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Book Review: Supply Risk Assessment in SCM- Assessing Supply Side Risks

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Abstract - Purchasing and supply management are widely acknowledged as strategies for companies. To make a prudent supplier selection decision, it is important to plan for uncertainty to mitigate risk. The study aims to address the risk which originates at the suppliers' end. This book focuses on categorization and prioritization of the risk elements and addressing a supplier selection problem with the risk elements under consideration. The increasing complexity of products and services, shorter product life cycles, globalization of trade and the improvement in logistics have led companies to focus on their core business.

Keywords: Supply chain management; Supply chain risks; agile supply chain; supply risk evaluation; supplier selection.

1.   Introduction

Current business trend shows increasing interest in outsourcing, reduction of the supplier base, long term relationships with suppliers, reduced inventory, and short lead times. These business activities have potential to increase risks in the supply chain and redefine the functions of the business units. The purchasing function including the supplier selection is no longer an operational function but a strategic level decision. To make a prudent supplier selection decision, it is important to plan for uncertainty to mitigate risk.

The main consequence of this change is more dependency on suppliers. An increasing dependence on supplier leads companies to be more exposed to uncertain events, so that supply risk management becomes necessary as part of supplier management. Thus supplier selection becomes one of the most important issues for the purchasing manager.

1.1   Importance of Managing Supply Chain Risks

Supply Chain Risk management has been a growing field of interest among researchers in the area of supply chain. Risk in this field can be defined as the probability of danger or disruptions, under which events would obstruct a company in achieving its planned objectives (Zsidisin, 2001). Risk has basically two dimensions in business

world: probability and severity of negative business impact (Peck, 2005). Two types of risk can be classified by applying these two dimensions. One has a low probability of occurrence, is unlikely to re occur in a similar form and is difficult to predict, but if it occurs, the impact is very significant and dramatic. The other has a relatively high probability of occurrence, is repetitive, predictable to certain degree and has a less dramatic impact than the first category. The first type of risk can happen due to events like natural disaster, terrorist attacks etc. The second type of risk results from unforeseen changes due to instability or variations associated with the firms and their environments. Tang (2006) has denoted these risks as disruption risks and operational risk respectively.

Adding to these market challenges, the adoption of "best practices" – such as outsourcing, supply base rationalization etc. has made enterprises vulnerable to supply disruptions than ever before. Most firms are struggling with barriers like prioritizing the risk elements and taking negation action. Increasing dependence on our supply base for organizational success, while those supply chains become even more "lean", means that the effect of supply chain disruptions are becoming more significant. Aberdeen (2007) predicts that supply risk management will emerge as a major business discipline and measure of competitiveness within next few years

1.2   Plan of Work

The work plan can be divided into two parts. The first part deals with case study and the second part with model building. This is explained in the following sections:

1.2.1   Case Study

The purpose of this part of the dissertation is to fill some of the gaps in the existing research by investigating how organizations discover, assess, and manage supply risk. Supply risk exists in virtually every organization. Organizations may explicitly recognize and manage supply risk, make a cursory analysis of supply risk, or ignore it altogether. The first objective of the research is to provide initial insights into how supply risk is defined, discovered, assessed, and managed and understand its implications. Case studies were employed with a convenience sample of six organizations who actively work on supply risk reduction to collect data pertaining to the research questions and propositions. Case study data collected included face to face interviews with key

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informants and archival records. Based on the research questions raised, propositions were placed and tested.

1.2.2   Model Building

The purpose of this study is a) devise a method for identification and prioritization of the risk elements and b) To create a supplier selection model with the risk elements under consideration.

2   Literature Review

Juttner et al. (2002) have observed that the use of the term "risk" itself is confusing, and argues that risk should be separated from "risk (and uncertainty) sources" and "risk consequences" (equal to the term risk impact). Risk sources are the environmental, organizational and/or supply chain related variables that cannot be predicted with certainty and that affect the supply chain-outcome variables. Juttner et al. (2002) suggest organizing risk sources relevant for supply chains into three categories:
(1) External to the supply chain, (2) Internal to the supply chain, (3) Network related.

