

Exploring Supply Chain Risk Factors for Supplier Selection in Electrical and Electronic Industry in Thailand: A Case Study Approach

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Abstract-Currently, supply chain management is a part of several organizations and supplier selection is the most important in the success of firms. Therefore, company requires agility in supply chain for risk diversification. The risk in supply chain is a potential variation of outcomes, which decreases the efficiency in operations. This paper explores risk factors in supply chain for supplier selection in electrical and electronic industry in Thailand. Results of this study help to understand the important factors for supplier selection. The analysis of risk factors indicates which factors highly impact to supply chain management. Thus, the findings can help practitioners to understand risk factors in order to manage supply chain more effectively and efficiently

Keywords-supplier selectio; exploring factors; supply chain risk factors

I. INTRODUCTION

Global competition is intensifying and supply chains are becoming longer and more complex, the likelihood of not achieving the desired supply chain performance increases, mainly due to the risk of supply chain failures [1]. However, coupled with these benefits that entice firms to go global are the uncertainties and consequent risks that managers face in global supply chains. Risk in supply chain is a critical issue since companies, which are unable to manage it, are likely to suffer in terms of performance. Poorly managed risks can lead to inaccurate forecasting, lower product quality, decrease in turnover and share price, loss of reputation, poor relationships with the organization's stakeholder. Supply chain risk is a potential threat to the supply chain system because many risk factors can affect an operation of the supply chain. As such, it is rather important for enterprises to better understand and identify these possible factors beforehand.

The main objective of this paper is to explore supply chain risk factors supplier selection using case studies of electrical and electronic industry. Research methodology followed by the results is then presented. The emphasis of this paper is to identify supply chain risk factors for supplier selection in a real situation in electrical and electronic industry in context.

II. LITERATURE REVIEW

A. Defining risk

A literature surveys on risk management reveals that there are many discussions about "risk" but a few of them are clear and provide concise definitions [2]. Table 1 has shown some definitions of risk from the literature [3-7].

TABLE 1. DEFINITIONS OF RISK FROM LITERATURE.

Authors	Definition
Rowe (1980) [3]	Risk is the potential for unwanted negative consequences to arise from an event or activity.
March and Shapira (1987) [4]	Risk refers to the negative variation in business outcome variables such as revenues, costs, profits, etc.
Lowrance (1980) [5]	Risk is a measure of the probability and severity of adverse effects.
Miller (1991) [6]	Risk refers to the variance in outcomes or performance that cannot be forecasted.
Yates and Stone (1992) [7]	Risk is and inherently subjective construct that deals with the possibility of loss.

Traditional supply chain management has also expanded to include responsiveness, leanness and agility. These three issues cause an increasing in complexity of supply chain and a shift of attention towards risk [8] (Figure 1).

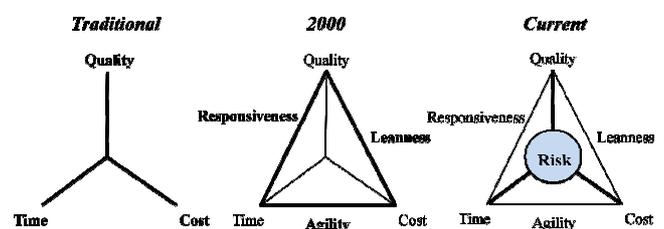


FIGURE 1. THE EVOLUTION OF KEY FOCUS AREA OF SUPPLY CHAIN (ADAPTED FROM NORRMAN AND JANSSON, 2004)

In a traditional risk model the bulk of the risk is held by the final product assembler as Figure 2, that can be seen the

different to risk diversification in the supply chain. Most modern supply chains typically exhibit a graded risk which can be linearly approximated. The approximate slope subsequently provides a good measurement of the risk sharing which is uniformly distributed among the partners (1stTier, 2nd Tier, 3rd Tier) [9].

