A FCM-Based Dynamic Modeling of ERP Implementation Critical Failure Factors

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ABSTRACT

Implementation of Enterprise Resource Planning systems (ERPs) is a complex and costly process which usually results in serious failures. Numerous factors affect these projects implementation due to their size, complexity and high chance of failure. Therefore, identifying these factors in ERP projects is a critical issue. The majority of previous studies and research projects have been conducted in identifying ERP Critical Success Factors (CSFs) rather than Critical Failure Factors (CFFs). In order to help practitioners, this paper studies the CFFs in this kind of projects. Unfortunately, the implications of interdependency among failure factors are usually underestimated by project managers and decision makers since they are difficult to model and analyze. With this in mind, the authors have built Fuzzy Cognitive Maps (FCMs) of failure factors in ERP implementation projects. The main advantage of FCM lies in them being capable of modeling complex phenomena based on the experts’ perceptions. This tool models uncertainty and related events, imitating human reasoning. Moreover, FCMs enable the developing of forecasting exercises through simulations. Practitioners would thus assess the joint influence of ERP implementation failure factors on project outcomes. The results make known to practitioners which problems will arise if the failure factors are not treated, and how these will impact on the outcomes of projects. Therefore, the tool proposed would help them to manage ERP implementation projects in a more effective and proactive way.

Keywords: Critical Failure Factors (CFFS), Enterprise Resource Planning (ERP), ERP Implementation, Failure Factors Interdependencies, Fuzzy Cognitive Map (FCM)

INTRODUCTION

Enterprise resource planning (ERP) applications are information systems (IS) packages that are engineered to institutionalize the sharing of organizational data resources (Klaus, Rosemann, & Gable, 2000). These systems are designed to address the problem of fragmentation as they integrate and streamline internal processes by providing a suite of software modules that cover all functional areas of a business (Koch, Slater, & Baatz, 2001). Since the emergence

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of ERP packages in the late 1990s, they have become popular among practitioners and IS researchers alike (Ifinedo, 2011). However, despite such interests globally, industry reports and academic studies have indicated that many adopting organizations have come to realize that the deployments of such systems were not as effective as expected (Ifinedo, 2011; Peslak, 2012; E. Wang, Shih, Jiang, & Klein, 2008; Zhu, Li, Wang, & Chen, 2009). Although ERP systems can bring potential benefits such as productivity and quality improvements in key areas, the high failure rate is a major concern (Davenport, 1998). The failure rate of these projects has been estimated at between 60% and 90% (Chang, Cheung, Cheng, & Yeung, 2008; Kwahk & Lee, 2008). These projects are, on average, 178% over budget, took 2.5 times longer than intended and delivered only 30% of promised benefit (Zhang, Lee, Huang, Zhang, & Huang, 2005).

These statistics imply that ERP implementation is a difficult and risky task. To avoid such costly failures and helping organizations better make use of their resources, much effort has been done by researchers. Some researchers have provided valuable insights into the process of ERP implementation (Mandal & Gunasekaran, 2002; Parthasarathy & Anbazhagan, 2007; Soja, 2008; Subramanianh & Hoffers, 2005; Yusuf, Gunasekaran, & Abthorpe, 2004) and others identified a variety of critical factors affecting on the success or failure of the system (Al-Hinai, Edwards, & Humphries, 2013; M Al-Mashari, 2003; Amid, Moalagh, & Zare Ravasan, 2012; Hanafizadeh, Gholami, Dadbah, & Standage, 2010; Nah & Delgado, 2006; Nah, Zuckweiler, & Lau, 2003; Somers & Nelson, 2004; Umble & Umble, 2002). Many factors contribute to the success or failure of ERP projects, but just a few of them are technology-related factors. Many others belong to different areas such as human resources, strategies, project management, management, structure, communication and financial issues (Hanafizadeh & Zare Ravasan, 2011). However, there are various obstacles or challenges that must be overcome in the process of the successful implementation of an ERP system by an organization.

Vast and complex number of success or failure factors affect on the implementation of ERP systems (Dawson & Owens, 2008; Farzaneh, Vanani, & Sohrabi, 2013; Khattak et al., 2013; Rouhani & Zare Ravasan, 2013; Sternad, Bobek, Dezela, & Lampret, 2009; Umble, Haft, & Umble, 2003). But most of researchers are interested in working on critical success factors (CSFs) as one of the most frequently used keywords in ERP systems publishing (Kayas, McLean, Hines, & Wright, 2008) and fewer numbers intended to investigate Critical Failure Factors (CFFs). Studies indicates that just six percent of all articles that were published by prestigious journals and conferences in ERP topics from 1998 to 2007 were assigned to CSFs (Z. Huang, 2010). But in the same period, the number of published papers on ERP CFFs was less than one percent. Since the review and analysis of ERP failure experiences in the form of research projects is very valuable for avoiding the past mistakes (G. Pan, Hackney, & Pan, 2008), studying ERP projects’ CFFs can be expressed as an interesting research topic.

While numerous studies, with the aim of narrowing this gap, have attempted to identify the critical factors affecting ERP projects failure (e.g. Amid, et al., 2012; Hauri & Heeks, 2010; Maguire & Ojiako, 2010; Wickramasinghe & Gunawardena, 2010; Xue, Liang, Boulton, & Snyder, 2005), none have investigated the interrelationships among ERP CFFs because past research often assumed each of the success or failure factors to have a direct and independent causal influence on final ERP implementation outcomes (Botta-Genoulaz, Millet, & Grabot, 2005). Investigating these interrelationships and considering how certain failure factors affect each other in a reinforcing manner have been highly suggested in ERP literature (Amid, et al., 2012; Chen, Law, & Yang, 2009; Wong, Scarbrough, Chau, & Davidson, 2005). With this goal in mind, the purpose of this study is to identify the most cited ERP CFFs in the literature and then investigate available interre-
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