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Investigating CSFs for the life cycle of ERP system from the perspective of IT governance

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ABSTRACT

In response to the trend in technology, critical success factors (CSFs) in current research projects are ranked differently from those in prior ones. This study investigates possible CSFs for the life cycle of an ERP system. This study also analyzes the effects of CSFs from the perspective of Information Technology Governance (ITG). Thirty-five CSFs were identified from articles published in top journals. These CSFs are then classified into five life-cycle phases of an ERP system. This study also explores whether the outcomes or performances of ITG are driven by CSFs for ERP. Entrepreneurs and managers should adopt an ITG perspective to manage CSFs for the life cycle of their ERP system. This approach will not only enforce and drive ITG but will also mitigate IT risks in ERP systems. Entrepreneurs and managers should also establish a performance measurement index for ERP systems to deliver value within organizations.

1. Introduction

Given the emergence of a globalized and integrated world economy, the internal and external environments of industries around the world encounter continuous massive changes. According to Rimini Street [64], finance executives react to rising annual maintenance fees under tight Information Technology (IT) budgets. Nearly half (45%) of the current ERP systems in the market replaced outdated ERP software [56]. Wailgum's [79] study in Forrester Research reveals that only 1% of the respondents in their survey plan to decrease their ERP investment in a global recession. Maintenance costs continue to rise as businesses evolve even after the implementation of ERP system. This situation requires an ERP system that will evolve continuously to keep pace with economic changes. ERP systems support the improvement of business efficiencies; hence, they are considered must-have solutions for large and modern organizations [17]. The advances and trends in technology enabled ERP systems to develop into indispensable tools for information integration of enterprises. Given the large expenditures on ERP systems and the significant risks of failure, managers should ensure the success of their ERP investments. Major IT investments, such as ERP systems, take five to seven years to deliver substantial returns [9]. ERP investments are a double-edged sword that could increase value or cause loss within organizations.

The pervasive use of technology increased IT dependency, a situation that calls for specific focus on IT governance (ITG). Serious concerns arise from the potential effects of ITG on the returns on IT investment, as well as the significant increase of corporate governance and accountability within organizations [33,76]. ITG is as critical as corporate governance at board and management levels. ITG provides tools and frameworks to ensure that IT supports business goals and maximizes the efficiency of investment [83]. Companies adopt ITG and implement a set of ITG mechanisms that encourage behavior consistent with the mission, strategy, values, norms, and culture of the organization; these mechanisms are designed by enterprises with effective governance [82]. The concepts and practices of ITG can act as a significant stimulus or moderator of progress and can monitor the efficiency and effects of IT investment, expenditures, maintenance, or upgrade. Utilizing and enforcing ITG is a vital issue. Confirming the role of ITG as a stimulus or moderator assures that IT investments are accurately measured and companies can successfully avoid risks and bring business value to the organization.

Organizations should pay attention to their IT assets or ERP not only during the initial phase but also throughout the life cycle of the system. Markus and Tanis [46] and Staehr [74] indicate that the problems and issues that arise in the early phases of the life cycle of ERP will affect later phases. The life cycle of ERP is not considered complete even after the application becomes operative and the implementation stage has been concluded. Most studies on CSFs for ERP focused on the stage of system implementation [6,15,52]. However, some researchers also focused on post-implementation

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issues [6,47]. Despite this development, success in one phase does not guarantee success in the later phases of the system life cycle. Existing studies are limited to the identification and analysis of CSFs for ERP system from the life-cycle perspective [20,40,52]. Given this limitation, the present study explores the following questions: What are the key factors that explain the success of an ERP system throughout its life cycle and the relevance between CSFs for ERP system and drivers of ITG, namely, strategic alignment, resource management, and risk management? How should firms enforce ITG when the relationships between CSFs and ITG drivers are controlled? This study explores whether ITG can act as stimulus or moderator of CSFs for ERP systems. A significant gap exists in the literature on CSFs of ERP system because of the lack of holistic understanding of the life cycle of the system from an ITG perspective. This study provides practical guidelines for CSF compliance throughout the life cycle of a system and confirms the success of an ERP system within an organization. Controlling and managing CSFs for ERP system in different phases of system life cycle will enable organizations to fulfill and achieve ITG outcomes and deliver value and drive continuous progress in organizations.

2. Theoretical background

ITGI [28] points out that the overall objective of ITG is to understand the issues and strategic importance of IT. Organizations with good ITG have effective ERP investments [5]. The application of ITG in ERP systems is important in supporting the business processes of organizations. ITG implementation will enable an enterprise to sustain its operations and implement sustainable strategies. The effects of CSFs must be fully considered during the entire life cycle of ERP [40,52]. This study examines CSFs in the life cycle of ERP systems from an ITG perspective. This section is framed around CSFs and the success of ERP systems, as well as drivers and outcomes of ITG and the life cycle phases of ERP systems.

