



# An AHP-based approach to ERP system selection

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## Abstract

An Enterprise Resource Planning (ERP) system is a critical investment that can significantly affect future competitiveness and performance of a company. This study presents a comprehensive framework for selecting a suitable ERP system. The framework can systematically construct the objectives of ERP selection to support the business goals and strategies of an enterprise, identify the appropriate attributes, and set up a consistent evaluation standard for facilitating a group decision process. A real-world example demonstrates the feasibility of the proposed framework. © 2004 Elsevier B.V. All rights reserved.

*Keywords:* ERP system; Decision analysis; Analytic hierarchy process (AHP); Information system

## 1. Introduction

Severe market competition has dramatically transformed the business environment with the result that companies need to reduce total costs, maximize return on investment, shorten lead times, and be more responsive to customer demands. Highly dynamic markets call for effective enterprise information systems to enhance competitive advantage. Enterprise Resource Planning (ERP) is increasingly important in modern business because of its ability to integrate the flow of material, finance, and information and to support organizational strategies (Yusuf et al., 2004, Yao and He, 2000). A successful ERP project involves managing business process change, selecting an ERP software system and a

co-operative vendor, implementing this system, and examining the practicality of the new system. Owing to the complexity of the business environment, the limitations in available resources, and the diversity of ERP alternatives, ERP system selection is tedious and time consuming. However, given the considerable financial investment and potential risks and benefits, the importance of a pertinent ERP system selection cannot be over-emphasized (Teltumbde, 2000).

Existing ERP commercial packages cannot provide a once-for-all business model for every process of all industry. Thus, no single ERP packaged software can meet all company functionalities or all special business requirements (Sarkis and Sundarraj, 2000; Teltumbde, 2000; Hong and Kim, 2002). Therefore, companies must choose a flexible ERP system and a co-operative vendor that is responsive to customer needs. All too often there is no systematic evaluation framework in place when most companies evaluate ERP

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systems. In addition, “ERP vendor hype” further complicates the selection process. Decision makers frequently adopt the common ERP evaluation criteria as the measures without developing tailor-made objectives and clear requirements that echo the company characteristics, its position in its competitive environment, and its corporate strategy. The result is an inevitable delay of ERP implementation and under-performance of the system. Hence, an ERP system selection framework is extremely critical in assisting executives to evaluate from the perspective of company strategies.

Since the business environment is characterized by high uncertainty, the process of ERP system assessment involves numerous problems. Kumar et al. (2002) emphasized that installing an ERP system is much more than having another information technology tool; it is a decision on how to shape the organizational business. Motwani et al. (2002) emphasized that ERP adoption involves initiating appropriate business process changes as well as information technology changes to significantly enhance performance, quality, costs, flexibility, and responsiveness. However, many companies install their ERP systems hurriedly without fully understanding the implications for their business or the need for compatibility with overall organizational goals and strategies (Hicks and Stecke, 1995). The result of this hasty approach is failed projects or weak systems whose logic conflicts with organizational goals.

This study proposes a comprehensive ERP system selection framework in which the objective hierarchy is constructed and the appropriate attributes are specified to provide detailed guidance for ERP system evaluation. The proposed methodology also ensures that the evaluation process is aligned with the competitive strategies and goals of the enterprise. The analytic hierarchy process (AHP) method (Saaty, 1980) is applied for dealing with the ambiguities involved in the assessment of ERP alternatives and relative importance weightings of attributes. An empirical case in Taiwan is described to demonstrate the practical viability of the proposed method.

## 2. Selection method review

A number of methods have been applied to ERP or other information system (IS) selection including scoring, ranking, mathematical optimization, and multi-criteria decision analysis. The scoring (Lucas and Moore, 1976) method is intuitive, but too simple to truly reflect opinions of the decision makers. Buss (1983) proposed a ranking approach to compare computer projects. This method also has the same limitation with scoring method. Mathematical optimization such as goal programming, 0–1 programming, and nonlinear programming have been applied to resource optimization for IS selection. Santhanam and Kyparisis (1995, 1996) proposed a nonlinear programming model to optimize resource allocation allowing for the interaction of factors; their model considered interdependencies between projects in the IS selection process. Lee and Kim (2000) claimed that Santhanam and Kyparisis’ model dealt with IS selection problems with limited criteria. They combined the analytic network process (ANP) and a 0–1 goal-programming model to select an IS project. Badri et al. (2001) presented a 0–1 goal programming model to select an IS project considering multiple criteria including benefits, hardware, software and other costs, risk factors, preferences of decision makers and users, completion time, and training time constraints. However, the applicability of these methods is often weakened by sophisticated mathematic models or limited attributes to carry out in a real-world ERP system selection decision, especially when some attributes are not readily quantifiable, as well as not too easy for managers to understand. Moreover, these methodologies focus too much on quantifiable calculations and look down upon the comprehensive selection framework of ERP system and the strategic considerations of a company.

The AHP method, introduced by Saaty (1980), directs how to determine the priority of a set of alternatives and the relative importance of attributes in a multiple criteria decision-making problem, and has been widely discussed in various aspects. For example, Schniederjans and Wilson (1991) utilized the AHP method to determine the

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