# Chapter 17
# ERP Selection using an AHP-based Decision Support System

**Maria Manuela Cruz-Cunha**
*Polytechnic Institute of Cávado and Ave, Barcelos, Portugal and Algoritmi Research Centre, Guimarães, Portugal*

**Joaquim P. Silva**
*Polytechnic Institute of Cávado and Ave, Barcelos, Portugal*

**Joaquim José Gonçalves**
*Polytechnic Institute of Cávado and Ave, Barcelos, Portugal*

**José António Fernandes**
*Polytechnic Institute of Cávado and Ave, Barcelos, Portugal & EAmb, Esposende Ambiente, Esposende, Portugal*

**Paulo Silva Ávila**
*School of Engineering, Polytechnic of Porto, Porto, Portugal*

## ABSTRACT

*Selecting the best desirable Enterprise Resources Planning (ERP) system has been a critical problem for organizations for a long time, as the failure on the selection process may have a highly negative impact in terms of costs and market share of a company. It is one of the most important decision making issues covering both qualitative and quantitative factors for organization. Multiple-criteria decision-making has been proved to be a useful approach to analyze these conflicting qualitative and quantitative factors. Literature offers proposals and approaches to handle this kind of problem; Analytic Hierarchy Process (AHP) has been applied successfully in most cases of software packages selection problems. This paper proposes an AHP model for the selection of an ERP system. The model's set of criteria was extracted from the literature review and validated by Portuguese organizations. This model can be applied in the ERP system selection using a software application that is under development. This software application eases the application of the AHP process to the selection of ERP packages and will provide input from real-world cases that will allow updating and refining the model.*

DOI: 10.4018/978-1-7998-3016-0.ch017

## INTRODUCTION

Organizations frequently use decision-support tools in order to support the often complex decisions of identifying the more advantageous scenarios concerning the selection or allocation of resources in general, as deeply shown in literature (Archer & Ghasemzadeh, 1999; Ávila et al., 2015; Bhutta & Huq, 2002; Büyüközkan, Feyzioğlu, & Nebol, 2008; Ghodsypour & O'Brien, 1998; Santhanam & Kyparisis, 1996; Stewart, 1991). In particular, the same applies to the software resources selection (Cebeci, 2009; Chaudhri, Jeckle, Rahm, Unland, & Ruhe, 2003; Grabski, Leech, & Schmidt, 2011; Howlett et al., 2010; Jadhav & Sonar, 2009, 2011; Kahraman, Beskese, & Kaya, 2009; Karsak & Özogul, 2009; Onut & Efendigil, 2010; Vayvay, Ozcan, & Cruz-Cunha, 2012). The selection of Enterprise Resources Planning (ERP) systems is a good example of a situation associated to a complex decision, due to the multiplicity of criteria involved and the relative weighting between these (Benlian & Hess, 2011; Bueno & Salmeron, 2008; Chaudhri et al., 2003; Cruz-Cunha & Varajão, 2011; Munkelt & Völker, 2013).

ERP systems are typically the most complex and most demanding information systems implemented by organizations (Grabski et al., 2011), and are fundamental in modern business, because of its ability to integrate the flow of material, finance, and information to support organizational strategies (Uwizeyemungu & Raymond, 2010; Yusuf, Gunasekaran, & Abthorpe, 2004). They are the information engines that, in most organizations, support the business processes, and hence the selection of an ERP system is a critical decision for an organization. Given their broadly discussed inherent complexity and the huge investment and maintenance costs involved (Al-Mashari, Al-Mudimigh, & Zairi, 2003; Anaya, 2014; Wei, Chien, & Wang, 2005) ERP system selection is a challenging and risky task. The organization must be able to reconcile its business needs with the technological constraints of the ERP system, otherwise the logic of the system may conflict with the logic of business systems. Installing an ERP system is much more than having another information technology tool; it is a decision on how to shape the organizational business (Kumar, Maheshwari, & Kumar, 2002).

Scientific literature presents several studies on the application of Multi-criteria Decision Making (MCDM) methods to the selection of software packages. Among the several approaches to the problem of software systems selection offered by literature, this research addresses the utilization of the Analytic Hierarchy Process (AHP) technique in the selection of ERP systems and, simultaneously, the development of a tool for the selection of the more appropriated ERP software system from several alternatives of ERP solutions in the context of Portuguese organizations. The authors are developing an intelligent approach to ERP software selection through AHP by taking into consideration quantitative and qualitative elements to evaluate ERP software alternatives.

This paper proposes an AHP model that integrates a set of criteria extracted from the literature review and validated by Portuguese organizations. This model eases the application of the AHP process to the selection of ERP software systems; it is supported by a Web application that is under development. This Web application will provide input from real-world cases that will allow updating and refining the AHP model.

In the next section, we present a literature review on the use of MCDM methods and the AHP technique. The third section presents the problem definition and methodology followed, and the subsequent sections present the problem modeling until the weighting of ERP selection criteria to be used by the decision support system.