2.1. CSFs for ERP and Success of ERP

Bullen and Rockart [11] define CSFs as "the few key areas where 'things must go right' for the business to flourish and for the manager's goals to be attained." Upadhyay and Dan [78] identify CSFs that firms should focus on; these CSFs ensure the success of a firm. CSFs should be identified to help firms focus their efforts on building their systems. Managers can utilize CSFs to assist them in discovering and identifying the elements required to achieve desired goals [32]. IT strategy is a CSF [63]. Information system is the backbone of information, communication, and control in organizations [10] that actualizes the best practices in business in all organizational processes [15].

Noudoostbeni et al. [53] indicate that ERP system is one of the primary factors that help organizations manage their resources optimally and effectively. ERP systems support the day-to-day operations and decision making of a business. ERP systems have been widely applied and have reached a stage of maturity [31]. ERP systems combine the key businesses and management processes of an enterprise to enhance operation efficiency. ERP systems provide opportunities to raise competitive advantage and increase the market share of companies [36]. Given the benefits of a properly implemented ERP system, organizations should consider the cost of poorly implemented system. The success of an ERP system depends on the time spent for its implementation [44]. Therefore, if the criteria for the success of ERP are defined in the early stages of implementation, it will not accurately capture the entire scope of ERP-related success in later periods.

Several studies examined CSFs across phases of ERP implementation [24,49,72,73]. Ngai et al. [52] suggest that CSFs for ERP help organizations identify critical issues that affect implementation. A comprehensive understanding of CSFs for ERP systems will help organizations decide on corresponding solutions to avoid failure during implementation. CSFs provide specific guidelines in different phases of implementation. ERP implementation during the maintenance phase should focus on factors, issues, and activities related to the improved use of existing ERP resources to promote efficiency and effectiveness in organizations [34,50]. According to Law et al. [40], the success of an ERP hinges on proper planning and implementation, as well as post-implementation activities; they suggest that ERP system practitioners and academics should consider a full life cycle perspective in the assessment of CSFs to ensure ERP success. However, only a few studies explored the management of CSFs for ERP systems from a full life-cycle perspective.

2.2. Drivers and outcomes of ITG

ITGI [28,30] defines ITG as the responsibility of executives and the board of directors; ITG consists of leadership and organizational structures and processes that ensure that IT sustains and extends the organization's strategies and objectives. Webb et al. [81] define ITG as the strategic alignment of IT with the business to ensure that maximum business value is achieved through the development and maintenance of effective IT control and accountability, performance management, and risk management. Peterson et al. [59] propose three key elements in ITG, namely, structures, processes, and control frameworks. ITGI [28] cites two areas of fundamental concern, namely, the business value delivered by IT and mitigation of IT risks. The first factor is driven by the strategic alignment of IT with the business. The second one is driven by the embedded culture of accountability in an enterprise. Both areas should be measured and supported by adequate resources to ensure results that lead to the five focus areas of ITG. Two of the focus areas are outcomes, namely, value delivery and performance measurement [28,83]. The other three areas are drivers, namely, strategic alignment, resource management, and risk management [28,83]. According to De Haes et al. [14], three key strands of ITG can be discerned in academic literature in the early 1990s; these ITGs include alternative forms of IT function and their impact on business outcomes, the nature and effect of consumers of IT services, and link among strategy, IT investment, and performance. ITG is a continuous life cycle that can be penetrated at any point. ITG usually starts with strategy and its alignment throughout the enterprise. Therefore, organizations should monitor the performance of their IT investments through appropriate measurement of ITG [29,75].

Based on the definitions of the five focus areas of ITG, value delivery (VD) and performance measurement (PM) outcomes are dependent on the sound drivers of strategic alignment (SA), risk management (RK), and resource management (RM) [18,27,28,30,83]. Organizations should measure the operational performance of their IT resource and its overall value to the business [69,84]. Weill and Ross [82] find that companies with superior ITG enjoy higher financial performance than companies with inferior ITG. Delivery of business value through IT investment is a recurring theme in literature [22,41,58]. VD and PM assess the results of ERP investment and are considered dependent variables in the analysis of CSFs. The present paper analyzes how CSFs for ERP systems use the three drivers (SA, RK, and RM) to achieve ITG outcomes (PM and VD) in the entire life cycle of an ERP system. This study provides organizations with a solid approach for assessing and managing the success of their ERP systems.