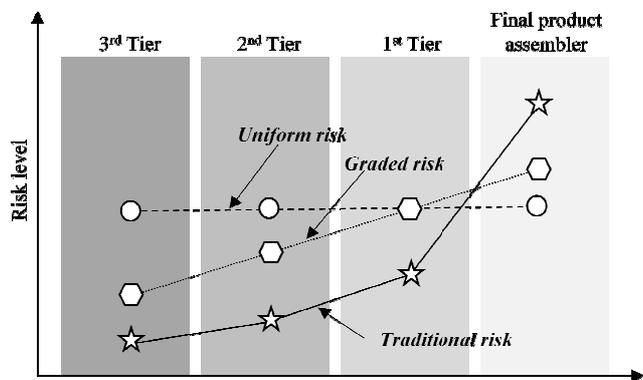


FIGURE 2. RISK SHARING IN THE SUPPLY CHAIN

B. Supplier Selection

The research of supplier selection was based on risk factor in supply chain is very little [10]. For instance, Liu [11] studied the case of interviewed enterprise that was the steel bars manufacturer in the steel and iron industry and the criteria for supplier selection included delivery, quality, cost, financial, technological competence, flexibility, improvement capability, service, relationship and others. Kang and Lee [12] applied to evaluate and select the most appropriate integrated circuit packaging company for outsourcing to consideration of qualitative factors which included defect rate, price, response to change time, on time delivery rate, process capability, capacity and quantitative factors which included technology and partnership relationship. Tidwell and Sutter field [13] presented a structured management approach to deal with the common problem of supplier selection, that was Quality Function Deployment (QFD), a process well known in the area of product design, development, and improvement. Gencer and Gurpinar [14] presented supplier selection in a case study of an electronic firm by considering business structure, manufacturing capability, quality system and alternatives. Ana and Charbel [15] presented supplier selection criteria that related to the green concept and a case study in Brazil, was consistently considered in the environment managerial competencies and design.

III. CASE STUDY

A case study approach is developed in this section for looking at five companies from the Thailand electrical and electronic industry. These companies considered supply chain risks and presented the influences in the supply chain risks.

B. Summary of case study profile

The Thailand electrical and electronics industry is an important for developing countries in decades. As the electrical and electronics industry has high export value and high investment, the industry employs more than 570,000 workers in about 2,000 companies which consist of small industries 65 %, medium industries 20% and large industries 15%, respectively. Table 2 summarizes the five case study profiles which are according to product, size employees and interviewers' position in company.

The selected companies mainly perform final product assembly in operations processes and these companies use raw materials such as iron, plastic, copper, electronics parts, etc. which each process involved.

C. Results and Finding

As the case study in the electrical and electronic industry has shown that all companies realizes to the important of the three supply chain risk factors which consisted of the industrial standard, on-time delivery, quality of delivery. For the first risk, if quality of raw materials or parts do not meet the standards or industrial regulations, therefore it will be able to effect to the company cannot export or launch the products to the market as its planning. The risk of on-time delivery will affect the company is unable to timely receiver materials or parts as scheduled and affect the company has unsteady production plan. For the risk of delivery quality, material or parts are possibly during transportation because some reasons, such as packaging quality is poor that will effect to the products cannot be produced and delivered to customer on time. In case of company E, involving supplier selection teams do not pay attention on the price risk of raw materials like others because its business is mostly focused in premium products.

Company A and E are mainly consuming electronic components which will mostly focus on improvement in quality of products and increase the efficiency of their operations because their products are high technology. Besides, they also concern the purchasing process risk about procurement processes that has no operational standard and there are some delays in the process, for instance it will result in the purchasing orders, quotation and evaluation of proposals.

