Managerial perceptions of supply risk

Journal of Supply Chain Management; Tempe; Winter 2003; George A Zsidisin;

Volume: 39

Issue: 1

Start Page: 14

ISSN: 15232409

Full Text:

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SUMMARY

There has been a growing emphasis in business on outsourcing production activities and focusing on core competencies. The decision to outsource the production of goods and services, however, has inherent risk. The purposes of this article are to describe characteristics of inbound supply that affect managerial perceptions of supply risk and to create a classification of those supply risk sources. An analysis of case study data suggests that supply risk is perceived by the effect that purchased items and services have on corporate profitability, market factors, and supplier characteristics. By understanding the characteristics of supply risk, supply management professionals can implement strategies for better managing that risk.

INTRODUCTION

Supply risk involves the potential occurrence of events associated with inbound supply that can have significant detrimental effects on the purchasing firm. There are numerous characteristics that affect how supply management professionals perceive risk. Prior studies on supply risk focus on how that risk is assessed (Steele and Court 1996; Zsidisin, Panelli, and Upton 2000), describe proactive supply management practices that are considered risk management (Smeltzer and Siferd 1998), and provide estimates of downside risk on commodities (Sanders and Manfredo 2002). In addition, research on supply management topics such as certifying suppliers (Larson and Kulchitsky 1998), developing suppliers (Hartley and Choi 1996; Krause 1999), and implementing and using information systems (Chopra and Van Mieghem 2000) have tangentially addressed supply risk. However, a research gap still exists in the supply management literature on the characteristics of supply that affect managers' perceptions of risk. Therefore, the purposes of this article are to: (1) gain insights into supply characteristics that affect managerial perceptions of supply risk, and (2) create a classification of supply risk sources.

The article begins with a review of research on sources of potential risk. An explication of the methodology for the current study follows; case study protocol and execution of the research is included in this section. The article then moves to an analysis of the data, followed by a discussion of managerial implications and conclusions.

SUPPLY RISK

There are numerous characteristics of inbound supply that can affect managerial perceptions of supply risk. Prior research on supply risk framed in terms of probability and effect is discussed below. Characteristics that can affect managerial perceptions of supply risk are then briefly presented and summarized in Tables I and II.

Supply risk has been defined as "the potential occurrence of an incident associated with inbound supply from individual supplier failures 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" (Zsidisin 2002). Within this definition are two key concepts of probability and effect, where risk consists of the combination of the probability of loss and significance of loss (Yates and Stone 1992; Mitchell 1995). Probability, from an a priori perspective, consists of the number of times an event occurs (in this research, a supply incident with negative repercussions) divided by the total number of equally possible events (Kerlinger 1986). Within a supply chain context, an example of supply risk would be a frost occurring in Florida that would impact the supply-demand balance for grapefruit juice (Steele and Court 1996).

From the perspective of purchasing and supply management (PSM) professionals, there are numerous factors that can influence perceptions of supply risk. Some of these factors, as shown in Table I, have been presented in prior articles (Kraljic 1983; Mitchell 1995; Steele and Court 1996). In addition, numerous research articles have investigated individual characteristics of supply risk as part of larger studies in PSM. As shown in Table II, the supply characteristics that affect supply risk perceptions can arise from numerous sources. For example, capacity constraints of supplier organizations involve the inability of those firms' production systems to produce the specified quantity demanded by customers (Lee et al. 1997). Fluctuations in demand may tax a supplier beyond its abilities, due to equipment, the number of available employees, or its inability to obtain necessary inputs. Factors such as the size of the plant, or activities that include purchasing capital equipment or training new personnel cannot be quickly adjusted to changes in demand.

The characteristics of supply risk mentioned in Tables I and II are not mutually exclusive. For example, capacity constraints may be affected by other supply risk characteristics, including volume/product mix requirement fluctuations and process technological changes. If a supplier cannot make appropriate increases for volume fluctuations or product mix requirements, capacity constraints can result. If a supplier cannot adjust to technological changes in the long term, that supplier may not be able to produce items at increased demand rates. Therefore, many of the supply risk characteristics discussed can result from the existence of other supply risk characteristics.