2.3. Life-cycle phases of ERP systems

Management of the life cycle of ERP is linked to the delivery of business value through IT [83]. The taxonomies of the life cycle of an ERP system include pre-implementation, implementation, and post-implementation [13]; adoption, decision, acquisition, implementation, usage and maintenance, evolution, and retirement [15]; project chartering, project configuration, shakedown, onward and upward [46]; and project preparation, business blueprint, realization, final

preparation, go-live and support, and post-implementation [68]. Researchers divided the life cycle of ERP into three to seven phases. Grabski et al. [20] concur that the life cycle of an ERP system of an enterprise spans years and even decades; these phases include ERP selection during the project initiation phase to business process reengineering (BPR) in the adoption phase, including the later phases of adaptation, acceptance, and routine use until managers consider optimizing or upgrading their ERP system. Organizations experience problems in all phases of the life cycle of an ERP system.

We adopt the five phases of life cycle of an ERP system presented by Chang et al. [12] who synthesized software life cycle (ISO/IEC 12207 and IEEE/EIA 12207), ERP system life cycle [16,4,45,65,66,57,62,2] , and other methods proposed by vendors, such as the five phases of Project Preparation, Business Blueprint, Realization, Final Preparation, and Go-Live and Support (ASAP). They propose a five-phase ERP system life cycle with explicit boundaries, including evaluation, acquisition, formal introduction, operation and maintenance, and expansion. Success in one phase does not guarantee success in the later phases of the system life cycle. Hence, enterprises should continuously appraise their ERP during each distinct life cycle phase. Enterprises should consider assessing information management and operating performance in the entire process of ERP implementation. The results of ITG-based ERP evaluation may help organizations determine whether IT investment delivers value to organizations.

3. Research design

An understanding of related research on CSFs for ERP system will help companies avoid costly lessons throughout the life cycle span of a system by controlling each driver of ITG. The basis of this section is the research frame and data collection procedures adopted in the study.

3.1. Research framework

This study is framed on the three drivers of ITG, namely, SA, RM, RK, and life cycle phases of ERP systems, namely, evaluation, acquisition, formal introduction, operation and maintenance, and expansion. Fig. 1 shows that the CSFs for ERP system identified in the filtering article were analyzed, categorized, and systematized to different views and interpretations. All extracted CSFs are organized to determine the classification of the ERP life cycle and the three drivers of ITG. The articles (see list in Note of Table 2) are extracted and reviewed from key journals in different fields to identify relevant CSFs. The CSFs are analyzed and classified independently in the filtering articles. Each CSF should be completely coded and classified into a phase of the system life cycle and three drivers of ITG. Discrepancies are resolved in an open discussion among authors. The study adopts the life cycle of ERP system defined by Chang et al. [12] to classify the CSFs of each article and analyze the association between CSFs and the three drivers of ITG [83]. The CSFs interact in different contexts or different life cycle stages [19]. This study acknowledges that the limitations of explanation rely on the authors' interpretations, experience, or primitive definitions of CSFs. CSFs in different phases have been addressed, but this study does not consider interdependencies between the phases because existing literature provides no basis for such analysis.

3.2. Data collection

We refer to Information Systems (IS) literature related to ITG in 12[1] core journals of IS, accounting IS (AIS), and management accounting (MA) [83]. We then review literature that identifies the factors that facilitate the success of an ERP system throughout its life cycle according to 17[2] core journals in information management field [38]. The scope of research must combine the lists (see Footnotes 1 and 2) mentioned above because of the integrated perspectives of ITG and the life cycle of ERP. Our aim is to review all papers on the success of CSFs for ERP by aligning the perspectives of ITG and the life cycle of ERP system from 1998 to 2011 in 24 key journals.

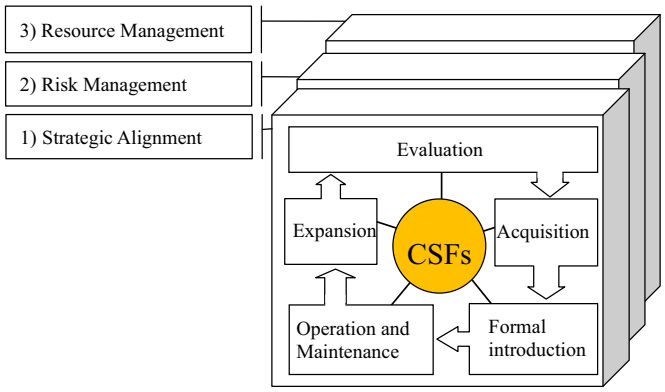

Fig. 1. Research framework for data analysis.