White (2003) defines supply chain risk management as the "end-to-end management of the flow of goods and services in the supply chain to ensure uninterrupted service at the promised level to the customer at known cost." White categorizes supply chain risk into the areas of process uncertainties, supply uncertainties, demand uncertainties and control uncertainties.

The definition of supply chain risk has been highlighted by White as threats impacting the end-to-end flow of goods and services. A case study by Zsidisin and Ellram (1999) examined one firm that defines supply risk as "anything that impedes the introduction of a new product, and an event which could disrupt production". Another study by Zsidisin (2000) defines supply risk as "the possibility of an incident occurring with inbound supply that would have a negative effect on a firm's ability to meet customer's needs"

Zsidisin, Carter and Cavinato (2004) look at supply chain risk mitigation from the perspective of the purchasing organization. Zsidisin et al. (2000) discusses supply chain risk mitigation techniques in terms of tackling issues arising from processes external to the organization. They discuss many cases and address the issues of strengthening supplier quality, lessening the chance of supply disruptions, and improving the process through which goods and services are supplied by vendors. Managing risk from supplier's perspective can help companies to identify and manage sources of risk to their inbound supply. This was shown in Zsidsin & Ellram's (2003) findings that a supplier's failure to deliver inbound goods and services can have detrimental effect throughout the purchasing firm and the supply chain.

Finch (2004) views supply chain risk management from the perspective of inter- organizational networking which includes issues internal and external to the organization.

Tullous and Munson (1991) categorize supply uncertainty by need, market and supplier uncertainty. Wu et al (2006) pointed that most of the existing research relies on a product focused approach and very few on supplier focused approach.

The first notable work on supply risk was by Kraljic (2001) who proposed a 4-phasestrategy to manage supply. The strategy presents key risk factors such as availability, number of suppliers, competitive demand and make-buy opportunity. Steele and Court (1996) address vulnerability management, which deals with an overall supply risk analysis procedure including risk identification and calculation.

Supplier uncertainty as defined by Zsidisin, Panelli and Upton (2000) is the chance that a detrimental incident can occur with a specific supply source. Zsidisin, Carter and Cavinato (2004) look at supply chain risk mitigation from the perspective of the purchasing organization. Zsidisinet al. (2000) discusses supply chain risk mitigation techniques in terms of tackling issues arising from processes external to the organization. They discuss many cases and address the issues of strengthening supplier quality, lessening the chance of supply disruptions, and improving the process through which goods and services are supplied by vendors.

Managing risk from a supplier's perspective can help companies identify and manage sources of risk for their inbound supply. This was shown by Zsidsin and Ellram (2003) who found that a supplier's failure to deliver inbound goods and services can have detrimental effect throughout the purchasing firm and the supply chain.

Aichlmayr (2001) has shown that in a relatively stable and predictable environment an array of statistical control methods can be used in the management of supply chain risks. Another popular method –Failure Mode Effect Analysis (FMEA) focuses on potential failures in order to assess, prevent and eliminate them as early as possible, as stressed by Ireson et al. (1995).

In standard FMEA, either Risk Priority Number (RPN) or Risk Priority Category (RPC) is used to construct the system failure effects model to implement risk analysis. This can be either deterministic or fuzzy. Jenab and Dhillon (2005) critically analyzed group based failure effect analysis and raised few issues regarding RPN based risk analysis. According to them RPN calculation suffers from non-consideration of the relative importance among failure factors and their non-consistency of relationship.

Once the risks are assessed, emphasis is on to the management of risks. The crucial steps for risk management require experience, knowledge and subjectivity of the people involved. A multitude of risk management techniques exists – both quantitative and qualitative.

Omera and Bernard (2007) highlighted the debate regarding qualitative and quantitative approaches for risk management in supply chains. They also opined that

application of risk theory in supply chain management is still in its early stage and that the proposed models need to be tested empirically.

Extensive research has been done to develop sophisticated tools that can analyze supplier performance and help in supplier selection decision. Many of these researchers though, have faced the dilemma that much of their data is plagued by uncertainty, vagueness and approximation. This uncertainty, vagueness, and approximation can be seen mostly in the area of risk analysis where risk is considered a black box in which the few who have ventured to take it into consideration and analyze it have failed to come out of the box with a clear and understandable analysis. It is quite clear from the discussion that for risk assessment, quantification may be better based on probability-possibility instead of pure statistical probability.

