

Supply Chain Risk Management to Supply Chain Performance: A Conceptual Framework Study

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Abstract - The proposed research topic is an analysis of Supply Chain Risk Management to Supply Chain Performance in Malaysia Manufacturers. This research objective is to analyse the effectiveness of Malaysia Manufacturers in practicing SCRM process systematically on different types of risks. The SCRM process involves five steps processes with each process involves unique tool and technique to assist in the decision-making [1, 2]. This is crucial to ensure the organisation has formal process to manage the risk in the format and efficient manner. Furthermore, the organisation employee knowledge capability plays a key role in ensuring the success of SCRM practices. This concern was depicted and analysed that the Malaysia SME automotive industry lacked formal SCRM practices and knowledge resources [3]. Finally, to achieve a complete study of the effectiveness of SCRM practices, we will exam what are the Supply Chain Performance (SCP) outcome that Malaysia Manufacturers are concerning from Strategic, Operational and Tactical perspective.

Keywords – Supply Chain Risk Management (SCRM), Supply Chain Performance (SCP), Manufacturing, Risk Management, Automotive.

I. INTRODUCTION

Supply chain in the globalisation market is vulnerable to the risk when the organisation has worldwide network location setup and complex supply chain networks. The wide network links are prone to potential risk such as natural disaster, supply disruption, bankruptcies, macroeconomic and political impact, that lead to challenges in mitigating the global supply chain uncertainties and consequent [1]. Globalisation often bring the best benefits on cost to the company, but this could bring highest level of risk too [4]. This leads to the rising of the supply chain role in the organisation. Researchers argued that supply chain plays key role in defining the companies' competitive position and marketplace success [5]. Malaysia Manufacturers from three main industries electrical, electronics and optical industry; petroleum, chemical, rubber, and plastic industry; and food industry [6], faces similar globalisation risks and uncertainties. After the 9.0 Richter earthquake in Japan in Mar 2011, the chain impact to automotive, electronics, chemical, steel, and semiconductor industry were affected by this natural disaster. This further wake up the organisation to further focus on risk mitigation plan to ensure business continuity, in managing the uncertainties cause by natural disaster [7].

The proposed research topic is an analysis of Supply Chain Risk Management to Supply Chain Performance in Malaysia Manufacturers. A preliminary literature review found that Malaysia Manufacturers understand the risk management importance to protect business interest, but actual practice is not formalized. Some organisation still implements Supply Chain Risk Management (SCRM) implicitly just meet compliance requirement purpose, instead of focus on value creation [8]. Studies found that Malaysia Manufacturers practice SCRM informally and being reactive to the risk event due to limited knowledge [3]. Similarly, studies concur the finding that Manufacturers suffered occurrence risk due to response delay [9]. This indicates that Malaysia Manufacturers may not have a systematic SCRM practices that can foster SCP results.

II. LITERATURE REVIEW

The literature review to analyse the supply chain risk management to enhance the performance of supply chain within Malaysian manufactures is examined within this paper. The paper intends to examine current and existing studies within this field to further develop the understanding of supply chain risks (SCR), the processes of supply chain risk management (SCRM), supply chain performance, and finally the relationship of SCRM to SCP within manufacturers in Malaysia. Through these studies, the researchers will be able to examine and analyse the linkages and thus provide a conceptual framework to categorise this important research dimension.

A. Supply Chain Risk (SCR)

Several definitions of risk were done by many researchers before in various literature aspect such as finance, strategy, business marketing, management, and psychology. However, in general perspective, risks are those factors that affects the organisation or individual to achieve the goal or deviate from the path. The potential losses and the likelihood of the risk events are the two components of the risk [1]. Through early to modern literatures, it has been noted that the term of supply chain has many definitions, and this vary based on the focus of key attributes and perspectives to the context where it has been examined. Earlier studies defined supply chain as set of networks that links inward and outward activities and processes to influence value of products and services for end consumer [10]. However, this was further enhanced by highlighting the information and financial flow within the supply chain through use of digital and technological

advancements [11]. This made wave for defining supply chain as networks linking inbound and outbound activities not restricted to just products and services, but provision of financial and information flows within the network to achieve higher levels of service for the target markets [12]. Hence, supply chain risk is defined through the variation of outcomes that influences reduction of value-added services [13].

