RETHINKING ERP CSFS: A NEW PERSPECTIVE ACROSS IT GOVERNANCE AND THE SYSTEM LIFE-CYCLE

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ABSTRACT

This research identifies 35 critical success factors (CFSs) from relevant studies conducted between 1998 and 2011 and classifies them into five life-cycle phases of the ERP system to describe how CSFs impact the three drivers of IT governance (ITG). Despite the trend of the times, top management support has been regarded as the most crucial backbone. However, in previous studies, many recognized CSFs were not consistently ranked according to the importance. In other words, the ranking of CSFs varies from study to study. The important role of entrepreneurs and managers pushes them to adopt ITG and ERP life-cycle perspectives to manage CSFs, mitigate risks, and deliver system values.

INTRODUCTION

The Rimini Street's research [34] points out that IT and finance executives have been raising the annual maintenance fees of IT. Wailgum [43] points out that only 1% of the respondents from the sample had planned to decrease their ERP investment during the global recession. With such large expenditures on Enterprise Systems (ES) and the significant risks of failure, it is valuable for managers to consider ways to make their own IT investments more successful. Effective ITG is critical because IT investment tends to increase progressively. Given the increasing importance of effective IT control, many researchers and practitioners have conducted intensive studies within the ITG domain. The reason is that an improperly managed huge investment may impair rather than enhance the organization's competitive position. Meanwhile, the life-cycle management of the ERP system needs continuous improvement after the system start-up, which will influence the ultimate success of an ERP system. Ngai, Law and Wat [28] state that to maximize the positive effect of the system in organizations, all phases in the life-cycle are equally important. Further, they advise that the CSFs of the whole ERP life-cycle should be examined. Law, Chen and Wu [20] deem that ERP success hinges not only on proper planning and implementation, but also on post-implementation activities; they also suggest that a full life-cycle perspective should be taken by ERP practitioners and academics in terms of assessment of CSFs. Grabski, Leech and Schmidt [11] concur that success in one phase does not guarantee success in later phases. Future research should help organizations determine what key performance indicators should be measured and monitored throughout the life-cycle of ERP. Only a few previous studies identified and analyzed CSFs of ERP systems from the life-cycle-wide perspective [11] [20] [28]. Therefore, the association and relationship between CSFs and ITG still remains unexplored. Reexamining relevant CSFs and controlling every driver of the ITG will be helpful in avoiding costly errors in the life-cycle span of systems. Hence, the research question is as follows: What key factors explain the success of an ERP throughout its life-cycle span, and how do they impact ITG?

THEORETICAL BACKGROUND

Facets of ITG

IT is fundamental for enterprise resources management, communication/negotiation between suppliers and customers, and global and dematerialized transactions. IT is also a key factor in recording and disseminating business knowledge. The ITGI [16] defines ITG as the responsibility of executives and the board of directors, and it consists of leadership, organizational structures, and processes that ensure that IT sustains and extends the organization's strategies and objectives. Good ITG is critical in supporting the achievement of enterprise goals. Bernroider [4] contends ERP investments in the ITG domain are more effective in organizations as ITG consists of proactive strategic guidance and participatory team building. ITG applied to ERP system applications is crucial in supporting business processes in many organizations. For ERP system-owning enterprises, ITG can sustain daily operations and implement strategies required to extend their activities in the future. The ITGI [16] points out that ITG is fundamentally concerned about: IT's delivery of value to the business, mitigation of IT risks, and five main areas for ITG. Two of the areas are outcomes: value delivery (VD) and performance measurement (PM), and the remainders are drivers: strategic alignment (SA), risk management (RK), and resource management (RM). VD and PM are regarded as assessment results of IT investment and are usually dependent variables in the analysis of ERP-CSFs research. This study analyzes how the CSFs of ERP impact the three drivers of ITG by adopting the phases of the system life-cycle span proposed in the study of [45]. .

ERP systems life-cycle phases

ERP life-cycle management is linked to the delivery of business value through IT [45]. Grabski et al. [11] concur that an enterprise system's life spans years and even decades—from ERP selection during the project initiation phase, to business process reengineering (BPR) in the adoption phase, through the later phases of adaptation, acceptance, routine use—until managers consider whether to optimize or upgrade their ERP system. Organizations experience problems at all phases of the ERP system life-cycle. There are many taxonomies of ERP systems life-cycle-wide, including pre-implementation, implementation, and post-implementation [8]; adoption, decision, acquisition, implementation, use and maintenance, evolution, and retirement [9]; project chartering, project configuration, shakedown, onward and upward [25]; and project preparation, business blueprint, realization, final preparation, go-live and support, and post-implementation [36]. Many researchers [8] [9] [25] [36] [11] divided the ERP life-cycle into three to seven phases. Nevertheless, after reviewing relevant literature, this present study adopts the five phases, namely, evaluation, acquisition, formal introduction, operation and maintenance, and expansion suggested by Chang, Yen, Huang, and Hung [7], who synthesized software life-cycle, ERP system life-cycle, and other methods proposed by vendors (e.g. ASAP).

