



Tourism Supply Chain Management

Loss-Averse behavioral hypothesis Manufacturer in engineering
supplier development under risk

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Abstract

Supplier development involves efforts undertaken by manufacturing firms to improve their suppliers' capabilities and performance. These improvement efforts can be targeted at a variety of areas such as quality management, product development, and cost reduction. Since supplier development requires investments on the part of the manufacturer, it is important to optimally allocate investment dollars among multiple suppliers to minimize risk while maintaining an acceptable level of return. This paper presents a optimization model that addresses this issue. Unlike that paper (Talluri et al. 2010), we assume manufacturers are loss averse. Assume that such a scenario: single-manufacturer and multiple suppliers (SMMS). In the SMMS case, we suggest optimal investments in various suppliers by effectively considering risk and return. We use the target shortfall probability approach, it may be easier to motivate and explain to manufacturer.

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1. Introduction

In China, upstream energy and raw material prices, the greater impact of downstream products. Manufacturing firms are incurring procurement costs associated with raw materials and components in excess of 50–60% of the firm's total revenue and this trend is expected to continue [1]. This phenomenon is resulting in increased dependency of manufacturing firms on their suppliers. It can be argued that manufacturing firms would need to involve themselves in suppliers' operations to a greater extent when suppliers' future capabilities will likely fail to meet their changing needs and expectations. Supplier development is intended to improve supplier process capability, delivery capability, product development capability, component quality and cost, which, in turn, lead to long-term benefits for the manufacturing firms. Since supplier development requires firms to invest assets and resources in suppliers, it is a selective investment process. Toyota, Honda, Nissan, Chrysler, Ford, General Motors,

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and General Electric all have implemented supplier development programs to assist suppliers, which have resulted in quality improvement and cost reduction [2]. In China, the listed QingSong Company considered the acquisition of upstream raw materials business to help supplier development.

The topic of supplier development has received considerable attention from researchers in the past two decades [3]. It is generally believed that success in supplier development will lead to better performance for the suppliers and the buying firms[4]. Krause et al. (1998) examined the impact of differences in attitude towards supplier development activities on supplier performance. They found that firms that actively and strategically involve themselves in supplier development reap greater long term benefits [5].

In essence, supplier development is a strategic initiative that requires long-term commitment from manufacturing firms to achieve desired outcomes. Due to its lack of immediate return, firms are often reluctant to invest in supplier development. It is entirely possible that returns from these investments may vary across multiple suppliers, an indication of risk in terms of uncertain returns in supplier development investments. When a manufacturing firm decides to pursue supplier development efforts, it expects to benefit from such an investment in terms of cost savings, improved quality, delivery performance and profitability. These benefits can be viewed as the investment returns. However, suppliers differ in their capabilities relating to quality management and control, product and process design, and delivery and execution competence. As a result, for the same investment of resources, the return from each supplier can vary, and in each case, it can be higher or lower than the firm's expectation. Furthermore, supplier development poses potential opportunistic behavior on the part of the supplier, which may lead to total failure or termination of the relationship earlier than expected. Thus, when viewed as an investment, the supplier development efforts lead to uncertain returns due to variation in supplier performance and the presence of moral hazard. Analogous to risk in financial investments, we conceptualize uncertainty of returns in supplier development as risk.

Talluri et al.(2010) seek to study the supplier development problem by applying the concept of financial investment under risk, used return and risk to two scenarios: single-manufacturer and multiple suppliers (SMMS) and two-manufacturers and multiple suppliers (TMMS)[6]. Unlike this paper, we develop an analytical model that is based on a key aspect of investments in supplier development. We assume manufacturers are loss averse. One of recent extensions of the standard supply chain management problem is the adoption of loss aversion to describe the decision-making behavior[7]. Researchers in the field of behavioral finance have proposed the concept dubbed "loss aversion", originated from Kahnman and Tversky's Prospect Theory[8]. Loss aversion is the tendency of individuals to be more sensitive to reduction than increase in their levels of well-being. In this paper, we suggest optimal investments in various suppliers by effectively considering risk and return in SMMS case. We use the target shortfall probability approach, it may be easier to motivate and explain to manufacturer. This research investigates the supplier development problem from a long-term investment perspective to better understand its potential benefits. Specifically, we consider supplier development investments in the context of multiple suppliers who supply different types of materials and components to a manufacturing firm.

2. Model analysis

Assuming the same as Talluri et al. 's paper, fig. 1 depicts the case where a single manufacturer engages in supplier development efforts with multiple suppliers. The manufacturer has limited amount of budget (resources) for supplier development efforts that needs to be optimally allocated to multiple suppliers. Thus, the amount invested in a supplier is dependent on the amounts invested in other suppliers. In addition, investment returns vary among suppliers depending on their capabilities and execution competence. The goal of the manufacturer is to allocate investment amounts so that a target return is achieved at minimum risk. Note that the unit of analysis is at the firm level. The supplier development program may involve in single or multiple products with a supplier. The investment return is, therefore, an overall return.

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