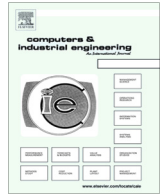




Contents lists available at ScienceDirect

Computers & Industrial Engineering

journal homepage: www.elsevier.com/locate/caie

An integrated DEMATEL and Fuzzy ANP techniques for evaluation and selection of outsourcing provider for a telecommunication company



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ARTICLE INFO

Article history:

Available online 30 September 2014

Keywords:

DEMATEL

Fuzzy ANP

Multi-criteria decision making (MCDM)

Outsourcing evaluation

ABSTRACT

In recent years, strategy aspects related to core competency, risk analysis and organizational flexibility especially have been growing. This trend has led researchers and industries to become more interested in the multi-criteria decision making (MCDM) models for selecting outsourcing providers. The efficiency of decision-making mostly depends on the ability of decision-makers analyzing the complex cause and effect relationship between criteria and taking effective actions based on the analysis. Using an analytical method to select the most eligible outsourcing provider is significant for a company which desires to improve its competitiveness. In this study, a fuzzy integrated multi-criteria decision making method for evaluation and determination of an outsourcing provider for a telecommunication company is analyzed by using DEMATEL and Fuzzy ANP multi-criteria decision making techniques. First, DEMATEL method is used in order to put forward the interrelationship among the main criteria which are determined in the study for outsourcing selection process. Then, local weights of the sub-criteria and sub-subcriteria are calculated by Fuzzy ANP approach on the basis of cause-effect relationships that are exposed through DEMATEL method. The local weights are put into ANP supermatrix, and calculations are implemented to select out the most eligible outsourcing provider.

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1. Introduction

Outsourcing can be defined as the complete transfer of a business process that has been traditionally operated and managed internally to an independently owned external service provider (Handley, 2008). It is the act of reversing a previous decision to make or perform a particular function internally. Outsourcing is a good strategy for firms that need to reduce operating costs and improve competitiveness and it is important that firms scientifically select appropriate outsourcing providers. (Liou, Wang, Hsu, & Yin, 2011).

As outsourcing is closely related to the traditional make or buy decision, we can rely on contributions from this classic set of literature to provide insights as to what may or may not be good strategic candidates for outsourcing. This notion is emphasized by Doig, Ritter, Speckhals, and Woolson (2001) who indicate that the first step in the make or buy decision is to understand the

strategic value of activities. As a result, firms' increased efficiencies and abilities to focus on core competencies have produced real profits and increased customer satisfaction. Nevertheless, ineffective outsourcing activities, derived from improper strategies or methods, will lead to a loss of core competencies and capabilities, exposure to unexpected risk, and business failures (Wang & Yang, 2007). Therefore, a scientific decision making process for choosing the most proper outsourcing provider is essential for increasing the success rate of outsourcing. Initially, outsourcing decisions predominantly involved standardized processes, commoditized products, and activities of extremely low strategic value. However, (Gottfredson, Puryear, & Phillips, 2005) indicates that firms are increasingly considering more strategic "capabilities" for outsourcing, making the strategic evaluation much more complex. They argue that outsourcing can provide short term competitive benefits and it can be compiled a list of factors that are relevant to the outsourcing decision making. They are reducing costs, improving core competency focus, increasing flexibility, creating variable cost structures, improving productivity, gaining competitiveness accessing external talents, sharing risk improving quality, conserving capital and stimulating innovation. It implies that upon outsourcing, a firm is accepting a position of competitive parity, for the activity in question. It has been posited that firms should

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concentrate on the development of a few core competencies and strategically outsource the rest (Quinn & Hilmer, 1994). Further, Barthélemy (2001) identifies outsourcing of core activities as one of the “deadly sins” of outsourcing. Thus, the concept of core competencies along with the resource based view of the firm provides the basis for the assertion that in considering outsourcing, the decision making team must have a thorough understanding of core and non-core capabilities and how they relate to a firm’s competitive advantage.

In this study, an integrated multi-criteria decision making approach for choosing the most eligible outsourcing provider is used for a telecommunication company which had decided to outsource some maintenance activities in order to gain more competitive advantages. The integrated method uses Fuzzy Analytic Network Process (FANP) technique in combination with Decision Making Trial and Evaluation Laboratory (DEMATEL) technique for increasing the sensitivity of interrelationships between the factors for choosing the outsourcing providers.

DEMATEL is a comprehensive technique for constructing and analyzing a structural model involving cause and effect interrelationships between complex factors or criteria. The DEMATEL method is based on digraphs, which can separate involved factors into cause and effect groups.

The ANP is an extension of analytic hierarchy process (AHP), and it is the general form of AHP. The ANP method has been widely and successfully implemented in various project selection cases such as information system project selection (Lee & Kim, 2000; Liang & Li, 2007); project selection (Cheng & Li, 2005); logistics service provider (Jharkharia & Shankar, 2007); urban renewal project selection (Wey, 2008); partner selection (Wu, Shih, & Chan, 2009), etc.

