A comprehensive framework for selecting an ERP system

Chun-Chin Wei, Mao-Jiun J. Wang*

Department of Industrial Engineering and Engineering Management, National Tsing Hua University, Hsin Chu, Taiwan, 300, ROC

Abstract

This paper presents a comprehensive framework for combining objective data obtained from external professional reports and subjective data obtained from internal interviews with vendors to select a suitable Enterprise Resource Planning (ERP) project. A hierarchical attribute structure is proposed to evaluate ERP projects systematically. In addition, fuzzy set theory is used to aggregate the linguistic evaluation descriptions and weights. An actual example in Taiwan demonstrates the feasibility of applying the proposed framework.
© 2003 Elsevier Ltd and IPMA. All rights reserved.

Keywords: Enterprise Resource Planning; Decision making; Fuzzy set theory

1. Introduction

An Enterprise Resource Planning (ERP) system is an integrated enterprise computing system to automate the flow of material, information, and financial resources among all functions within an enterprise on a common database [1]. A successful ERP project involves selecting an ERP software system and vendor, implementing this system, managing business processes change (BPC), and examining the practicality of the system. However, a wrong ERP project selection would either fail the project or weaken the system to an adverse impact on company performance [2,3]. Due to limitations in available resources, the complexity of ERP systems, and the diversity of alternatives, selecting an ERP project is a time-consuming task.

Several methods have been proposed for selecting a suitable ERP project or management information system [4–11]. The scoring method [5] is one of the most popular. Although it is intuitively simple, it does not ensure resource feasibility [9,10]. Teltumbde [4] suggested 10 criteria for evaluating ERP projects and constructed a framework based on the Nominal Group Technique (NGT) and the analytic hierarchy process (AHP) to make the final choice. Santhanam and

Kyparisis [7,8] proposed a nonlinear programming model to optimize resource allocation and the interaction of factors; their model considered interdependencies of criteria in the information system selection process. Lee and Kim [9] combined the analytic network process (ANP) and a 0–1 goal-programming model to select an information system. However, these mathematical programming methods can not contain sufficient detailed attributes, above all, which are not easy to quantify, so that the attributes were restricted to some financial factors, such as costs and benefits. Furthermore, many of them involved only the consideration of internal managers, but do not offer a comprehensive process for combining evaluations of different data sources to select an ERP project objectively.

Reports made by professional organizations and information collected from interviews with ERP suppliers should be considered in evaluating information of ERP projects. Professional organizations, such as research institutes and consulting companies, employ many experts to analyze information about ERP, including market share, vendor size, system performance, and other data. Their professional studies are very helpful to managers to have an overview of ERP systems and vendors. Furthermore, decision-makers can extract important attributes from these reports. However, the literature lacks studies on integrating the evaluation of objective external professional data sources and subjective internal interview data sources. This

---

* Corresponding author. Tel.: +886-3-5742655; fax: +886-3-5722685.

E-mail address: mjwang@ie.nthu.edu.tw (M.-J.J. Wang).

study aims to provide a new framework for integrating the two kinds of data evaluation for selecting a suitable ERP project.

In reality, selecting a suitable ERP project involves multiple factors. Some of the measures, for example, the risk of the project, the functional fitness, and the ability of a vendor may not be precisely defined. Evaluation ratings under various attributes and the weights of the attributes are frequently assessed in linguistic terms, 'high', 'poor', among others. A fuzzy multiple-criteria decision-making method (FMCDM) is very useful in integrating various linguistic assessments and weights to evaluate ERP alternatives.

This study proposes a comprehensive framework for selecting a suitable ERP project. Decision-makers can effectively integrate objective professional comments and subjective opinions of managers. A measure called, "fuzzy ERP suitability index" is used to account for the ambiguities involved in the evaluation of the appropriateness of ERP alternatives and the importance weights of attributes. An actual case in Taiwan is described to demonstrate the proposed method in practice.