RESEARCH DESIGN

Understanding related research on the CSFs of ERP systems and controlling every facet of ITG are helpful for ERP-system-adopting companies to avoid system failures. It is hoped that the relevant CSFs discussed in this study will assist managers in better prioritizing resources to maximize the effect of the system and to achieve ultimate success. This section presents the data collection procedures, the research period, scope of journals, and demographics of filtered data.

Table 1. Research methods and themes of each article in the final sample

Research Method / Analysis Technique	Experimental Research		Conceptual Research		Subtotal
	Survey	Case Study	Literature Review	Modeling and Simulation	
Quantitative	[4][5][10][13][14][15] [19][30][38][46][40] [42]	[3]	[2]		14
Qualitative	[37]	[1][6][22][23][29][31][32] [33][35][41][44]	[11]	[17][18][26]	16
Both		[12][27]			2
Subtotal	13 (41%)	14 (44%)	2 (6%)	3 (9%)	32

Data collection

The first presentation on ERP issues was given at the Decision Sciences Institute's Annual Meeting in Las Vegas in 1998. Wilkin and Chenhall [45] reviewed ITG literature published by the foundation of the ITGI between 1998 and 2008. Therefore, this study began by reviewing literature published between 1998 and 2011. First, 12 core journals related to ITG domain are referred to [45]. Second, [21] cross compared three sources and listed 17 core journals of SCIE and SSCI in the field of information management of knowledge database. It is suggested that the two aforementioned lists of journals should be combined in order to integrate the perspectives of ITG and ERP system life-cycle-wide. From the perspective of ITG and ERP system life-cycle-wide, this study aims to review significant papers of ERP CSFs published in the 24 key journals between 1998 and 2011. 'ERP CSFs/IT success' is set as keywords to search journal articles satisfying the requirements of this study. Then the content of the selected articles is cut down to less than 10 pages. Table 1 depicts research methods and analysis techniques adopted in the extracted articles. A large proportion of the selected articles, including [4] [5] [10] [13] [14] [15] [19] [30] [38] [46] [40] [42], employ the research method of survey to carry out statistical analysis of their quantitative data.

Table 2. 35 CSFs classified based on the ITG drivers and phases of the ERP life-cycle span

Phase / Driver	Evaluation	Acquisition	Formal introduction	Operation and maintenance	Expansion
Strategic alignment	(1)(2)(3)(4)(5)(6)(7)(8) (10)(11)(12)(14)(15)(16) (17)(18)(20)(21)(22)(25) (26)(28)(32) (34)(35)	(1)(2)(3)(4)(5)(6) (7)(8)(10)(11)(14) (15)(16)(18)(20) (21)(22)(25)(28) (32)(35)	(1)(2)(3)(4)(5)(6)(7) (8)(10)(11)(12)(13) (14)(15)(16)(18)(20) (21)(22)(25)(27)(28) (29)(30)(31)(32)(35)	(1)(2)(3)(4)(5)(6)(7) (8)(10)(11)(14)(15) (16)(17)(18)(20)(21) (22)(25)(27)(28)(29) (30)(31)(32)(35)	(1)(2)(3)(4)(5)(6) (8)(10)(11)(12) (14)(15)(16)(17) (18)(21)(25)(26)
Risk management	(1)(2)(4)(7)(10)(11)(16) (18) (21)(23)(26)	(1)(2)(4)(7)(10) (11)(16)(21)(23) (26)	(5)(10)(11)(14)(18) (23)(26)	(5)(10)(11)(23)(26)	(5)(26)
Resource management	(1)(2)(8)(9)(12)(13)(16) (19)(20)(24) (33)	(1)(2)(8)(9)(12) (13)(19)(20) (24) (33)	(1)(8)(9)(12)(13)(16) (19)(20)(24) (33)	(1)(8)(9)(11)(12) (13)(16)(19)(20) (24)	(9)(13)(16)(19) (20)

