

# Fuzzy MCDM Approach for Make or Buy Decision Problem

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## INTRODUCTION

Make or buy decision is one of the crucial issues faced by today's organizations to cope with challenges in business environment such as intensified competitive environment, increased demand for complex product/services, environmental issues, and technological advancements. Make or buy decision plays an important role on the organizations' success, by determining total costs, profitability, investment decisions, operational effectiveness, corporate strategy, customer services, flexibility, and core competency (Humphreys et al., 2000; Tayles & Drury, 2001; Moschuris; 2008). Make-or-buy decision requires consideration of a number of conflicting criteria ranging from strategic to operational, from technological to environmental, from quantitative to qualitative factors.

This study proposes a systematic approach to make or buy decision problem by using multi-criteria decision making methods under fuzzy environment. Specifically the study is conducted to support the management of a Turkish company operating in the wood building products sector on their decision over the make or buy problem of a new product. The proposed approach consists of mainly two stages. Market entry decision is evaluated in the first stage, make or buy decision is handled in the second stage. The first stage employs fuzzy simple additive weighting approach (SAW) while the second stage implements an

integrated approach incorporating fuzzy SAW and fuzzy VIKOR methods.

The chapter is organized as follows: Second section gives a literature review on the make-or-buy decision. The proposed approach to a real life make or buy decision is presented in the third section. This section also presents the results of the problem. Future works and conclusion are presented in the last two sections of the study.

## BACKGROUND

The literature contains a good number of studies from different perspectives. Padillo (1995) presents a comprehensive literature review and taxonomy of the issue. Canez et al. (2000) discuss current make or buy decision approaches in the literature and proposed a framework for the problem. Ruffo et al. (2007) carry out a literature review and outlined some criteria on the make or buy decision process. In a recent literature review, Moses and Ahlströmthe (2008) focus on how make or buy decision processes develop over time; and they determined the dimensions of the process changed over time.

Some authors focus on the evaluation factors to be considered on the analysis of make or buy decisions. It has been emphasized that "cost" is frequently a primary factor to be considered on the choice between the make or buy alternatives (Blaxill & Hout, 1991; Tayles & Drury, 2001; Fill

& Visser, 2000; Water & Peet, 2006). However, financial factors should not be evaluated as only factor addressing the organizations' make or buy decisions (Dale & Cunningham, 1984; Padillo & Diaby, 1999; Moschuris, 2008; Cortellessa et al., 2008). Analyzing a make or buy decision problem, in addition to the financial criteria in term of costs and profitability, some other criteria such as quality, delivery time, reliability, technical capability, and financial stability, should necessarily be considered (Dooley, 1995; Probert, 1997; Humphreys and McIvor, 1997, 2000).

Long-term considerations should be taken by analyzing make or buy decisions over a strategic aspect. There exist a number of studies on the strategic nature of make-or-buy decisions (Padillo and Diaby, 1999; McIvor et al., 1997; Humphrey et al., 2000, 2002). Such studies provide many strategic models, frameworks, methodologies, and approaches to consider the long-term effects of make or buy problem. Probert (1997) describes a strategic approach based on mainly assessment of manufacturing technologies. Welch and Noyak (1992) develop a framework including technological and strategic factors in addition to traditional cost analysis. McIvor et al. (1997) suggest a conceptual approach covering many strategic criteria. Padillo and Diaby (1999) suggest a dynamic multi-objective and multi-criteria decision making methodology including multiple steps for the evaluation of make or buy decision alternatives and emphasized that the model can be used in production as well as any of the function of the value chain. McIvor and Humphreys (2000) propose a computer based hybrid system to help managers on their make or buy decisions. Humphreys et al. (2002) design a knowledge –based system for make or buy decisions. Platts et al. (2002) and Water and Peet (2006) have employed decision making models by using multi-criteria decision making approaches for the appraisal of make or buy decisions. Kulkarni and Jenamani (2008) develop a strategic framework that can be used not only for make or buy decisions of

new products but also reevaluation of make or buy decisions of current products. Cruz-Cazares et al. (2013) make a study on the selection of the appropriate R&D strategy either make, or buy, or make and buy decisions by analyzing internal and external factors. Puranam et al. (2013) also study on make-buy decision by combining external and internal procurement for the same source by taking into account a number of constraints.

On the other hand, some studies cover the uncertainties; imprecise data faced by the decision makers in real life in their applications of make or buy problems (Yoon and Naadimuthu, 1992; Water and Peet, 2006). Fuzzy logic is a useful tool to cope with this type of problems and human subjectivity in the evaluation process (Zadeh, 2008; Çebi et al., 2010). There exist relatively fewer studies with fuzzy techniques for solving make or buy decision problems. Hwang et al. (2007) suggest a Web based approach with three-step decision support system employing fuzzy multi-criteria decision techniques for make or buy decisions for manufacturing systems. Cheshmberah et al. (2011) address the problem by using PROMETHEE, one of the fuzzy multi-criteria decision making approaches, to find a solution for outsourcing activity of an Aerospace industry. Korvin et al. (2003) employ fuzzy analytic hierarchical process to find the best solution to make or buy decision problem with regard to a specific part in the automobile industry.

Based on the previous studies, this study presents a multi criteria decision making approach for solving make or buy decision problem. Even though there are many tools available to analyze economic and strategic factors separately, this research attempts to develop a comprehensive model that will combine both categories of factors that lead to a better outsourcing decision. Make or buy problem has been analyzed as a multi criteria decision making problem under fuzzy environment to deal with the uncertainties and subjectivity in the evaluation and decision process.

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