



Managing the full ERP life-cycle: Considerations of maintenance and support requirements and IT governance practice as integral elements of the formula for successful ERP adoption

Chuck C.H. Law^{a,*}, Charlie C. Chen^b, Bruce J.P. Wu^c

^a Mihalcheon School of Business, Concordia University College of Alberta, 7128 Ada Boulevard, Edmonton, Alberta, Canada

^b Department of Computer Information Systems, Appalachian State University, Boone, NC 28608-2049, United States

^c Department of Information Management, Tamkang University, Taipei County 25137, Taiwan

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ABSTRACT

Companies adopting enterprise resource planning (ERP) systems have often focused primarily on implementation-related factors while neglecting those of post-implementation. As a result, the usefulness and operation of the ERP systems, once installed, are compromised. This research adopted a case study approach to demonstrate that ERP adoption efforts that fail to pay attention to post-implementation requirements (especially those relevant to maintenance and support (M&S)) from an early stage in the project lifecycle will face dire consequences. It points out that poor planning and management of M&S services can imperil the normal operations of an ERP system and the daily activities of a business. With the life span of ERP systems getting shorter, sound M&S practices can extend their life and create a stable system platform to support efficient and effective business operations. M&S issues deserve to be considered as integral elements among the critical success factors (CSF) of ERP adoption projects. In other words, ERP success requires a full lifecycle perspective to be taken by adopting companies. With lessons having been learned from the mistakes in the first project, the company in this case study revamped its ERP implementation second time out, with due consideration being given to M&S strategies and practices from project initiation onward in order to realize a stable, usable, and maintainable system. The case study explores and identifies the critical success factors (CSF) of ERP adoption, and shows that M&S must be included as a key element from the outset and throughout the system lifecycle. Our findings capture a great deal of experience for any ERP adopting companies to follow in order to avoid learning costly lessons both in implementation and subsequent M&S throughout the lifespan of the system. A set of propositions is also presented for academic researcher to consider in future ERP research endeavors.

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1. Introduction

The successful implementation of enterprise resource planning (ERP) systems can create competitive advantages for companies which adopt them. With product life span becoming increasingly shorter, the installation of an ERP system alone cannot sustain competitive advantage unless it is properly maintained and allowed to evolve to satisfy new business requirements. In other words, the perspectives and practices of project management must be extended to encompass post-implementation activities in the ERP lifecycle. Maintenance and support (M&S) services, as an intrinsic part of an ERP system, can improve its quality and extend its life span. High quality M&S can result in the system having a

profound and lasting impact on adopters' competitive advantage [17].

The extant academic and practitioner literature centers mostly on adoption and implementation issues, ranging from ERP-process fit, business process re-engineering (BPR), and implementation methodologies to organizational impacts [26]. Post-implementation issues are as important as matters concerning adoption, yet they are often under-researched [26]. Such issues encompass ongoing requirements, change management, user support, and maintenance and upgrade of ERP systems. As Glass and Vessey [14] point out, the total post-implementation cost, including maintenance, of a piece of software could be as high as 70% of the total cost, and annual M&S could amount to 25% of the cost of implementation. This shows how important M&S is to ERP as well as to other types of software systems. It is therefore critical for companies and other stakeholders to fully understand and manage maintenance issues so as to devise appropriate measures to

* Corresponding author.

E-mail address: charles.law@concordia.ab.ca (Chuck C.H. Law).

address problems, mitigate interruptions to daily operations, and extend the life and benefits of the enormous investment made in ERP systems [25].

This study set out to investigate, analyze, and report on the strategies, challenges, and practices of ERP adoption and maintenance in a multinational firm operating in the Greater China region, which comprises Taiwan, China, Macao, and Hong Kong. We consider the full ERP lifecycle of the projects with a focus on M&S issues, since we believe the requirements of the latter are of paramount importance [26] to the success of implementing as well as operating the system. Using ERP projects as examples, this study will explore the linkage between implementation and M&S, and highlight the impact of the latter on the success of implementation and operations. While ERP implementation issues have been discussed widely in the extant literature, M&S issues tend not to be. Therefore, the results of an extensive review of the literature are reported in section two. In this section, we attempt to summarize key conceptual and practical issues pertinent to the M&S of ERP, all of which made a significant contribution to defining the focus and objectives of the study. The methodology adopted to operationalize this study is discussed in the third section, followed by a detailed description of the ERP experience of the company studied in section four. Based on an analysis of the case study, section five identifies and discusses eight critical success factors (CSF) and their implications, so far as relevant, to the M&S of ERP. Along with the CSF, a set of propositions is also presented. The academic contributions and limitations of this study, and directions for future research, are presented in section six while section seven sets out our concluding remarks.

