Integrating Enterprise Systems

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INTRODUCTION

In the last two decades many organizations installed enterprise resource planning (ERP) systems as a means to integrate their back-office operations. The need for integration, however, actually amplified with the advent of ERP. In addition to integrating ERP with legacy systems, consolidating multiple copies of ERP running in different business units posed major challenges. Moreover, recent strategic initiatives such as customer relationships management (CRM), supply chain management (SCM), business to consumer (B2C), and business to business (B2B) all require a free flow of information between ERP and other enterprise systems to be successful. It is, therefore, more critical than ever to plan for and implement integration projects involving ERP properly. Hwang (2005) describes the need for integrating enterprise systems in detail. He also discusses several success factors cited in practitioner journals. Since then a handful of empirical studies have been published in the scholarly literature. This article provides a review of those studies with a special focus on the success factors. A consolidated list of success factors is developed for practitioners. Promising research directions are discussed.

BACKGROUND

While researchers have examined integration issues for some time, it was not until the early 2000s that empirical studies involving ERP began to appear in the literature. Table 1 summarizes the characteristics of the five empirical studies reviewed, and Table 2 summarizes the critical success factors (CSF) discussed. Alshawi, Themistocleous, and Almadani (2004) investigated the feasibility of minimizing ERP customization through integrating two ERP packages. They found that an enterprise application integration (EAI) tool was useful in integrating SAP R/3 with an Oracle H/R module at a telecommunication company. Sharif, Irani, and Love (2005) studied the integration project of a global industrial company involving ERP and legacy systems. The integration effort was deemed unsuccessful based on a post hoc evaluation model that they developed. Lam (2005) proposed a CSF model for EAI projects. He termed this the BOTP model, after the categories into which the success factors fall: business, organization, technology, and project. A case study involving a large financial services provider integrating its consumer banking systems revealed three broad groups of success factors: top management support, integration strategy, and project planning and execution. Mendoza, Perez, and Griman (2006) developed a set of 20 CSFs and tested them in two case studies, one in a B2B and the other in an ERP setting. Many but not all of the success factors were present in the two companies. Finally, Stefanou and Revanoglou (2006) examined a successful ERP implementation at a hospital.

Alshawi et al. (2004) and Stefanou and Revanoglou (2006) did not discuss their findings in the context of some type of success models. The three studies that did classified various CSFs by their types (e.g., organization vs. technology) or the type of integration involved (e.g., intra- vs. inter-organization). One group of variables discussed by Sharif et al. (2005), for instance, deals with ERP II tailorability, the ability to integrate ERP with customers via CRM and B2C and with business partners via SCM. Building on the maturity model of Schmidt (2000), Mendoza et al. (2006) developed their list of CSFs based on different levels of integration, from level one point-to-point integration to level

Table 1. Study characteristics

Study	Case Study	CSF Model
Alshawi et al. (2004)	Integrating two ERP systems	No
Sharif et al. (2004)	Integrating ERP with legacy systems	Yes
Lam (2005)	Integrating ERP with legacy systems	Yes
Mendoza et al. (2006)	Integrating ERP with legacy systems; B2B integration	Yes
Stefanou and Revanoglou (2006)	Integrating ERP with legacy systems	No

Table 2. Critical success factors in the literature

Study-	Business	Organization	Technology	Project
Sharif et al. (2004)	1. optimization of business models 2. acceptability of success	1. effect of influencers	**1. vertical specialization** **2. horizontal specialization** **3. extended ERP functionality**	1. scope of technical effort involved
Lam (2005)	1. strong business case 2. overall integration strategy **3. process interoperability with business partners**	1. top management support 2. business process change and overcoming resistance to change 3. good organizational and cultural fit	1. handling legacy systems 2. technology planning 3. common data standards 4. use of right tools 5. use of mature technology	1. realistic project plans and schedule 2. client involvement, communication, consultation, and training 3. required skills and expertise on-board, vendor competence 4. monitoring and feedback 5. proper migration approach 6. adequate testing plans
Mendoza et al. (2006)	1. careful strategy of implementation	**1. valuable support by senior management** **2. change determined and justified at a productivity level** 3. effective organizational change management **4. appropriate strategy of security** 5. known organizational structure	1. standard data model documentation, unification, and updating 2. appropriate configuration of communication software 3. helpful technical support 4. complete technological infrastructure	**1. effective outgoing and incoming communication** **2. adequate management of project scope** 3. appropriate outsourcing management 4. high expertise project team 5. low impact of IS on the organization 6. effective internal and external training plan 7. relevant user involvement 8. valuable project management 9. effective project leadership 10. significant administrative support for the project consultant

four external integration. Lam (2005) does not distinguish internal from external integration projects but acknowledges that some factors such as "process interoperability with business partners" are more important in inter-organization settings than in intra-organization settings.

Table 2 organizes the CSFs into four groups of Lam (2005): business, organization, technology, and project. This is a general classification scheme into which any success factor can be classified. At the same time, it makes sense to differentiate factors that are oriented toward more external integration or ERP II tailorability (Sharif et al., 2005) than internal integration. Those external-oriented factors are boldfaced in Table 2. It is, however, important to note that the internal/external dimension should be treated as a continuum rather than a dichotomy because some factors apply to both intra- and inter-organizational settings (Mendoza et al., 2006)

CRITICAL SUCCESS FACTORS

As can be seen in Table 2, the success factors discussed by different researchers share a number of commonalities. A consolidated list of success factors is presented in Table 3, with factors that are either common across different studies or fit closely with the theme of each category. As shown in Table 3, for instance, the theme of the business factors category is to define the value and strategy of integration. The list in Table 3 is concise and presented in an easy-to-use format for practitioners. It can be expanded or modified as more studies appear in the literature in the future. The next paragraphs discuss all the factors listed in Table 2.

Factors dealing with business aspects are related to the value and strategy of integration. In today's business environment it is critical to demonstrate the return on investment (ROI) of any major endeavors, especially for expensive and complicated integration projects (Lam, 2005). It is also important to develop an integration strategy (Lam, 2005; Mendoza et al., 2006) at the outset including key performance indicators (Mendoza et al., 2006). Sherif et al. (2004) similarly discuss the need for defining the success for integration projects. They also suggest "optimization of business models" as a success factors, because organizations with flexible and adaptive business models are likely to value integration efforts. Finally, Lam (2005) describes "process interoperability with business partners," a factor admittedly more important to external than internal integration projects.

Organizational factors deal with the acceptance of the mission by all the constituencies. Top management support