2. Procedure for selecting an ERP project

A systematic ERP selection algorithm, using two-dimensional analysis and fuzzy set theory, is presented. The first dimension involves objective ratings of ERP project data in accordance with external professional reports. The second dimension requires assigning subjective ratings to ERP projects on the basis of data acquired in interviews. The objective and subjective evaluations are combined to obtain the final fuzzy ERP suitability.

A stepwise procedure follows.

Step 1. Form a project team and conduct the business process re-engineering (BPR).
Step 2. Collect all possible information about ERP vendors and systems. Filter out unqualified vendors.
Step 3. Establish the attribute hierarchy and assign weights to the attributes.
Step 4. Interview vendors and collect detailed information.
Step 5. Analyze the data obtained from the external professional reports to obtain the objective ERP suitability.
Step 6. Assign subjective ratings to the ERP projects on the basis of data acquired in interviews to calculate the subjective ERP suitability.
Step 7. Combine the evaluations of both data sources and aggregate the decision-making assessments to determine the final fuzzy ERP suitability.
Step 8. Utilize the fuzzy integral value ranking method to obtain the rank of each ERP project.

Step 9. Analyze the results of indices, λ and k. Observe the change in the final ERP suitability and the final ranking value.
Step 10. Select the ERP project with the maximum ranking value.
Step 11. Implement the selected ERP project.

Fig. 1 shows the comprehensive framework of the method.

2.1. Form a project team and conduct BPR

The first step is to form a project team that consists of decision-makers, functional experts and senior representatives of user departments. In essence, an ERP project is not
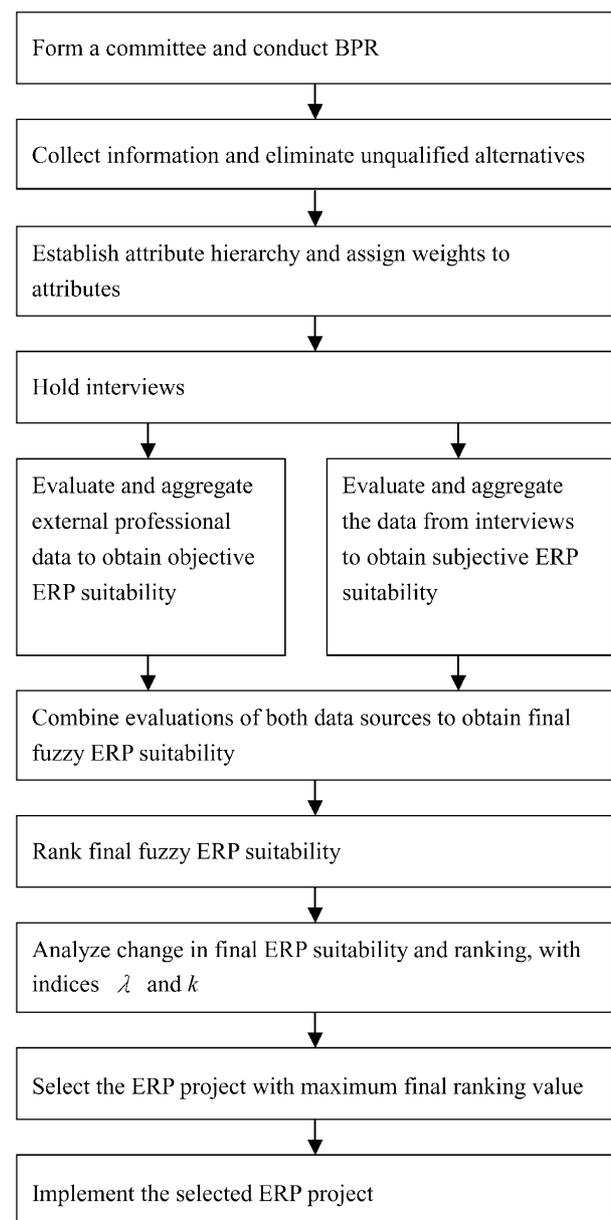

Fig. 1. Comprehensive ERP project selection procedure.