



## Segmenting and mining the ERP users' perceived benefits using the rough set approach

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### ABSTRACT

Enterprise Resource Management (ERP) systems are viewed as a promising and powerful information technology solution for dealing with the impact of competition advancements and enabling corporations to improve productivity and to operate more efficiently. Although implementations of ERP are complex and costly, corporations may actively adopt and engage in such ERP implementations if perceived benefits exceed perceived risks and costs. A number of studies have contributed to discussion of important factors related to ERP introduction or implementation. Other studies have listed various potential benefits which may be obtained when implementing ERP systems. However, few studies attempt to deepen the analyses of the ERP users' perceived benefits in order to gain meaningful findings for promoting ERP implementations. Typically, elements of a set of ERP benefits do not necessarily share the same importance. Moreover, a given ERP benefit may be accorded a variety of very different levels of importance by different corporations. This paper attempts to segment the ERP users into two subgroups according to the notion of Herzberg's Motivation-Hygiene theory, and further, to uncover imperative perceived benefits for distinct subgroups of ERP users employing the rough set theory. The results of this study should provide better understanding and knowledge of strategic implications for both ERP system adopters and vendors, and thus advance the scope of ERP implementations.

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### 1. Introduction

Enterprise Resource Management (ERP) systems are viewed as promising and powerful information technology solutions that enable corporations to improve productivity and to operate more efficiently. According to Su and Yang (2010), the ERP system is a combination of business processes and information technology, constituting an integrated enterprise computing system designed to automate the flow of material, information, and financial resources among all functions within an enterprise on a common database. Moreover, ERP systems can assist corporations in automating and integrating corporate cross-functions such as inventory control, procurement, distribution, finance, and project management (Tarn, Yen, & Beaumont, 2002). In order to meet the impact of advancements in such competitive areas as shorter lead-time, higher quality, competitive prices, and improved customer service, corporations are increasingly interested in adopting ERP systems.

Due to competitive pressures resulting from globalization, corporations increasingly need more effective total enterprise

solutions like the ERP system. The ERP system enjoys its present popularity because of its apparent capacity to improve operational efficiency and business efficacy (Chou & Chang, 2008). Aydin and Tunali (2007) suggest that the ERP system is evolving and integrating many advanced applications, including Supply Chain Management (SCM), Customer Relationship Management (CRM) and E-Procurement. Today's ERP systems integrate the main business and management processes within and beyond a firm's boundary, as well as supporting most commercial activities, including purchasing, sales, finance, human resources, and manufacturing resource planning (MRP) for modern corporations (Shiau, Hsu, & Wang, 2009). The report of Exact Software. (2005) notes that the evolution of the ERP system, which rose in the 1990's from its beginning as a tool for materials planning, and has grown over the years, can be divided into three differently-featured phases: (1) the traditional ERP phase (1990's) which was characterized primarily by the capability to service materials planning, order entry, distribution, general ledger, accounting, and shop floor control; (2) the extended ERP phase (2000–2004), in which it expanded to handle such issues as scheduling, forecasting, capacity planning, e-commerce, warehousing, and logistics; and (3) the ERP II phase (from 2005) which offers further advanced solutions, covering project management, knowledge management, workflow management, SCM, CRM, human resource management, portal capability,

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and integrated financials. However, it must be noted that ERP implementations are complex and costly, even though advanced ERP systems have evolved several highly favorable features such as: more wide intensive and extensive coverage; better flexibility in handling functions; and web-centric application.

Cebeci (2009) remarks that ERP implementations are the most difficult investment projects because of their complexity, high cost and adaptation risks. Ge and VoB (2009) point out that the successful implementation rate is still low, and many corporations have not achieved full potential benefits from ERP systems. Saatcioglu (2007) comments that ERP systems, extremely complex pieces of software, are costly, and ERP implementations require large investments of money, time and expertise. Su and Yang (2010) point out that, nevertheless, because the potential ERP benefits are large, many corporations are willing to undertake the difficult process of introducing these expensive and risky ERP systems. Thus, although ERP implementations are complex and costly, corporations may actively adopt and engage in ERP implementations if perceived benefits exceed perceived risks and costs. In other words, corporations are motivated to adopt ERP systems because ERP implementation may well result in a set of attractive potential benefits. Shiau et al. (2009) note that ERP systems provide a multitude of benefits to businesses, such as: inventory reduction, data integration, and cost reduction. Ge and VoB (2009) note that an ERP system is a highly integrated enterprise information system helping us to manage all aspects of an enterprise's business operations, including production, purchasing, engineering design, manufacturing, sales, marketing, distribution, accounting, and customer service; and once the ERP systems are successfully implemented, significant benefits may be obtained in such areas as improved customer service, better production scheduling, and reduced manufacturing costs.