Note: (1) Top management support; (2) Project team competence; (3) Interdepartmental co-operation; (4) Clear goals and objectives; (5) Project management; (6) Interdepartmental communication; (7) Management of expectations; (8) Project champion; (9) Ongoing vendor support; (10) Package selection/customization; (11) Data analysis and conversion; (12) Dedicated assets/resources; (13) Use of steering committee; (14) User training on software; (15) Education on new business processes; (16) Business process reengineering; (17) Architecture choices/system configuration; (18) Change management ; (19) Vendor partnership/tools ; (20) Use of consultants ; (21) Alignment of the business with the new information system; (22) Internal audit activities; (23) Perceived degree of complexity of ERP systems; (24) Competitive pressure; (25) Organizational culture; (26) Risk management; (27) Influence of direct supervisors; (28) Performance evaluation scheme; (29) Intrinsic motivation; (30) Perceived usefulness; (31) Job specifications; (32) Knowledge Management Competence; (33)Improved access to information; (34)Firm Size; (35)Organizational Structure

Data analysis process

The 32 articles looked at CSFs from three facets (i.e., SA, RK, and RM) and analyzed ITG in five phases (i.e., evaluation, acquisition, formal introduction, operation and maintenance, and expansion). For example, Article [46] argues that the 4 CSFs should be "system configuration," "project management," "leadership involvement," and "organizational fit." According to the questionnaire and definition of 22 CSFs [39], the "organizational fit" is classified under education of new business processes (15) and BPR (16) in this study. The remaining CSFs are classified under Architecture choices/system configuration (17), Project management (5), and Top management support (1). Article [46] discusses 5 factors: CSF(1), (5), (15), (16), and (17) respectively, from SA, RK, and RM angles in the two phases of operation and maintenance and expansion. The classification of the other factors is demonstrated in Table 2 below. The 153 CSFs derived from the 32 selected articles are analyzed and further classified as 35 CSFs.

RESULTS AND DISCUSSION

Table 2 categorizes the 35 CSFs according the ITG driver and the phase of the ERP life-cycle. For example, CSF (1), (2), (3), (4), (5), (6), (7), (8), (10), (11), (12), (14), (15), (16), (17), (18), (20), (21), (22), (25), (26), (28), (32), (34), and (35) belong to the SA driver of ITG and the phase of evaluation. Notwithstanding the phase, most CSFs were explored from the SA rather than the RM or RK angle. There was strong support for SA, and it appeared to be a key foundation in ITG throughout the ERP system life-cycle span. As can be seen in Table 2, only a few CSFs from the three ITG drivers are classified under the expansion phase. Moreover, this phenomenon will push organizations to consider how to upgrade their present systems and make these systems work more steadily based on the cogitation of RK and RM of ITG.

Strategic alignment

According to Table 2 SA is the most important issue for system success. In terms of selecting and implementing an ERP system, organizations have to make important decisions on project team structures, implementation strategies, database conversion strategies, transition techniques, risk management strategies, and management strategies [23]. Bernroider [4] also reports key management practices in defining and aligning ERP strategies, management commitment, inclusion of stakeholders, and team building strategies. In an organization, coordinating strategies and systems is a prerequisite for smooth future operations.

User training is often considered an antecedent variable to ERP success because many studies emphasized the early phases of the ERP life-cycle span [3] [5] [6] [11] [40]. ERP training should not be a one-time preparation. Instead, it should be an ongoing set of communications, educational opportunities, and support for new business processes [3] [11] [13] [30] [37] [40] [46]. Creating an organization-wide learning culture could have significant effect on ERP assimilation. Therefore, the capability for interdepartmental communications and collaboration of top management plays an important role in managing organizational strategies and structures. Support from top management [1] [5] [17] [18] [27] [29] [30] [31] [32] [35] [41] [46] and organizational fit of organizational readiness [13] [37] [46] significantly and positively influence the success of implementation. Change management is a structured process in which individuals affected by the change are proactively managed and some tactics are recommended, such as "readiness for change" assessments, training programs, job redesign, and organizational structure modifications [4] [11] [23].Change management and BPR [11] [13] [19] [23] [29] [31] [40] [46] emphasize the need for a strategic alignment between the ERP system deployment and strategic management. New or updated ERP systems should fully support the existing business processes. Otherwise, users would be reluctant to accept the ERP systems. In addition, the selected

studies have rethought and explored the value of ERP CSFs from the SA driver of ITG. These studies reported that CSFs with high SA achieve better system performance and increase business value.

