



An empirical investigation of the impacts of internal/external facilitators on the project success of ERP: A structural equation model

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ABSTRACT

In recent years many companies have improved their business performance and competitive position by implementation of enterprise resource planning (ERP) systems. This study goes beyond the boundaries of an individual organization to develop an integrated framework for successful implementation of ERP systems. We also discuss the internal/external facilitators which make this possible. Meanwhile, the authors utilize the SERVQUAL instrument, project management and information systems success theory in our empirically investigation of the roles and interdependent relationships of system vendors, consultants, project management and system performance, based on existing measures suitable for this study. The results reveal a significant causal relationship between system providers, implementation consultants and project management, and project to system performance, except directly from SERVQUAL to system performance. It is believed that an understanding of the relationships between the relevant factors for ERP success is necessary to satisfy the adopter's requirement, both practically and theoretically.

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1. Introduction

Over the past decade, enterprise resource planning (ERP) systems have been implemented in many organizations worldwide [28]. However, there are various obstacles that must be overcome in the process of the successful implementation of an ERP system by an organization [32,59,67]. In fact, ERP implementation is a difficult and risky task. Executing an ERP project not only tends to be large and complex but also involves a broad range of organizational transformation processes during the whole implementation process. There are many internal and external entities involved in this type of high-risk project besides the executive steering committee for project management (PM) which require expertise that is not typically found within the organization, such as system vendors and implementation consultants [25].

The system vendors and implementation consultants represent external sources of expertise and the executive steering committee of project management (PM) stand for an internal transformation mechanism facilitating fundamental changes in the organizational structure. The organization goes through tremendous changes through PM efforts during ERP project implementation, creating

environments where systems could be modified or embedded and systems of services are delivered in the process of the transformation. System vendors, implementation consultants and the executive steering committee of PM are the three key participants to achieve success in driving the system performance of ERP.

It should be noted well that if an ERP system cannot be embedded, system services cannot be delivered and system performance not carried out by the efforts of the system vendor, implementation consultant and PM. Given this, it is believed that a more comprehensive and integrated ERP success model should incorporate such factors as the Vendor/Consultant quality and PM dimensions. More importantly, study of ERP systems success is limited if these three important dimensions are not considered.

A review of the previous literature on ERP success reveals that researchers have either used narrowly defined measures [73] or examined ERP success at individual stages [40]. However, few go beyond the boundaries of the organization to discuss the internal/external contextual factors that lead to success, looking at the whole process of what drives successful ERP implementation from a wider perspective. Although Gable and colleagues [22,52] have stepped up to this challenge on ERP assessment of systems success issues and discussed the impact of external contextual factors, overall, there is a shortage in the literature of an integrated model dealing with the internal/external contextual factors as antecedents of ERP success. It goes without saying that no one has examined the relationships

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between dimensions leading to ERP systems and the PM dimension as a moderator (intermediary) of ERP system performance in the later stages. This study aims, therefore, to fill this gap by examining the effects of the afore-mentioned two external and one internal contextual factors, i.e., system vendor, implementation consultant and PM on ERP success assessment, simultaneously.

The rest of this paper is organized into six sections. Section 1 briefly describes the research problem and the goals of this study. In Section 2, we discuss the influence on ERP system quality from two perspectives, internal and external facilitators, to better understand the participants involved in the process of ERP implementation. In Section 3, we consolidate these streams of research and propose a modified research framework and six propositions. In Section 4, methodology (sample, data arrangement and model testing) and the discussion of management implications are introduced. Limitations and suggestions for future research are discussed in Section 5. Finally, we present our conclusions in Section 6.

2. Literature review

The deployment of any complex system has always faced barriers [21]. Barriers are high when striving to accomplish anything involving a large network of internal and external stakeholders, applying untried technology and utilizing best-practice models that may not be a good match to the organization [55]. Wang et al. [64] has stated that such barriers can arise from the adaptability of the system or procedural transformation of behavioral concerns and can be addressed by looking at system performance as perceived by clients during later stages of implementation. Each step in the deployment process requires analysis to determine what factors will promote effective deployment [12,33].