Articles concerning ERP CSFs/success during each phase of the ERP life cycle were collected and analyzed from the three drivers of ITG perspective using web search facilities. We use the following keywords for conducting crosswise search with title, abstract, keyword of authors supplied in the articles collected:

1. 「ERP」 and 「CSF」 or 「CSFs」 or 「Critical Success Factors」 or 「Success」
2. 「ERPII」 and 「CSF」 or 「CSFs」 or 「Critical Success Factors」 or 「Success」
3. 「EERP」 and 「CSF」 or 「CSFs」 or 「Critical Success Factors」 or 「Success」
4. 「Enterprise Resource Planning」 and 「CSF」 or 「CSFs」 or 「Critical Success Factors」 or 「Success」

Data were collected by searching the keywords listed above in each selected journal using web facilities. We retrieved 82 articles from 17 journals published from 1998 to 2011. However, we failed to find articles from seven journals through crosswise keyword search with title, abstract, or keyword of author. We then excluded the main body of articles with less than 10 pages to eliminate editorials, book reviews, and viewpoints. To ensure that the subjects are included in the remaining articles, we perused abstracts and conclusions and skimmed through the content. Subjects the stray from the main purpose of the paper were obviated. The articles were filtered by setting conditions. Table 1 lists the detailed references of the final 32 articles across years (2002–2011) and journals (12). Twenty-eight articles were obtained from MIS field. "Information & Management" journal published most of the papers.

Table 2 summarizes the research methods and techniques used for each filtered article. The 32 articles in the research sample are classified

[1] Review sources of ITG: MIS Quarterly, IBM Systems Journal; Journal of Management Information Systems; Communications of the ACM; Information & Management; Information Systems Research; Journal of Strategic Information Systems; Sloan Management Review; Journal of Information Systems; International Journal of Accounting Information Systems; Accounting, Organizations and Society; and Management Accounting Research.

[2] The 17 core journals in the MIS field: Decision Support Systems; Electronic Commerce Research and Applications; European Journal of Information Systems; Information and Management; International Journal of Electronic Commerce; International Journal of Information Management; Information Systems Journal; Information Systems Management; Information Systems Research; Journal of the Association for Information Systems; Journal of Computer Information Systems; Journal of Global Information Management; Journal of Information Technology; Journal of Management Information Systems; Journal of Organizational Computing and Electronic Commerce; Journal of Strategic Information Systems; and MIS Quarterly.

Table 1
Numbers and fields of filtered articles in 1998 - 2011.

Journal's name	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Subtotal/Journal	Field	Subtotal/field
IJAIS	–	1	–	–	–	1	1	–	–	–	3	AIS	4
JIS	–	–	–	–	–	–	–	–	–	1	1	AIS	
DSS	–	–	–	–	–	–	1	–	–	1	2	MIS	28
EJIS	1	–	–	–	–	–	–	–	–	1	2	MIS	
IJIM	–	–	–	–	1	–	2	–	2	–	5	MIS	
IM	1	1	2	–	–	2	1	–	–	–	7	MIS	
ISJ	–	–	–	–	–	–	3	–	1	–	4	MIS	
JCIS	–	–	–	–	1	2	–	–	–	–	3	MIS	
JIT	–	–	–	–	–	–	–	–	1	–	1	MIS	
JOCEC	–	–	–	–	–	–	–	–	–	1	1	MIS	
JSIS	–	–	–	1	–	–	–	–	1	–	2	MIS	
MISQ	–	–	–	–	–	–	–	–	1	–	1	MIS	
Subtotal /Year	2	2	2	1	2	5	8	0	6	4	32		32

Note 1: IJAIS (International Journal of Accounting Information Systems), JIS (Journal of Information Systems), DSS (Decision Support Systems), EJIS (European Journal of Information Systems), IJIM (International Journal of Information Management), IM (Information & Management), ISJ (Information Systems Journal), JCIS (Journal of Computer Information Systems), JIT (Journal of Information Technology), JOCEC (Journal of Organizational Computing and Electronic Commerce), JSIS (Journal of Strategic Information Systems) and MISQ (MIS Quarterly).
Note 2: This paper omits from null data in column of 1998–2001.

Table 2
Distribution of research methods and themes in the final samples.