Risk management

It is found that in terms of risk management (CSF (26)), recent ERP research of CSFs focuses more on small and medium-sized enterprises (SMEs) [2] [23] [33]. A recent review of risk management in ERP projects [2] not only indicates that risks frequently occur in the early conceptual phase but also highlights the top 10 risk factors, including inadequate selection [1] [37], poor project team skills, low top management involvement, low-key user involvement, inadequate training and instruction, inadequate BPR, bad managerial conduct, ineffective project management techniques [46], inadequate change management, and ineffective strategic thinking and planning in the ERP life-cycle. The primary goal of system implementation is the functional fit of adequate software selection. Greater functional fit will help members in the organization to play their part in the collective organizational endeavor [37].

In short, the company has to deal with either a misfit between the package, business processes, and strategies, or the need for major modifications because of wrong choices. These solutions are time-consuming, costly, and risky. Besides, the biggest challenge of systems integration usually involves the data [37] [46]. The process of data analysis and conversion is complex because it involves various systems and data formats. Hence, data should be exported and properly reformatted before they could be imported into the ERP [31]. An ambiguous architecture may store potential crises of dysfunctional operations of the ERP system [46].

As discussed previously, in terms of selecting and assessing ERP software, the demands of the organizations and the organizational characteristics should be taken into account. After the appropriate software is obtained, the integration of data, including data analysis and conversion, process fit, and user interface fit, will be carried out. This undertaking should allow individuals or departments to gain access. Accordingly, the current study suggests that RK should consider the first three phases of the system life-cycle span, focusing more on the information system. Only a few studies have explored the reciprocation between information system and the organizational context, and the focus of research is on SMEs.

Resource management

Somers and Nelson [40] provide managers with guidance on how key players in an organization can best utilize limited resources in key activities. The key players include top management support, project team competence, project champion [18], ongoing vendor support [1] [18] [31], the use of the steering committee [42], vendor partnerships/tools [31] [37] [42], and the use of consultants [31] [42]. It is best to employ consultants who can perform requirement analysis, recommend suitable solutions, and manage implementations [31] [40] [42]. Vendors use accelerators that include business process modeling tools, templates for industry-specific business practices, bundles of server hardware and ERP software, combined packages of software, services and support [31][37][40][42].

A better fit between the software vendor and the user organization is positively associated with the implementation success of packaged software [1] [18] [40] [42]. This partnership is critical during the ERP system life-cycle span. The careful choice of a project manager, personnel training, and a champion supporter are linked to system success [6]. Employee perceptions of fair treatment generate responsive performance [18] [22] [26]. Cooperation is linked to trust [1] [18] [32] [40] which is a foundation of advancing new initiatives. Cooperation can be strengthened by active team building, with both frequent communication and gender mix [1].

The resource-based view of the firm posits that organizations can develop unique internal capabilities to gain a competitive advantage. An ERP system is regarded as a capability which enables not only the

infrastructure to manage information and coordinate activities but also the firm to develop more efficient operations and take advantage of new opportunities. Consequently, IT facilitates its own success, and ITG should proactively foster links across organizational boundaries and challenge technical limitations to encourage knowledge sharing. Although implementing the ERP software requires financial support and resources, support from people involved in the process of implementation also plays a vital role. In this study, it is found that the selected samples underscore the need of RM, concentrating on the three stages of the system life-cycle span as well as the vendors.

CONCLUSION

The results of the present study support the view that ERP CSFs are inextricably linked to ITG and system life-cycle span. It is vital to have appropriate ITG in an organization, and the history and the internal motivations of an organization should be taken into account. The results in this study support the need of a fit between the drivers of ITG and organizational factors. A novel contribution of the present research is that it extends the need by considering organizational factors and other relevant factors to highlight the importance of the ITG drivers. It is important that CSFs of ERP are recognized as a dynamic changing continuum instead of a static position.

ERP implementations affect the entire organization and are typically associated with BPR. It is found that CSFs tend to be interrelated. As such, changes in any one of them would affect the others. ERP implementation projects are as much about organizational changes as IT. Major changes are increasingly necessary for companies/organizations to survive and remain competitive in this new environment. Changes may demand more leadership. Top management with strong leadership, commitment, and participation increases the possibility of implementation success.

A growing number of studies have probed into the area of “organizational fit.” Several models have been proposed to relate contingency factors to ITG. Moreover, the literature highlights that successful ITG is closely related to consistent leadership and individuals confidently understanding their roles. By rethinking and reexamining ERP CSFs, this study highlights the importance of the ITG drivers. Suitable ITG frameworks that fit the organizational and historical contexts of a firm could result in better system performance and deliver IT values. Sharing, communication, and collaboration should be encouraged in an organization as these three elements drive the core of virtuous ITG during the ERP system life-cycle span.

REFERENCES

Due to the constraint of space, the 46 references mentioned in this present study are omitted. If you are interested in any of the references, please feel free to contact the authors.