After thorough review of related literature, it can be observed that risk /uncertainty remains unaddressed in supplier selection. In the literature, supplier selection and supply risk management are generally studied separately with little linkage established between the two issues. Both Zsidisin et al. (2004) and Berger et al. (2005) noted that minimal research has been conducted how purchasing organizations assess and manage risks that exist with their suppliers.

3 Discussion

Chapter 1 is dedicated to the introduction and explanation of the concept of Supply chain risks. It also discusses the importance of the steps to combat risks and also different ways to do that.

Chapter 2 is dedicated to the revision of the literature that provided important aspects of this book. The literature referred to in this section provided a key role in the development of this book.

Chapter 3 is dedicated to the fundamentals which are the basis of the analysis in this book. These fundamentals include, what is fuzzy logic and how it works. The second part of this theoretical background is the introduction of what is risk and everything it entails and the role of risk management in supply chain management.

Chapter 4 is dedicated to the case study undertaken, proposition development and testing the propositions. The chapter deals with how supply risk, its management and performance implications are related.

Chapter 5 is dedicated to the development of the framework and the methodology undertaken in the development of the algorithm and models as well as the testing of the algorithm in various scenarios.

Chapter 6 is dedicated to the conclusions, recommendations, and the future work of this book.

3.1 Observations and Applications

A list of customary supply risk evaluation factors has been enumerated and risk evaluation methodology is recommended by multiplying probability, consequence and duration of risk. Zsidisin and Ellram (1999) propose a 10 step approach for risk assessment by giving equal importance for 8 identified risk factors using a five point nominal scale. Zsidisin (2000) proposed a new supply risk classification and identifies key risk factors based on case studies and managerial interviews.

The approaches to mitigate supply chain risk have been placed encompassing numerous techniques. Hutchins (2003) views supply chain risk as caused by areas external to the organization. These are defined as the partner's abilities to meet contract, possibility of harm or loss if requirements are not achieved, probability of events with undesirable results, variations regarding requirements and their mitigation.

On analyzing the model as presented in various literature reviewed, it appears that most of them are using various quantitative models for managing operational risks and in few cases disruption risks. The various quantitative models used addresses operational risks but they fail to address disruption risks in explicit manner. Tang (1995) in his work has presented an extensive review about risk management and supply chain risk management articles.

The techniques utilized in the first part of the research viz. Pattern matching and Yager's methodologies have, in various forms, been applied in other environments so their performance there is known. Combining this knowledge with the theoretical background of these techniques and experience with case examples provide insights into the advantages of proposed methodologies. The methods are scalable and new knowledge and information can be accommodated at any stage. The multi-criteria methods are designed to find compromise solutions for situations that will be acceptable to the group as a whole. The methods utilize multi-criteria decision making techniques to provide flexibility across a range of supply chain environments.

The methods allow the organizations to express their judgments regarding the importance of each type of risk elements using ordinal scales. The methods frame the input required from each organization to exactly fit the input structure and assumptions of the multiple criteria group decision making techniques. Moreover, these techniques are very comfortable for decision makers because of their flexibility.

The information used in this research can be used by supply chain managers as a base for developing risk assessment tool. The output gives an understanding about the risk elements and their effect on company's performance. Supply chain management professionals can focus on reducing the chance that risk can have on their organizations success and profitability. In the second part the focus is on quantification of the supply chain risk by

the fuzzy system enabling purchasing organizations to appreciate the risk involved with a given supplier.

The supply chain manager can make use of the result for comparing suppliers objectively on the basis of inbound risk and make the optimum supplier selection decision. This can be specially done for the strategic items having multiple suppliers. This can help practitioners to address the missing link between the supplier selection and supply risk management as pointed out by Micheli (2008). There are several advantages in using the models presented in this work as opposed to the traditional quantitative models.

