Chapter 2.18
An Application of Multi-Criteria Decision-Making Model to Strategic Outsourcing for Effective Supply-Chain Linkages

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ABSTRACT

An appropriate outsourcing and supply-chain planning strategy needs to be based on compromise and more objective decision-making procedures. Although factors affecting business performance in manufacturing firms have been explored in the past, focuses are on financial performance and measurement, neglecting intangible and nonfinancial factors in the decision-making planning process. This study presents development of an integrated multi-criteria decision-making (MCDM) model. This model aids in allocating outsourcing and supply-chain resources pertinent to strategic planning by providing a satisfying solution. The model was developed based on the data obtained from a business firm producing intelligent home system devices. This developed model will reinforce a firm's ongoing outsourcing strategies to meet defined requirements while positioning the supply-chain system to respond to a new growth and innovation.

INTRODUCTION

In today's global age, business firms are no longer able to manage all supply-chain processes from new product development to retailing. In order to obtain a successful business performance, appropriate outsourcing and supply-chain practices should be identified, established, and implemented

within the firm. The growth of business scale and scope forces business decision-makers to resolve many of the challenges confronting business firms. These tasks and activities are often not well-defined and ill-structured. This new paradigm in business practices can deliver unprecedented opportunities to establish the strategic outsourcing and supply-chain planning in business firms (Heikkila, 2002; Li & O'Brien, 2001). Due to the technology and market paradigm shift, strategic outsourcing and supply-chain planning process in business firms may become more tightly coupled with new product research and development, capacity and financial planning, product launching, project management, strategic business alliances, and revenue planning.

Successful linkages of these complicated processes play a critical role affecting business performance in manufacturing settings (Cohen & Lee, 1988; Fisher, 1997; Min & Zhou, 2002; Quinn & Hilmer, 1994). Strategic outsourcing and supply-chain planning is a growing requirement for improving productivity and profitability. Many outsourcing studies have been conducted with supply-chain linkages directly and indirectly as follows: capacity planning (Lee & Hsu, 2004), downsizing (Schniederjans & Hoffman, 1999), dual sourcing (Klotz & Chatterjee, 1995), information system decision (Ngwenyama & Bryson, 1999), line balancing (Liu & Chen, 2002), service selection (Bertolini, Bevilacqua, Braglia, & Frosolini, 2004), transportation mode choice (Vannieuwenhuyse, Gelders, & Pintelon, 2003), and vendor selection (Karpak, Kumcu & Kasuganti, 1999).

In spite of a plethora of outsourcing studies in the existing literature, multi-criteria decision making (MCDM) applications are scarce and seldom identified as the best practice in business areas. Especially, an integrated MCDM model comprising goal programming (GP) and analytic hierarchy process (AHP) is rarely applied to manage an emerging outsourcing and supply-chain concern. This chapter has dual purposes: (1) to develop a decision-making model that aims at designing a strategic outsourcing and supply-chain plan, and (2) to provide the decision-makers with an implication for effectively managing strategic outsourcing and supply-chain planning in business firms and other similar settings.

The chapter is organized in the following manner. The "Introduction" section presents current research issues in both strategic outsourcing and supply-chain planning and MCDM in a business setting. The next section "Multicriteria Decision Making" provides a review of MCDM models. After that, a problem statement of the case study along with description of data collection is described. The model development to a real-world setting and the model results and a sensitivity analysis are provided, followed by concluding remarks.

MULTI-CRITERIA DECISION MAKING

Multi-criteria decision making (especially integrated MCDM) is defined as an applied linear programming model for a decision process that allows the decision-maker to evaluate various competing alternatives to achieve certain goals. Relative importance is assigned to the goal with respect to a set of chosen criteria. MCDM is appropriate for situations in which the decision-maker needs to consider multiple criteria in arriving at the best overall decisions. In MCDM, a decision-makers select the best strategy among a number of alternatives that they evaluate on the basis of two or more criteria. The alternatives can involve risks and uncertainties; they may require sequential actions at different times; and a set of alternatives might be either finite or infinite. A decision-maker acts to maximize a value or utility function that depends on the chosen criteria. Since MCDM assumes that a decision-maker is to select among a set of alternatives, its objective function values are known with certainty. Many