A Framework for Applying CSFs to ERP Software Selection: An Extension of Fuzzy TOPSIS Approach

Rekha Gupta, Jamia Millia Islamia, FTK-Center for Information Technology, New Delhi, India
S. Kazim Naqvi, Jamia Millia Islamia, FTK-Center for Information Technology, New Delhi, India

ABSTRACT

The literature review studies on ERP system indicate two main areas of thrust: the study of critical success factors for the risk aversion in ERP implementation projects and the ERP system selection studies. However, ERP system selection is a tedious and a time-consuming activity. The critical success factors (CSFs) serve as vital input ingredients to the ERP selection Models. It is however notable that, that none of the CSFs listing propagated by the researchers find a straightforward application in the selection procedure. The paper bridges the gap between the two thrust areas by proposing a framework for applying the prioritized CSFs listed for direct utilization in the selection process. An exhaustive review on the ERP selection techniques reveals the focus on AHP and/or the Fuzzy Logic approaches to ERP selection problem. A new approach to ERP selection problem with the extensions of the Fuzzy-TOPSIS is subsequently introduced and is illustrated by a solved numerical example. Also, the computational simplicity of the extensions of Fuzzy TOPSIS is demonstrated.

KEYWORDS

Critical Success Factors (CSFs), ERP Selection Framework, Extensions of Fuzzy Top Order Priority Preference by Similarity to Ideal Solution(TOPSIS), Fuzzy AHP, Multi-criteria Decision Making (MCDM)

INTRODUCTION

Enterprise Resource Planning (ERP) systems are enterprise wide systems that provide a seamless information flow throughout the organization and help to integrate and automate the business information and processes within and across functional areas in an organization. It thus enables an organization achieve competitive and strategic advantage by reaping the benefits of enterprise wide integration. However, ERP implementation is believed to be a high-risk investment process as it requires substantial financial commitments and has an inherent high failure probability.

Moreover, the ERP selection is a multi-criteria decision making problem with evaluation of multiple conflicting conditions for selecting best option from all of feasible alternatives under the assessments of several experts. Multi-attribute decision-making (MADM) is the most well-known branch of decision-making. The MADM approach requires the selection to be made among decision alternatives described by their attributes. Weighing and considering multiple criteria leads to informed and better decision making. Owing to the complexity of the business environments, limitations of available resources and the diversity of ERP alternatives, ERP system selection is tedious, precarious and a time-consuming activity. Since ERP systems usually impose their own constraints on companies’ processes, strategies and culture, it is imperative that the ERP selection decision be conducted with great care.
Hence, ERP selection is a lengthy, time-consuming process that needs to be aligned to the business processes, its working and ultimately aligning towards organization strategy and goals. ERP system selection yields positive results like increasing productivity, timely delivery, reduction of setup time, reduction of purchasing cost. The failure in selection of ERP system leads to the failure of project or company performance will get weakened (Liao, Li & Lu, 2007).

The criteria used in ERP selection studies are critical success factors (CSFs). These are considered vital for risk aversion in ERP implementation projects, The CSFs for ERP implementation bring a concept that helps an organization identify the critical issues that affect the process of implementation. These factors are believed to have crucial role to play in.

Rockhart (1979) developed the Critical Success Factor concept as a way of identifying general managers’ information needs and requirements. Rockhart (1979) insisted that systems should be developed to meet the informational needs so as to ensure successful competitive performance for the organization. CSFs have been defined as “those few critical areas where things must go right for the business to flourish”. Reviews of the existing literature on the ERP projects indicate that Critical Success Factors (CSF) have been studied by researchers for risk aversion in ERP implementations projects.

It is however notable that, that none of the CSFs listings proposed by the researchers so far has found a straightforward application in the ERP selection process. This clearly indicates inadequacies in the research output achieved so far. Another concerning issue, which adds to this limitation, is infeasibility on part of organizations to devote attention to all the listed CSFs for selection purposes. It would be appreciable if an effective method of selecting CSFs on basis of organizational ERP selection requirements was available.

The study attempts to provide a bridge between the two major research thrust areas namely the ERP CSFs and selection studies by proposing a selection framework. Further, the selection technique based on extensions of TOPSIS is used for ERP product selection is proposed based on its computational efficiency and agility. In the following section, we present an overview of review studies both on ERP CSFs and ERP selection models followed by critical analysis of the techniques used so far. The proposed framework is illustrated in section 4.0 and the numerical demonstration of the selection technique by Fuzzy TOPSIS method is presented in section 5.0.

LITERATURE REVIEW

ERP Critical Success Factors (CSFs) Studies

The CSFs for ERP implementation bring a concept that helps an organization identify the critical issues that affect the process of implementation. These factors are believed to have crucial role to play in successful ERP implementation with their monitoring and control (Fok et al., 2009; Ngai et al., 2008) if carried out effectively. The approach has also been widely adapted to address ERP implementation issues (Ahmad & Cuenca, 2013; Bernroider & Koch, 2001; Bingi, Sharma & Godla, 1999; Dezdar & Ainin, 2012; Esteves & Pastor, 2000; Holland & Light, 1999; Marnewick and Labuschangne, 2005; Ngai et al., 2008) etc.

ERP Selection Studies

In order to implement an ERP project successfully, it is necessary to select an ERP system which can be aligned with the needs of the company. The review studies indicate a variety of techniques used for ERP selection. The techniques that are primarily used are AHP (Wei, Chien, & Wang, 2005; Perera & Costa, 2008, Unal & Gunar, 2009), ANP (Ayag & Ozdemir, 2006; Yazgan, Boran & Goztepe, 2009; Lin, Chen & Ting, 2011), Fuzzy methods (Biswa, Bordoloi, Singh, & Purkayastha, 2016; Chen, Chen, Chen, Tsai & Lin, 2012; Grace & Williams, 2016) and few researches based on Data Envelopment Approach (Lall & Teyarachakul, 2006), Balance Scorecard (Cebeci, 2009), etc.
Beyond Ambient Display: A Contextual Taxonomy of Alternative Information Display
www.igi-global.com/article/beyond-ambient-display/3877?camid=4v1a

Fuzzy Cognitive Map Reasoning Mechanism for Handling Uncertainty and Missing Data: Application in Medical Diagnosis
www.igi-global.com/chapter/fuzzy-cognitive-map-reasoning-mechanism/62709?camid=4v1a