In order to address this research gap in supply risk, the purpose of this study is to first determine which of the previously discussed characteristics affect PSM professionals' perceptions of supply risk to their organizations. Prior work by Kraljic (1983), Mitchell (1995), and Steele and Court (1996) has presented initial lists of supply risk characteristics. However, these supply risk characteristics have emerged from either conducting a literature review or being derived from anecdotal experiences. In order to address this first issue, case studies were conducted with individuals from seven purchasing organizations to deter mine how they perceive supply risk.

The second purpose of this study is to derive classifications of supply risk characteristics. To date, the author is not aware of any current classification of how supply risk is perceived by supply management professionals. In order to address this research gap, the characteristics of supply risk discovered in the case studies were analyzed and grouped into three overall classifications of item, market, and supplier characteristics.

RESEARCH METHOD

The research method consisted of conducting case studies with purchasing organizations involved in supply risk management. The case study method was selected as the primary research tool for examining how purchasing managers perceive supply risk. Case study participants were pre-screened through initial telephone, in-person, or e-mail interviews for their involvement in supply risk and its management.

The case studies were pursued until the researcher reached a point of data saturation (Strauss and Corbin 1998), which occurred after the seventh case study and within the expected range of six to 10 case studies (Yin 1994). Firm demographics in terms of industry and organizational level can be found in Table III.

The research method started with a literature review examining risk in the supply chain. The literature review included research from many subject areas, such as supply management, logistics, operations, marketing, strategy, and decision sciences. The literature review served two purposes. First, it assisted the researcher in raising additional questions of how and why purchasing professionals perceive supply risk. Second, the information obtained from the literature review supported the creation of the case study research protocol. The case study research protocol, of which excerpts can be found in the Appendix, was created prior to data collection and refined after a pilot case study.

Table I

Table II

A case study protocol is a tactic for increasing the reliability of case study research and providing the investigator a guide for carrying out the case studies (Yin 1994). The protocol usually contains an overview of the case study project, field procedures, case study questions, and a guide for the case study report. An overview of the case study protocol was provided to case study participants. The protocol included case study profiles, methodology and case study design, data analysis techniques, case study format, and a timetable for the research.

The case studies were conducted at the companies' locations. In the few circumstances where in-person interviews were not possible with certain individuals, telephone interviews were conducted following the guidelines proposed by Walton (1997). Interviews with key informants averaged approximately one to two hours each. To better utilize interview time, several questions about supply risk perceptions were provided to informants beforehand. Information-gathering techniques such as obtaining historical data and documentation, and conducting structured interviews with various professional purchasing personnel and other key informants, were implemented during the case studies.

Data generated in the case studies was subject to open and axial coding analysis, as per the guidelines set by Miles and Huberman (1984), Strauss and Corbin (1998), and Yin (1994). Open coding breaks down case study data in order to analyze, conceptualize, and develop categories for the data. Axial coding is a technique that makes connections among categories. Axial coding groups issues during first-level coding and summarizes the issues into themes. The themes that emerged from the interview data coding of supply risk perceptions were item, market, and supplier characteristics. Each of these themes is discussed in detail below.

CASE STUDY RESEARCH FINDINGS

Item Characteristics

There are two item characteristics that supply management professionals perceive as a risk to their firms: the profit impact of purchased items and the nature of the product application. These two item characteristics focus on the impact that the item itself can have on the purchasing firm, are summarized in Table IV, and are discussed in greater detail below.

Impact on Profitability. The unavailability of items) from a supplier can have detrimental effects on profit, regardless of price. For instance, case study respondents from organizations identified in Table IV as Comp1, Comp2, and Cell provided the example of tantalum capacitors affecting corporate profitability. Tantalum capacitors are relatively inexpensive and are known as "penny parts." However, the high cost of these items during the summer and fall of 2000 directly affected the cost of many electronics products. Items such as capacitors can always be obtained, but if there is poor prior planning and forecasting, the prices for these items can significantly increase, affecting long-term profitability in very competitive industries.

Nature of Product Application. The use of an item for a new product application was perceived as having greater risk than using the item in existing products. For example, Compl specifically looks at technical risk by using a supplier interlock matrix similar to a Failure Mode and Effects Analysis (FMEA). Risk is considered greater for new products because of the lack of previous history from which to make accurate assessments of risk. In fact, it was discovered that Semil spends a significant amount of time and resources in understanding and managing the risk associated with new products due to their perceived risks.