2. Review of relevant issues and framework of the study

2.1. Stages of the ERP lifecycle

ERP systems can be deployed in a big-bang or phased approach, either of which initiates the stages of a system's project lifecycle. According to the staged implementation model [20], the project lifecycle consists of four phases—adaptation, acceptance, routinization, and infusion. The last two phases – routinization and infusion – are the post-implementation stages that are most relevant to this study, though they cannot be examined without reference to the practices and decisions of previous phases.

Routinization is the stage where ERP is assimilated into the routine activities of an organization. The infusion phase is where the next innovation is sought or any disordered situations (such as bugs, outdated drivers, incompatible hardware and software, and unfamiliarity of new users with the system) are corrected. A substantial number of activities and players need to be actively involved throughout the lifecycle of an ERP system. The infusion stage must not be treated lightly since the maintenance and evolution of the installed system must be handled properly to

fulfill emerging business requirements. Other researchers have also expressed similar opinions. For instance, Markus and Tanis' [23] four-phase model consists of stages labeled chartering, project, shake-down, and onwards and upwards. The shake-down phase is the one in which corrective actions are taken to stabilize the system for routine operations [23]. The fourth (onwards and upwards) phase is aimed at providing ongoing maintenance, user support, and upgrades to the system [23]. Thus, the infusion process is one of the critical elements that deserve our attention [29].

2.2. Important issues in ERP adoption and maintenance

The ERP phenomenon has been considered a very important one, resulting in many studies in the last decade of the critical issues or success factors for adoption. Issues and CSF identified in these studies range from those relating to organizational and project management to implementation strategy and human resources [8,26,28]. However, it has been pointed out [26] that the volume of ERP studies concentrates mainly on the pre-implementation and implementation phases, with little discussion of post-implementation. While we expect that readers would have little problem accessing a comprehensive list of implementation issues and factors, we present below a discussion of the issues that are relevant to the M&S of ERP systems, with a summary displayed in Table 1.

Three major issues can arise very early in the ERP lifecycle: (1) the extent of customization; (2) the choice between in-house implementation, use of external consultants, or total outsourcing; and (3) the management of conflicts of interest between stakeholders. These issues often carry forward into the infusion stage in which the adopting company may need to decide on the degree of customization to be allowed in order to narrow functionality gaps, satisfy emerging user requirements, and strike a balance between competing demands from users in the post-implementation stage. It also has to decide whether to rely on expensive external expertise for implementation and M&S activities, or to develop its own in-house capacity. These decisions will have a substantial impact on the practices and costs of M&S, and the recruitment, development, and retention of the internal human resources essential for successful system operation. Failing to address these major issues will adversely affect normal business operations, possibly leading to dire consequences for the company.

2.2.1. Strategic decision about the extent of ERP customization

The extent of customization of the ERP system is a strategic decision that can affect the costs and risks of implementation, and the ongoing maintenance and upgrade of the system [11]. The rapidly changing business environment creates a need for frequent updates to the system to meet business needs. Customization of an ERP package means changing the software to fit business

Table 1
Key issues relevant to ERP maintenance and support.

Issues	Studies
• Customization refers to modifications made to the native features of an ERP product. They may include modifications to user interfaces, reports, messages and even program codes, and additions of bolt-on logic to the native system	[12]
• In contrast, a "vanilla" implementation of ERP system does not allow any modifications to the native systems. The system is to be set up to meet the needs of the adopting company using configuration tables and parameters supplied by the native system.	[28,33,40]
• Customization increases the risks and costs to the implementation and maintenance of an ERP project.	[5,11]
• Customization creates hurdles for on-going maintenance and support of an ERP system. For instance, it creates difficulty for the ERP system's migration to a newer release, and it is costly to retain customizations created in the past.	[5,19,22]
• Some researchers and consultants suggest to eliminate customizations before migrating to new releases.	[5]
• Unlike that of traditional proprietary systems developed in-house, ERP implementation and maintenance is in many circumstances vendor-driven. ERP vendors will continue to distribute software patches for "bug fixes", and new enhanced releases, which may be incompatible to any in-house customizations made to the older releases.	[24,25]
• ERP vendors will cease to support older versions of their ERP products after a period of time subsequent to the launch of new releases	[5]

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