The internal and external facilitators have an influence on ERP system quality. Examination of these two perspectives is needed to better understand the participants involved in the process of ERP implementation. One also needs to investigate the relationships between service quality from the system vendor and the implementation consultant and the level of achievement level by project management for successful ERP project implementation.

2.1. External facilitators

2.1.1. Effect of system providers and implementation consultants

According to Yen and Sheu [75], successful implementation of an ERP system requires a strategic fit between the product and the organization. Xu and Ma [74] also mentioned that the benefits of ERP depend on the client's operations, maintenance, and upgrading skills and knowledge, which can be learned, acquired and transferred from a consultant. Without external help, few organizations can implement ERP successfully. External support, therefore, is usually obtained from software vendors and implementation consultants.

Ko et al. [34] first underscored the crucial role that system vendors play in ERP implementation. It is recognized that the service quality of the ERP provider is crucial throughout the life span of any ERP process [34,40,56]. Janson and Subramanian [29], therefore, concluded that a close fit between the software vendor and the user organization is positively associated with successful implementation.

Furthermore, according to Dong-Gil [20], ERP implementation also requires knowledge of activities associated with configuring and testing ERP modules, installing software, and training employees in preparation for ongoing operation, maintenance and support of customized a vendor-supplied system. Few firms, however, by themselves have sufficient in-house skill or a comprehensive enough knowledge base to implement a complex ERP system [64]. The consultant who possesses experience in system implementation, however, can effectively support clients with the necessary knowledge to help with project management and implementation methods.

The client possesses detailed knowledge of the firm's business processes, organizational context, and competitive situation. Consequently, high-quality consultants not only will have a positive effect on ERP system quality but they will also be able to provide valuable service to alleviate the misfit problem [65].

Markus and Tanis [40] further highlighted "dependence on vendors and consultants" as the two key issues in ERP implementation. They differentiate these systems from other IT implementations since they represent an external source of expertise to the firm. These two types of external entities play a critical role in ERP implementation. Clearly, the service quality provided by system vendor and implementation consultants needs to be effectively articulated, gathered and analyzed to determine what factors will promote effective deployment. Most importantly, the analysis of the service quality of system vendors and implementation consultants for ERP implementation will enable subsequently assist project management to facilitate communication and mutual understanding as well as increase coordination between the service quality and system performance through the PM's activities during the implementation process. The knowledge and service from both sides could then be integrated into the implementation and measured by the application of the service quality (SERVQUAL).

2.1.2. Service quality of external facilitators

Over the past decade, commonly used measures of information system (IS) effectiveness have focused on the products, rather than the services, of the IS function. However, organizations have struggled with traditional measures to improve the service performance of the system provider and their largely intangible benefits. There is a danger that IS researchers will inaccurately measure IS effectiveness if they do not include in their assessment package a measure for service quality. Consequently, there has been an urgent call for new types of IT performance indicators [30]. One alternative measure that has recently become quite popular in the IT setting is service quality as perceived by the customers of IT services [66]. The IS function includes a significant service component. System providers, like other service firms, have realized the significance of customer-centered philosophies, and are turning to quality management approaches to help manage their business. Similarly, since ERP implementation consultation is a professional service, the service quality should be assessed from a client's perspective.

Service quality is a concept that has aroused considerable interest and debate in the literature, because of the difficulties in defining and measuring it, with no overall consensus emerging on either [71]. Caruana et al. [11] pointed out that definitions of service quality revolve around the idea that it is the result of comparisons made by customers make between their expectations about a service and their perception of the way the service has been performed [44,50]. Pitt et al. [46] offered SERVQUAL, an instrument developed by the marketing area, as a possible measure of IS service quality. The majority of the work to date has attempted to use the SERVQUAL methodology in an effort to measure service quality [6,37,44].

Certainly, the SERVQUAL instrument has been the predominant method used to measure the degree of satisfaction associated with consumer perception of service quality especially related to the IS function. In order to examine the applicability in the IT setting and the quality of service inputs from system providers and implementation consultants during the process of ERP implementation, the authors have adapted the concept of service quality and SERVQUAL to measure the performance of IT service. The main five generic dimensions of SERVQUAL are outlined as follows [62]:

- (1) Tangibles: physical facilities, equipment and appearance of personnel.
- (2) Reliability: ability to perform the promised service dependably and accurately.

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