TABLE. I. SUMMARY OF KEY SUPPLY CHAIN RISKS

Risk Type	Detail Risk Factors and Sources
Supply Risks	Collaboration failures; quality excursion; inventory disruption impacts; scheduling; supply and demands; access to technology; supplier market strength; technology uncertainty
Demand Risks	Introduction of new product development (NPD), demand variation, seasonality, competition, chaos (Bullwhip effect on demand distortion); short product life cycles; error forecasting.
Operational Risks	Logistic and transportation breakdown issues; production breakdown, process capability or capacity; process variations; lead time; strike, employee accidents; inventory; capacity flexibility; cost of capacity; changes in technology
Security Risks	Information system security; IT infrastructure breakdown; lack of extensive networking and IT capability; terrorism; vandalism; crime; sabotage; pirate attack
Macro Risks	Min wage rates; inflation; natural disaster; war; legal issue; economic stability; social and cultural grievance; government policy; regulatory regulation and compliance; sanctions
Financial Risks	Financial impact resulted such as bankruptcy, cash flow control; cost change; interest rate; exchange rate; low profit margin; market size and growth
Resources Risks	Collaboration failure; resource supply; knowledge limitation

To further narrative to supply chain scope in considering the characteristic of inbound supply, [14] defined SCR as “the potential of an incident associated with inbound supply from individual supplier failure or the supply market, in which its outcomes result in the inability of the purchasing firm to meet customer demand or cause threats to customer life and safety”. Another simple definition is an individual’s perspective whereby the disruption of supply by a supplier causes a potential loss [15]. This definition has weakness that limits on supply aspect when the global supply chain involves internal or external, operational, demand and security risk [1].

To wider the risk classification, there are macroeconomics, policy, competitive and resource risk too [16]. This reflects the criticality to fully understand the wide scope of risk types that covers product, service, information, and financial flow. This literature review summarizes the risk type in table 1 by reviewing sources from [1, 2, 13, 16-21].

B. Supply Chain Risk Management (SCRM) Process

SCRM process can be constructed in many options. According to the literature review of SCRM [13] having reviewed 224 article and found that 93% article used either quantitative or qualitative research method to study SCRM process. Their studies suggested four step processes as risk identification, assessment, mitigation, and monitoring. These steps processes were further referred by [22]. However, [23] defined the process in three steps which were risk identification, risk assessment and risk mitigation. This has lack of risk Monitoring process that is critical to access the effectiveness of the SCRM activities. However, another study then identified seven steps adding three more steps on contingency plan, risk excursion management and crisis recovery [24]. This extends SCRM to further focus on the crisis management and recovery. Reviewing the SCRM study in Malaysia [3], the researchers used three steps method as [24] proposed, which could be best suitable at that time for Malaysian manufacturers environment. With the development of complexity in the supply chain network, three steps processes are no longer sufficient, and this led to review the proposal from [1], which had five steps processes: risk identification, risk assessment and evaluation, selection and approval of risk management, implementation or SCRM and mitigation of supply chain risk. Significant difference of [1] proposed process is on selection of approval risk management strategies. The decision making to select best risk mitigation strategy is important process that link to business performance. This additional process emphasis the criticality and significance of the decision-making process that is the key enable to achieve effectiveness of SCRM. This process is best fit for this research topic in analysing SCRM practices in Malaysia Manufacturers. However, a weakness of this argument is lack of emphasising the risk monitoring process. Thus, by reviewing [13], and the proposed process derived by [22] and incorporating it into [1] proposed process as a baseline, our study and literature review proposes a SCRM process as below.