Supplier selection has been investigated through many theoretical and extensive empirical researches and acknowledged as one of the most important activities of the purchasing department (De Boer et al, 2001). Literature in supplier selection is mainly in three methodological streams, namely conceptual, empirical and modeling. Dickson (1966) while studying the importance of supplier selection criteria for purchasing manager presents more than 20 suppliers attributes that a manager may consider for a supplier selection.

Analytical models for supplier evaluation range from simple weighted scoring models to complex mathematical programming approaches. In a comprehensive review of supplier selection and performance evaluation methods, Weber et al (1991) report that 47 out of 74 articles in review utilize multiple criteria.

Little evidence has been found of research that specifically focuses on reducing supplier risks. Some studies explored supply risk management approaches. However, the majority of these methods react to a negative event. They add an extra safety net to reduce the impact of the negative event rather than working proactively to remove or mitigate risks in order to prevent its occurrence or reduce the probability of its occurrence. While adding extra safety nets, such as increasing the inventory of raw materials and finished goods can mitigate the impact of supply side disruption, it does nothing to reduce the supply side risks (Waart, 2006).

4   Conclusion

The quantification of the supply chain risk by the fuzzy system enables purchasing organizations to appreciate the risk involved with a given supplier. The primary objective of this work was to understand the supply side risk involved in supply chain for a supplier. Also, risk assessment has to make sense out of imprecise linguistics expressions, make contextual connections among the sources of risk and quantify output risk.

The major contributions of this work involve the extraction of sources of risk based on industry opinion and previous works and the development and demonstration of a fuzzy system framework for risk assessment. Limitation in the process exists in the form that a well-structured knowledge about the potential candidates is required for

the detailed analysis. The case example considers a limited number of aspects whereas there may be situations where the number of aspects will be more. In such situations an expert system in heuristic rules may be developed to make the computations simpler by opening the possibility of the creation of a fuzzy expert system in the area of risk assessment in supply chains.

The challenge in using the proposed decision framework would be defining and specifying the type of fuzzy numbers for linguistic variables and establishing the scale of preference structure to be used by decision makers. When there are many risk element, it would be more difficult and complicated to establish the preference of scale structure as each decision makers may have different ideas about the importance of decision criteria and how they should be evaluated making group decision making much more complicated.

The methodology could be extended to multi-tier supply chain both upstream and downstream within the supply chain. Since each supply chain has its distinct element, future work may address the need of incorporating into the proposed framework a facility that permits the users to modify weighting factors according to the specific requirements of the supply chain under consideration. Another scope could be comparing the results of the proposed methodology with other MCDM methods. Finally, further applications in other industries would be helpful in obtaining information about other supply chains.

Reference

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SCM (Supply Chain Management). SIPOC Diagram. SMED. Who is at risk and what is the likelihood of harm? Identify the actions that are required to eliminate or mediate the risk. Evaluate the rate of success with the applied action. Monitor the results to make sure it is still as effective. Keep documents that may be necessary. This includes: The process that was used to access the risk. To assess the risk of workplace hazards, there is a chart called the risk matrix that is often color-coded for severity and likelihood of accidents/emergencies. To determine the consequences of a hazard, the employer or person in charge of determining this scale should treat the chart and all of its outcomes as an inevitability to ensure that the most accurate consequences are documented. Supply chains must into account the uncertainty of demand. Moreover, the risk of uncertain demand can cut two ways: (1) there is the risk that unexpected demand will not be met on time, and the reverse problem (2) the risk that demand is over estimated and excessive inventory costs are incurred. There are other risks in unreliable vendors, delayed shipments, natural disasters, etc. The book's introductory chapter covers the development of the field, reviewing both its recent research and practical developments. The final chapter outlines open questions and discusses future directions where research and practice may take Supply Chain Risk as a field. 232 Resilience in Supply Chain Systems and SCM. 22. 233 Factors Contributing to Vulnerability and Resilience. Start studying SCM PRE ASSESSMENTS 7,8,9,10. Learn vocabulary, terms and more with flashcards, games and other study tools. Which of the following tends to reduce safety stocks among supply chain members, generating even less variability in supply chain orders? Information visibility. Building, maintaining and strengthening beneficial relationships with suppliers and customers is accomplished through the use of