performance.

2.5.3 Supply risk

Bogataj and Bogataj (2007) simplify that the supply risk can occur if the supply activity is not on time or delayed, or does not meet the quality and quantity required from the supply chain members. Zhang and Song (2011) explained the importance of the supply side in the supply chain network. The supply side's disruption may negatively impact the performance because the companies expect their suppliers to deliver the materials or service on time (Zhao et al., 2012). The study conducted by Lintukangas et al. (2014) highlights supply risk in green supply management adoption. They classified the supply risk into five factors: property right risk, brand image risk, quality risk, price and cost risk, and outsourcing risk. Meanwhile, Jiang (2011) developed a scenario analysis about the supply risk. Based on the analysis, Jiang (2011) found that all the products or materials exported to Europe needed to meet the policy standards provided by European Union. However, most of the suppliers were not able to achieve the standards. Because of that, the firm encountered the problem with the supplier of the supply chain network, which can disrupt activities in the supply chain. For example, the study conducted by Musa (2012) highlighted the supply risk issue that happened to the Ericsson Company in the year 2000, whereby their chips' supplier was involved in fire accidents. Due to this disruption, Ericsson lost about USD 400 million.

2.5.4 Information risk

Information risk can be defined as the loss increases (likelihood) because of the wrong information sharing, incomplete information, and illegal retrieving of information Diabat et al. (2011). Based on the result found by Punniyamoorthy et al. (2013), they defined information risk as "wrong choice of communication or information sharing medium, and wrong interpretation of communication". Available information from the actors (supply chain members) in the supply chain activities is essential to assure the supply chain activity is run efficiently (Vilko et al., 2011). Despite that, Vilko et al. (2011) also highlighted the importance of information exchange in the supply chain that contributes to problem solving such as supply chain disruption, sustain up-to-date documents in each process of supply chain, and improves supply chain performance.

2.5.5 Demand risk

According to Bogataj and Bogataj (2007), when the production exceeds customer demand or does not meet the customer demand, the company is facing the demand risk. Demand risk will affect the performance to overcome the problem of inventory cost and image problems. The surplus of production will increase the inventory cost, but the shortage will affect the company's image. Zhang and Song (2011) clarify demand risk as follows: instability of demand by the customers, the customer moves to other competitor, forecast error, and risks are negatively impact the customers. Besides, Zhao et al. (2013) also focused on the demand risk caused by the unstable demand of the customers. Demand fluctuation can lead to a high inventory cost and product delay.

2.5.6 Environmental risk

Several studies described external supply chain risk as environmental risk (Freise & Seuring, 2015; Punniyamoorthy et al., 2013; Bandaly, 2012; Ghadge, 2012; Christopher et al., 2011; and Christopher & Peck, 2003). Gilaninia et al. (2013) defined environmental risk as the risk an organisation has received direct or indirect effects because of environmental causes. Because the firm cannot control this risk in the supply chain, this risk is highly potential to disrupt the supply chain flow without any signs. Sharma and Bhat (2014) have stated that the environmental risk has happened based on environmental interaction. Aghapour et al. (2015) have clarified environmental risk cause adverse effect for an extended period in organisational performance. This risk is difficult to predict by the organisation because it is far away and out from the organisational planning boundaries. However, this risk can be tackled by preparing many alternatives and responses (Olson & Wu, 2010).

2.6 Hypothesis development

Figure 1 illustrates the conceptual model that leads this study. This study proposed the mediated model where the existence of supply chain risks has a negative effect on the organisational performance directly and through the implementation of GSCM practices as a strategy that has a positive effect on organisational performance.

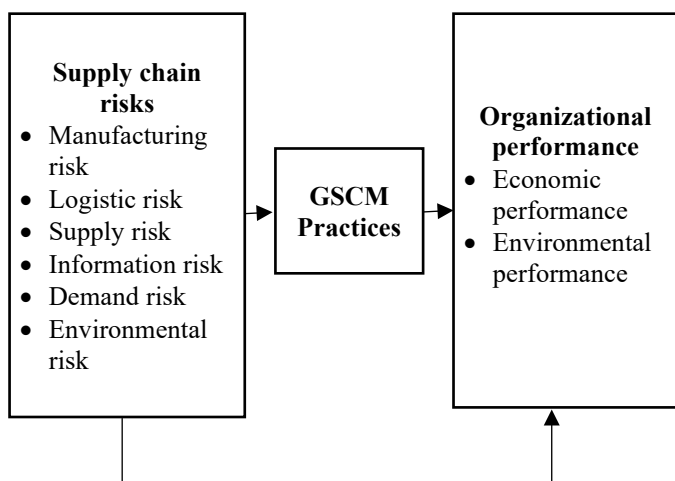


Figure 1: The Proposed Conceptual Model

2.6.1 Supply chain risks and organisational performance

Much literature concentrated on the relationship between supply chain risks and organisational performance (Munyuko, 2015; Bavarsad et al., 2014; Zhao et al., 2013; Leat & Revoredo-Giha, 2014; Zhang & Song, 2011; Wagner & Bode, 2008). Bavarsad et al. (2014) prove that supply chain risk has a significant and negative effect on organisational performance. The study conducted by Zhang and Song (2011) shows inconsistent results whereby demand risk has a significant negative effect on organisational performance. However, supply risk has no significant relationship with organisational performance. Therefore, this study determines the relationship between supply chain risks and organisational performance. Besides, the study conducted by Freise and Seuring (2015) highlighted that environmental risk has a significant negative effect on organisational performance. The following hypotheses are proposed:

H1. Supply chain risks have a significant negative effect on organisational performance.