Risk Identification - As highlighted the supply chain risks (table 1) using qualitative and quantitative methods in identifying the potential supply chain risks. Other methods as analytic hierarchical process, operability and hazard analysis, qualitative value-added engineering processes and knowledge-based systems approaches are also worth exploring [13]. This initial steps in SCRM processes are critical to create the risk profile and to recognize future uncertainties [1, 22].

Risk Assessment and Evaluation - Using risk diagram that has two components on probability and consequences of risk event to provide user the overall picture to identify the priority, after identifying all the potential risk factors [22]. There are many risk assessment methods and [1] derived three types of method: decision analysis, case study and perception based. Similarly, [13] summarised total seven methods for risk assessment based on type of SCR. Important of this process is to ensure the organisation has a formal assessment process.

Selection of Approval Risk Management Strategies - proposed strategies such as postponement, hedging, sharing/transferring, avoidance, speculation, control, and security. Risk management strategies should be synchronised with sourcing strategy that fit into corporate business strategy. [1]. Studies classified the different strategies implementation accordingly risk type and assessment [13]. Hence, there are many different strategies that best fit to the risk factor. Researchers argued the strategies can split into risk transfer, risk taking, risk elimination, risk reduction and further individual risk analysis [22]. In reviewing all inputs, the risk management strategies can be unique to each case but shall be linked organisation business objective and strategies.

Implementation of SCRM - the combination of both the previous studies combines the selection process with implementation or action plan at one [13, 22]. Researchers further found out the enablers to ensure the success of risk strategy implementation that requires complexity management, organisational learning or knowledge management, IT or software and staff performance metrics [1].

Mitigation and Monitoring - always be prepared for any unforeseen risk events, even after implementing the risk management strategies. This is proactive approach in addressing the probability of expected events by providing a firm and more mature decision-making process when facing the unexpected events [1]. Risk monitoring is to identify the potential increasing threats in the probability or consequences of an identified risk. Also new significant risk factor may appear, and it is necessary to monitor the changes and establish necessary risk mitigation strategies [22]. Similar arguments were presented that pre-warning system helps to identify abnormal data effectively and decide the next step course of action such as warning signal [13].

C. *Knowledge Concepts*

Knowledge concept can split into what is true and what is perceivable within the cognitive system. The containers that store the explicit knowledge for sharing purposes is defined as knowledge resources. Few examples are informal messages, learning objects, books, article, software, etc. Knowledge management is

important for increasing competitiveness and rising from the innovation [25]. Alternative definition by [26] also argued that knowledge resources include employees, processes, customers, and technology, each of which is a possible object for decision making. If certain effect must deliver in the organisation, the organisation must be able to master it. This phenomenon precisely reflects SCRM activity that the ability of the organisation to manage well it efficiently, is highly depending on the knowledge resources. Studies of SCRM in Malaysia SME automotive industry by using qualitative method [3]. The article found that lack of formal SCRM practise and knowledge resources are far behind to be formalized. This aligned to most earlier studies by [27] that presented the argument on organisational learning has significant effect in knowledge transfer and skill required to success in global operation. It has further been proven that strong relationship of learning knowledge to lead time reduction [28]. Thus, the use of IT or other form of electronics linkage can help on the knowledge management on process capabilities and technological dimension, that directly or indirectly help to improve organisation performance [29]. The study was primarily carried out within Asia-pacific regions relevant to the research scope for Malaysian manufacturers. Hence, the IT software, documentation procedures and employee knowledge levels are the key contained factors of knowledge resource for SCRM execution.

D. *Supply Chain Risk Management (SCRM)*

Earlier studies suggested the lack of clear definition of SCRM, and hence further studies added comment that despite many earlier studies focussed in the area but still not clear definition [30]. Studies further argued that it is new meeting point of SCR and risk management that studies conducted extensively in the past [31]. Through achieving stronger agility and robustness supply chain risk management is vitally important to business performance [32]. Several definitions provided by literature defined SCRM as the application of risk management practices for managing uncertainties and risks experienced through logistics activities through partner collaboration [33]. This definition reflects a generic process and later [23], refined the scope to be more specific processes as “to identify and manage the SCR, through a coordinated approach amongst supply chain members, to reduce overall supply chain vulnerability as a whole” [33]. Further development of the definition by [33], it became “to identify and evaluate risk and consequent losses in the global supply chain and implementation of appropriate strategies through a coordinated approach among supply chain members with the objective of reducing one or more of the following – losses, probability, speed of event, speed of losses, the time for detection of the events, frequency, or exposures – for supply chain outcomes that in turn lead to close matching of actual cost saving and profitability with those desired.”