A number of studies have discussed significant factors for ERP implementation, as well as listing various potential benefits which may result from implementing ERP systems. However, although users' perceived benefits can, indeed, be an imperative predictor, few studies have seriously looked at ERP users' perceived benefits. Even with high perceived risks and costs, if perceived benefits are sufficiently attractive, corporations may still actively engage in ERP implementation. Thus there is an increasing need to deepen our analyses of ERP users' perceived benefits, in order to gain meaningful findings for promoting ERP implementation. Unfortunately, the previous literature has contented itself with listing a miscellaneous set of ERP benefits which do not necessarily share the same importance. It is evident that the importance of one ERP benefit may be evaluated quite differently by different corporations. Therefore, this paper attempts to address the issue of how to go about segmenting and mining the ERP users' perceived benefits. To this end, segmenting methods and data mining techniques are applied in this study. The remainder of this paper is organized as follows. In Section 2, a literature review is conducted. In Section 3, research design and results are presented. Finally, based on the findings of this research, conclusions and implications for management are presented.

## 2. Literature review

### 2.1. Issues of ERP implementations

For purposes of achieving a successful ERP implementation, there are some important issues that must be considered such as: identifying the motivations for ERP adoption; checking the ERP competences for a successful ERP adoption; realizing the importance of integration in implementing ERP systems; selecting a suitable ERP system; comprehending critical factors

of ERP implementation; and measuring ERP performance and impact.

Identifying the motivations or needs for ERP adoption is the starting point for successful ERP implementation. Su and Yang (2010) note that the adoption of ERP systems could be motivated by a variety of factors – pressure from competitors, requests from partners or customers in the supply chain for linkage or system upgrades, or simply the need to replace poorly functioning inherited systems. Velcu (2007) emphasizes two kinds of motivations for ERP implementation: technical motivations and business motivations. Technical motivations comprise replacing disparate systems, reducing software maintenance burden by outsourcing, eliminating redundant data entry, reducing data errors, decreasing computer operating costs, and integrating applications cross-functionally. Business motivations include enabling business growth, improving inefficient business process, reducing business operating and administrative expenses, reducing inventory carrying costs, acquiring multicurrency IT support, eliminating delays and errors in filling customers' orders, and standardizing procedures across different locations.

Successful implementation of ERP systems may result in competitive advantages in our innovative age (Hsu, Lai, & Weng, 2008), and has the potential to provide corporations with new competitive capabilities, based on the provision of real-time information that can improve the speed and precision of response (Su & Yang, 2010). There is, however, a definite need to check ERP competences in order to achieve a successful ERP adoption. This is because, depending on the situation with regard to those competences, the strategies employed in ERP implementation can be evolutionary or revolutionary. In order to ensure that a corporation can successfully transform ERP systems into competitive advantages, Stratman and Rothe (2002) highlight eight recommended ERP competences related to a successful ERP adoption. These ERP competences may be regarded as a portfolio of managerial and technical, as well as organizational, skills and expertise. They include strategic planning, executive commitment, project management, IT skills, business process skills, ERP training, change readiness, and learning. Similarly, Su and Yang (2010) suggest a set of ERP competences as follows: strategic IT planning, executive commitment, project management, IT skills, business process skills, ERP training, learning, and change readiness.

Many studies have emphasized the importance of integration in implementing ERP systems. Ge and VoB (2009), for example, comment that the ERP system can be regarded as a highly integrated enterprise information system which controls and manages all aspects of business operations. According to Al-Mudimigh, Saleem, and Ullah (2009), because ERP implementation has become more popular, and suitable for adoption by almost every type of business organization, it has, in fact, become an essential for business success. But, to be successful, ERP implementation needs to achieve several sorts of integrations including: process integration, organizational integration, data integration, and application integration. In particular, process integration is often cited as a key goal associated with the implementation of information technologies such as the ERP (Berente, Vandenbosch, & Aubert, 2009). There is also the important task of selecting a suitable ERP system to match properly with organizational needs and competences. According to Wei and Wang (2004), a successful ERP project must achieve the selection of an appropriate ERP system and a cooperative vendor, while, at the same time, managing business processes change, and examining and monitoring the practicality of the ERP system. Moreover, Cebeci (2009) notes that the ERP system selection needs to match the business strategies and goals of a given corporation, and he employs fuzzy AHP (analytic hierarchy process) and balanced scorecard to develop a decision support system for selecting ERP systems.

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