TABLE 2. COMPANY CHARACTERISTICS

Company	Product line	Size employees	Interviewed
A	Car audios and Visual equipment	380	Purchasing manager
B	Washing machine, Refrigerator, Clothes dryers	1,300	Purchasing manager
C	Refrigerator, Washing machine, Microwave Oven, Air conditioner	3,000	Purchasing manager
D	Refrigerator, Washing machine, Rice cooker	2,000	R&D general manager
E	Televisions, LCD TV, LED TV, Computer Display	650	Quality senior manager

Company E is high technology company that concern about supply chain risks more than others companies

(A, B, C, D). Factors that company E has mainly considered are as follows:

- Production process; The standards and quality control.
- Safety; The workplace and accident may affect life and property.
- Environment; The production has less productivity as well as various customer-defined rules in the field of green procurement.
- Legal; To non-compliance with multiple regulations, requirements of law such as environmental concerns and security controls in operation.
- Information; To unreliable data or chance of crash data and information may have been leaked or revealed to competitors.
- Infrastructure; The physical structures such as road traffic

that effect to delivery.

- Technology; The technology supports in the production line that effect to performance.
- Labor disputes; The labor strikes or compensation will effect to production plan.
- Return; The process delays in the return of the materials or parts that do not meet the required standard.
- Organization; The organization of operational not clear effect to working process, responsible or operations.
- Capability; The potential production such as developments in the production process, quality control, increase capacity, development of new products, production line.
- Quality of product; The raw materials or components in the manufacture of quality does not meet specifications.
- R&D; The product design and development to quickly meet customer demand.

TABLE 3. CROSS CASE COMPARISON OF SUPPLY CHAIN RISK FACTORS FOR SUPPLIER SELECTION

Risk factors	Company					Cross case risk factors for supplier selection
	A	B	C	D	E	
Industrial standards	↑	↑	↑	↑	↑	25
On-Time	↑	↑	↑	↑	↑	25
Quality of delivery	↑	↑	↑	↑	↑	25
Price	↑	↑	↑	↑	↗	24
Performance	↑	↑	↗	↗	↑	23
Productivity	↑	↑	↗	↑	↗	23
Material	↗	↑	↑	↗	↗	22
Organization	↗	↗	↗	↑	↑	22
Capability	↗	↗	↗	↗	↑	22
Quality product	↗	↗	↗	↑	↑	22
R&D	↗	↗	↗	↑	↑	22
Collaborative	↑	↗	↗	↗	↑	22
Purchasing process	↑	↗	↗	↗	↑	21
Production process	↗	↗	↗	↗	↑	21
Forecast	↗	↗	↗	↗	↗	20
Quantity delivery	↗	↗	↗	↗	↗	20
Financial	↗	↗	→	↗	↗	19
Safety	↗	→	→	↗	↑	19
Environment	→	→	↗	↗	↑	19
Information	→	→	→	↑	↗	18
Infrastructure	→	↗	→	↗	↗	18
Economic	→	↗	↗	→	↗	18
Legal	→	→	→	↗	↑	18
Technology	→	→	→	↗	↗	17
Labor Disputes	→	→	→	↗	↗	17
Return	→	→	→	→	↗	16
Natural Disasters	→	→	→	→	↗	16
Policies	→	→	→	→	→	15
Politics	→	→	→	→	→	15

↑(5): The most important, ↗(4): The important, →(3): The moderate, ↘(2): The less important, ↓(1): The lowest important

The common importance factors for every company are the forecast risk of uncertainty in the planning, preparation of raw materials, production and delivery. The quantity delivery risk is the risks of material or parts damaged on delivery process such as pack aging quality. The policies risk of the government policies that impact the business. The politics risk is associated with the political situation or crisis that is affecting the business.

V. CONCLUSION AND FURTHER RESEARCH

A decision making of selection the best supplier can increase the efficiency of supply chain operations. This research explores supply chain risk factors for supplier selection using a case study approach that has seen as crucial five factors which consist of risks in industrial standards, on-time delivery, delivery quality, price and performance. For the last five factors include risks of labor disputes, return, natural disasters, policies and politics because these factors are less occurrence. Therefore, manager will have to understand and evaluate these risk factors and consider the critical issues by categorizing and managing risks from both up-stream and downstream enterprises of supply chain operations. Future research will develop a generic model using fuzzy multiple criteria decision making (MCDM) approach in order to screen appropriate suppliers for an electrical and electronic company.

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