This definition well elaborates the risk management processes and the ultimate objectives and goals. To further simplify the definition, authors argued that “the implementation of strategies to manage both every day and exceptional risks along the supply chain based on continuous risk assessment with the objective of reducing vulnerability and ensuring continuity” [32]. However, with the growing of risk factors across multiple dimensions, it had enhanced the risk management aspect to define SCRM as “an inter-organisational collaboration endeavour utilising quantitative and qualitative risk management methodologies to identify, evaluate, mitigate and monitor unexpected macro and micro level of events or conditions, which might adversely impact any part of the supply chain” [13]. This definition is best fit to the research scope of the globalised Malaysian Manufacturers.

E. Supply Chain Performance (SCP)

The performance is “A set of metrics used to quantify the efficiency and effectiveness of supply chain processes and relationships, spanning multiple organisational functions and multiple firms and enabling supply chain orchestration” [34]. It is impossible to find out a unique and commonly acceptable way to measure the performance because the characteristic of performance measurement shall have relevance, sustainability, effectiveness, efficiency, coherence, and robustness element [35]. Researchers defined SCP as an extended supply chain activity to delivery product or services; cross companies’ boundaries in the value-added channel until end customer; and cross traditional functional organisation within company various departments [32]. Similar argument [36] refers SCP as “the extended supply chain’s activities in meeting end-customer requirements, including product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner” [36]. The measurement of effectiveness and efficiency of supply chain operations in a systematic manner is referred as supply chain performance [37]. And the effectiveness of the performance of supply chain (SCP) enables firms to ensure continuous improvements within supply chain processes [37]. Many organisations understand the importance of financial and non-financial performance measure to optimise effectiveness of supply chain management. However, it is challenging to have a balanced framework that can avoid over concentrating on operational metrics and lack of strategic measures. Thus, to enable effective performance measurement, the selected measurement metrics needs to have balance between both financial and non-financial metrics that are relevant to all strategic, operational, and tactical levels of the organisation [38]. This research will use these SCP metrics frameworks to build the conceptual framework for later stages of the research studies and explored further later in the paper.

F. Relationship of SCRM-SCP in Malaysian Manufacturers

There are many research studies on SCRM that has significant relationship to SCP. Studies [1] published the six risk management strategies in SCRM control with qualitative research method that has significance positive impact to SCP. Similarly, it has been shown that effective SCRM practises generate strong agility and robustness that improve SCP on customer value and business performance, by using deductive and inductive research method [32]. Further on from Malaysia researchers, [7] derived that the relationship of robustness, resilience, flexibility, and agility in SCRM practises has positive relationship to SCP on business continuity perspective in Malaysia SME automotive industry. The focus on single process on supply chain risk identification in Malaysia automotive SME that human factor, government policy change and force majeure events are the main risk factors [39]. More recent studies had linked the risk from logistic and finance side have significant impact to SCP on product quality, order fulfilment, delivery spend, delivery dependability and customer satisfaction [17].