2.6.2 Supply chain risks and green supply chain management (GSCM) practices

The study of supply chain risks and green supply chain management practices is still limited. Nevertheless, in supporting the relationship between supply chain risks and green supply chain management practices, this study considers the study conducted by Lintukangas et al. (2014) investigating the relationship between supply risk and green supply management. Based on the result found by Lintukangas et al. (2014), the supply risks were negatively related to green supply

management. The study conducted by Seuring and Müller (2008) also supports the relationship between supply chain risks and green supply chain management practices. The study conducted by Seuring and Müller (2008) examined the relationship between supply risk and sustainable supply chain management. Thus, it leads this study to propose the following hypothesis:

H2. Supply chain risks have a significant negative effect to green supply chain management (GSCM) practices.

2.6.3 Green supply chain management (GSCM) practices and organisational performance

Previous studies have provided the research framework to show the direct effect between green supply chain management practices and organisational performance (Laosirhongthong et al., 2013; Lee et al., 2012; Green Jr. et al., 2012; Zhu & Sarkis, 2004). Several studies have found positive relationships between green practice and organisational performance (Lu et al., 2013; Grant, 2008; Bin et al., 2008). Hajikhani et al. (2012) defined green supply chain management practice as part of sustainable development practice to achieve both economic and environmental benefits concurrently. Zhu and Sarkis (2004) investigated the relationship between green supply chain management practices towards organisational performance. They found that green supply chain management practices positively affect both economic performance and environmental performance. In addition, Green Jr. et al. (2012) also discover a direct relationship between green supply chain management practices and organisational performance. Hence, the hypothesis below is proposed:

H3. Green supply chain management practices positively affect organisational performance.

2.6.4 Supply chain risks, green supply chain management (GSCM) practices, and organisational performance

As suggested by Zhu et al. (2012), future studies should investigate the best aspect that can help manufacturers improve organisational performance by implementing green supply chain management practices. Therefore, the relationship between supply chain risk, green supply chain management practices, and organisational performance is considered to contribute to Malaysia's manufacturing companies.

Zailani et al. (2012) considered eco-design (one of the GSCM practices) as a mediating variable between external pressure and environmental performance. The study's findings show that eco-design fully mediates the relationship between external pressure and environmental performance. Besides that, Zhu et al. (2012) has examined the mediating effect of green supply chain management practice on organisational performance. Furthermore, Ali and Shukran (2015) are convinced that the mediating role is a key empirical framework to simultaneously improve organisational performance and reduce risk. Since there is a direct effect between supply chain risk and organisational performance and between green supply chain management practices and organisational performance, the hypothesis below is proposed:

H4. Green supply chain management (GSCM) practices mediate the relationship between supply chain risks and organisational performance.

3.0 PROPOSED RESEARCH METHODOLOGY

The unit of analysis of this study is organisation. The population of this study comprises the manufacturing sector in Malaysia that obtained ISO 14001 because this sector involves the supply chain activity, supply chain management, and applied the environmental management system. According to the Federation of Malaysian Manufacturers (2015), the total population of this study is 481.

The sample selection will apply a stratified sampling method based on the Malaysian states. It is believed that by using this sampling method, every organisation in the population has an equal chance to be selected. The sample size of this study refers to Krejcie and Morgan's (1970) sample size table. They recommended a minimum of 214 samples from a 481 population.

Data will be collected via electronic mail. To increase the response rates, follow-up is a gentle reminder by the researcher to retell the respondent about the survey that has to be answered (Fox et al., 1989). This study will follow up by telephone calls to the manager to encourage participation and to complete the questionnaire form. After doing the follow-up but the response rate was below 90% or 100%, the questionnaires in the form of a booklet will be personally distributed to the respondents to achieve high response rates.

To analyse the data, SPSS 22 will be used for demographic analysis or descriptive statistics to distinguish the frequency distribution, means, and standard deviation of the company profile. The data of this study will be analysed using structural equation modelling (SEM). The data reliability and validity of each variable will be analysed using SEM. SEM is suited for a study that provides predictions (hypothesis), theory development, theory testing, and confirmation theory (Hair et al., 2014).

4.0 CONCLUSION

Economic performance and environmental performance in the Malaysian manufacturing sector are thoroughly discussed and need to be solved. Previous scholars have proven the supply chain risks as an obstacle for the firm to improve the organisation's performance. Derived by the resource-based view (RBV) theory, this study proposed a conceptual model that illustrates the relationship between supply chain risks, green supply chain management practices, and organisational performance also has been proposed according to the previous literature. The earlier results from the scholars drive this study to develop the hypotheses for this study. The questionnaires will be sent to the Malaysian manufacturing sector, which obtained ISO 14001 because this sector involves the supply chain activity, supply chain management, and the environmental management system. The expected result has been discussed in the hypothesis development based on the previous literature. Hence, green supply chain management practices are expected to be a strategy to improve economic and environmental performance.

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