Table III

Table IV

Market Characteristics

The case study data indicated that supply market conditions were very important to managerial perceptions of supply risk. The market characteristics noted by the case study respondents include global sourcing, market capacity constraints, market price increases, and number of qualified suppliers. Global sourcing and market capacity constraints were not included in the research protocol, but discussed by case study respondents in how they perceive supply risk. The market characteristics perceived to significantly influence supply risk perceptions are summarized in Table V and discussed in the following passages.

Global Sourcing. Several of the organizations studied have significantly increased the percentage of sourcing to suppliers located in other countries. For the electronics firms, much of this sourcing is done in Asia. The case study organizations have several reasons for implementing global sourcing strategies, such as to lower costs and to obtain items only available in other countries.

Similar to the findings of Min (1994) and Kelle and Miller (2001), the case study respondents noted additional perceived supply risk from global sourcing. Factors mentioned by case study participants that affect global sourcing risk are currency fluctuations, long-term cost savings, natural disasters, supplier management, and transit times. For instance, Cell stated that a supply risk it faces is currency fluctuation, which has a significant effect on Earnings Before Interest and Taxes (EBIT). Another example of global sourcing risk occurs with Far Eastern suppliers located in earthquake-prone regions. Respondents from all five of the electronics firms provided examples of how the 1999 earthquake in Taiwan had a detrimental effect on their organizations.

Market Capacity Constraints. Market capacity risk occurs when there are only a few supply sources available. An illustration of market capacity risk was provided by Semi2, which noted that in 1999, a fire occurred with a manufacturer of beryllium oxide. Semi2 subsequently discovered that only two suppliers in the world manufactured this chemical used in manufacturing computer chips. When the facility in Germany was destroyed, the global production capacity for this chemical was immediately reduced by 40 percent.

Market Price Increases. Three of the case study firms noted that market price increases significantly affect supply risk perceptions, as previously discussed by Steele and Court (1996). For example, the tantalum capacity shortage and resulting price increase during the summer and fall of 2000 affected supply risk perceptions and corporate performance for Compl, Comp2, and Cell because the price increases reduced overall corporate profits.

Number of Qualified Suppliers. Several of the respondents were concerned with the number of qualified suppliers available. For example, Semil stated that there are many suppliers capable of manufacturing resins. However, if that organization is not certified beforehand by the purchasing organization, there is greater perceived risk due to the lack of knowledge of its production processes, testing, and interaction with the final product. Two of the organizations concerned with the number of qualified suppliers are in the semiconductor industry, where it is difficult to qualify some supplier processes. Having capable, qualified, and certified suppliers is critical for executing a successful supply strategy.

Supplier Characteristics

The case study respondents noted specific supplier characteristics that affect their supply risk perceptions. These characteristics include capacity constraints, inability to reduce cost, incompatible information systems, quality problems, unpredictable cycle times, and volume and mix requirement changes. A summary of supplier characteristics that the case study participants considered to significantly affect risk perceptions is found in Table VI, and discussed in greater detail above.

Table V

Capacity Constraints. Respondents from two of the case study organizations noted that supplier capacity constraints were a significant risk to their organizations because they detrimentally affect firm competitiveness. The two firms, Cell and Semi2, purchase large quantities of capacitors and memory chips. The phenomenal growth of the cellular phone industry has placed an additional burden on first- and second-tier suppliers to quickly increase capacity. In addition, the two firms that raised significant concern about the risk of capacity constraints did not anticipate the extent of growth of cellular phone purchases and had difficulty providing suppliers accurate forecasts for future demand.

Inability to Reduce Cost. Case study respondents from three case study firms noted that the inability of suppliers to reduce costs poses significant risk to their organizations. Again, these three organizations are in the electronics industry. For these organizations, as with most of the respondents in the electronics industry, the question is not whether cost will be reduced, but whether cost will be reduced enough to meet market demands for reducing the prices of products to consumers.

In one instance, Compl stated that cost reduction capabilities often originate from the supply chain configuration. Com

Fonte: Proquest – acesso em 26/3/2003