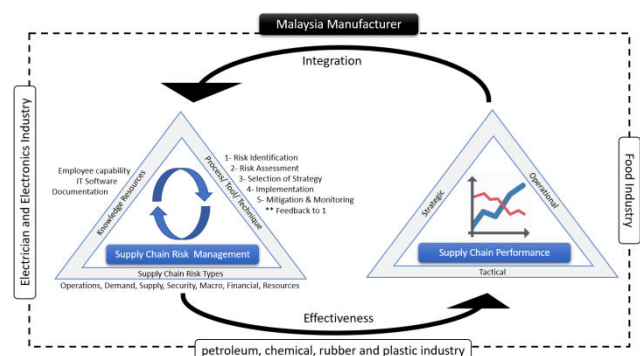


Fig. 1. SCRM Practices to SCP within Malaysian Manufacturers Framework

It is the most recent and comprehensive research article to build the relationship on different SCRM strategies to various SCP target elements. From our literature studies, we aimed to present the key findings on the integration of SCRM practises with SCP to achieve an effectiveness performance that can improve organisation performance, the relationship of SCRM to SCP with its key components is shown in figure 1. The structured SCRM is a closed loop activity that has three key factors: SCR types, process, and knowledge base. Classify relevant risk type of own organisation to establish the focus area. The defined processes with related tools and technique will create relevant control activities, while the knowledge resources are central to stakeholder engagement which are key attributes of firms’ performance measures and competitive advantage within the market [40]. Through the effective SCRM execution, it shall result positive SCP outcome which can be categorised in three categories.

III. PROPOSED RESEARCH FRAMEWORK

The conceptual framework shown in figure 2 is developed to address some of the research questions derived through this study and as identified within the literature. The conceptual framework consists of two main dependent variables. Based on the extend literature review on SCRM and SCP, the framework proposes that the effectiveness of SCRM practises to influence the SCP result.

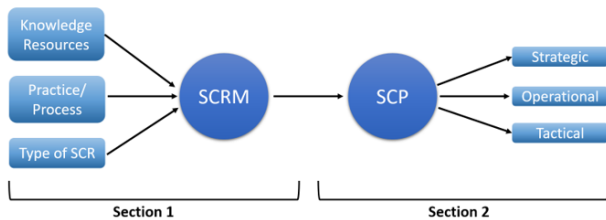


Fig. 2. Research Conceptual Framework

The SCRM has three independent variables: knowledge resources, practice/process, and type of SCR. The SCP can be categorised in three key outcomes as: Strategic, Operational and Tactical. To analyse the effectiveness of SCRM practises in the organisation of Malaysia Manufacturers, the authors proposed to use research methods will use deductive quantitative method to verify the concept in two parts. Part one aims to check the SCRM practises in the organisation from the classification of the SCR's type that involved in the organisation. Follow by the current knowledge capability and SCRM practises. It was evident through our study, that many of the previous research carried out were focused on establishing the risk factors, risk mitigation strategies or the relevant SCP elements. There is a limited scope and evidence towards studies on the process execution and knowledge resource capability in the SCRM context. Through our research and the proposed conceptual framework, we aim to address the gaps from the previous studies to analyse the Malaysian manufacturers on their effectiveness of SCRM practises from the three variables. This framework is also supported by the studies that Malaysian SME automotive industry lacks formal SCRM practises and knowledge resources [3].

IV. CONCLUSIONS AND FUTURE RESEARCH

This paper and our research studies focussed on the analysis of supply chain risk management to supply chain performance with focus on Malaysian manufacturers. From the literature review aligning to the research objective and scope, the conceptual framework has been established as in figure 2. This integrated analysis of SCRM practices to SCP result could be pioneer research in Malaysia Manufacturers, covering three major industry sectors. This will provide insight understanding of industry performance and resources capability against its SCRM practises. Future study can extend to other

industry or emerging SME, with development of new framework to capture the more dynamic and complex supply chain, with a more comprehensive quantitative and qualitative metrics [41]. Through this paper and the key findings, some of the proposed future work recommendation for researchers and practitioners within this field could examine further as:

- A more detailed qualitative study can be conducted through a case study approach within Malaysian manufacturing sector to further develop a profound understanding on the key challenges and gaps within the connection of supply chain risk management to supply chain performance practices.
- To identify the key practices and methods towards the effectiveness of manufactures adopting and practising SCRM practices for different types of risks, both with Malaysia, and Asia Pacific regions.

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