Fuzzy ANP method is developed to deal with uncertain human judgments (Mikhailov & Singh, 1999a, 2003). The FANP method has been applied in order to increase the capabilities of the ANP for dealing with inconsistent and uncertain judgments. The FANP method has been implemented for group prioritization, partnership selection, competitive bidding, evaluation of services, project selection and so forth (Mikhailov, 2004, 2002; Mikhailov & Singh, 1999b; Mikhailov & Tsvetinov, 2004; Mohanty, Agarwal, Choudhury, & Tiwari, 2005).

Herein, first the DEMATEL method is applied to derive cause and effect interrelationship between main criteria of outsourcing provider selection for a telecommunication firm in Turkey. Then, based on the information gained from the DEMATEL method, FANP method is implemented to select the most eligible outsourcing provider for the firm in an uncertain environment to deal with inconsistent and vague judgment of decision makers of the firm. The proposed model can be easily used for other industries, to help other firms to evaluate and select their outsourcing providers.

2. Literature review

Outsourcing is contracting-out a part of one company’s existing internal processes or services to another company in order to gain competitive advantages when the activities are implemented more efficiently by outside suppliers (Yang, Kim, Nam, & Min, 2007). Besides, it also transfers the responsibility of the physical business function and often the associated knowledge to the external organization (McCarthy & Anagroustou, 2004). The main purposes for using outsourcing provider include cost savings, focusing on core competencies, and management flexibility (Hamel & Prahalad, 1994).

Processes and services which are considered as core competencies should be produced internally. Non-core activities should be outsourced which increases the flexibility through the better use

of international resources; it enables quick responsiveness to customer needs and decreases financial risk by reducing capital investments (Ellram, Tate, & Billington, 2008).

Some of the advantages of outsourcing are mentioned above. On the other hand, it has some disadvantages which the firm needs to carefully consider along with its benefits. The common disadvantages are information security, loss of management control, morale problems, and labor union issues (Howell, 1999). Moon (2010) states that, since outsourcing incurs hidden costs at the preparation stage and future profits are uncertain, outsourcing immediately is not always optimal. Thus, he proposed a real option model to evaluate when the optimal time to outsource is.

A report of a business consulting firm claims that around 70% of the US companies have had a negative experience with outsourcing projects and are now taking a more cautious approach (Deloitte Consulting, 2005). Liou et al. (2011) considers that this negative experience might be the result of the lack of comprehensive evaluation to discover the best candidates for outsourcing. Therefore, the evaluation of outsourcing provider alternative is a strategic decision making process and the decision makers should focus on how outsourcing will impact the future strategic activities of the firm.

In the literature, there are a number of studies which determine selecting the most effective outsourcing providers. Liou et al. (2011) used DEMATEL, the fuzzy preference programming and the ANP to form a model for the selection of partners for outsourcing providers. Hsu and Liou (2013) proposed a new hybrid multiple criteria decision-making (MCDM) model, which combines the DEMATEL and the ANP (DANP) method for outsourcing provider decision model in the airline industry. Hsu, Liou, and Chuang (2013) also used DANP method and modified grey relation theory for the selection of an outsourcing provider.

Lin, Lin, Yu and Tzeng (2010) used ANP method for outsourcing vendor selection for a semiconductor company in Taiwan. Liou and Chuang (2010) proposed a MCDM method based on DEMATEL, ANP and VIKOR techniques for outsourcing provider selection. Hsu and Hsu (2008) used a decision-making method based on entropy-combined technique for order preference by similarity to the ideal solution (TOPSIS) for clinics for outsourcing their medical information needs. Li and Wan (2014) develop a new fuzzy linear programming method for solving multi-attribute decision making (MADM) problems with fuzzy truth degrees and incomplete weight information for outsourcing provider selection.

3. Methods used in the integrated approach

This section includes two sub-sections which address the methodology and techniques used in this study. The first one explains the DEMATEL method which is used for obtaining cause and effect interrelations among criteria. The second section explains the Fuzzy Analytic Network Process (FANP) method.

3.1. The DEMATEL methodology

The Battelle Geneva Institute created DEMATEL in order to solve difficult problems that mainly involve interactive man model techniques as well as to measure qualitative and factor linked aspects of societal problems (Gabus & Fontela, 1972). It analyzes the influential status and strength between the factors and convert them into an explicit structural mode of a system (Lin & Wu, 2008). The mathematical concepts are then evolved and adapted in many academic fields, such as industrial strategy analysis, competence evaluation, solution analysis, selection, and etc. It has been proven as a useful method to solve complicated problems.

The DEMATEL methodology construction process is described below;

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