Research Method	Field research		Conceptual research		Subtotal
	Survey	Case study	Literature review	Modelling and simulation	
Analysis technique					
Quantitative	[2],[4],[9], [10] [11], [15],[16] [17],[18], [26] [30], [31]	[21]	[20]		14
Qualitative	[1]	[3],[6], [7],[8] [13], [14],[19] [22], [25], [28],[29]	[24]	[5],[12],[32]	16
Both		[23],[27]			2
Subtotal	13 (41%)	14(44%)	2(6%)	3(9%)	32

Note: [1], Seddon et al. [70]; [2], Ifinedo, [26]; [3], Ward et al. [80]; [4], Tsai et al. [77]; [5], Ke and Wei [35]; [6], Akkermans and Helden [1]; [7], Liu et al [42]; [8], Bradley [8]; [9], Grabski and Leech [19]; [10], Bradford and Florin [7]; [11], Ifenedo [25]; [12], King and Burgess [37]; [13], Malhotra and Temponi [43]; [14], Pan et al. [55]; [15], Zhu et al. [85]; [16], Hong and Kim [23]; [17], Somers and Nelson [73]; [18], Law, and Ngai [39]; [19], Sarker and Lee [67]; [20], Aloini et al. [2]; [21], Amoako-Gyampah and Salam [3]; [22], Plant and Willcocks [60]; [23], Nah and Delgado [49]; [24], Grabski et al. [20]; [25], Newman and Zhao [51]; [26], Osei-Bryson et al. [54]; [27], Häkkinen and Hilmola [21]; [28], Staehr [74]; [29], Poba-Nzaou and Raymond [61]; [30], Sedera and Gable [71]; [31], Bernroider [5]; [32], Morton and Hu [48]. This table uses [xx] to refer to the article number.

according to field (including survey and case study) and conceptual (including literature review and modeling and simulation) research methods. After adopting analysis technique, the final samples were classified into statistical analysis of quantitative data, analysis of qualitative data, and both quantitative qualitative data. Articles [2], [4], [9], [10], [11], [15], [16], [17], [18], [26], [30], and [31] in cell of Table 2 utilized surveys to process statistical analysis of quantitative data, which comprised the largest domain in this study. The CSFs for ERP systems typically focused on identification either through case study or surveys of factors associated with successful implementations.

Table 2 shows that most studies in the final samples explored ERP CSFs/success through diversiform methods. Survey and case studies comprise 85% (41%+44%) of the contributions and were the largest portion of data in terms of methodology. Most studies adopted statistical analysis of quantitative data from surveys against case studies that processed data by qualitative analysis. A small number of articles in other classes adopted deduction to develop conceptual propositions or induction of literature review.

3.3. Analysis of filtered data

CSFs for the implementation of ERP system gained attention after the research of Somers and Nelson [72]. Their study provides a useful and well-grounded ranking of 22 CSFs for ERP implementation. The current paper demonstrates that the highlighted CSFs change with time. Additional studies from 1998 to 2011 focused on "user training," "BPR," and "change management." Somer and Nelson (2001) proposed the top three CSFs, namely, "top management support," "project team competence," and "interdepartmental cooperation." Previous studies [1,37,73] directly adopted the top 10 CSFs proposed by Somer and Nelson (2001); these studies did not address the issue of appropriate metrics in contemporary era.

The current study extracts the CSFs in each article of the sample and analyzes CSFs based on the definitions of ITG drivers [83] and the life cycle of an ERP system [12] in Appendix A. For example, in the research of Zhu et al. [85] on “What leads to post-implementation success of ERP? An empirical study of the Chinese retail industry, retailers deployed an ERP system for at least two years to ensure that the system passed the shakedown phase; they then proceed to post-implementation to experience the benefits of ERP deployment. Zhu et al. [85] suggest the CSFs in post-implementation, which include system configuration, project management, leadership involvement, and organizational fit. "Organizational fit" was divided into education on new business processes and BPR, which are respectively denoted as CSF (15) and CSF (16); this classification is based on the initial questionnaire and definition of 22 CSFs proposed by Somers and Nelson [72]. The remaining CSFs were classified into architecture choice/system configuration, project management, and top management support according to the definition of 22 CSFs [72]; these CSFs are denoted as CSF (17), CSF (5), and CSF (1), respectively. Zhu et al. [85] discuss five factors, namely, CSF(1), CSF(5), CSF(15), CSF(16), and CSF(17), from SA, RK, and RK angles during the operation and maintenance and expansion phases of ERP. The remaining articles are classified using a similar process. A total of 153 CSFs were obtained from the 32 articles. The CSFs are then aggregated and classified into 35 CSFs according to initial definitions (see Appendix A).

Table 3
CSFs of the ERP system life cycle span from ITG drivers.

Phase	Evaluation	Acquisition	Formal introduction	Operation and maintenance	Expansion
Driver					
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)**

Notation: Numbers in the cells represent CSF order listed in the second column of Appendix A. Numbers in boldface: Top 5 CSFs during different phases in the present paper.

4. Results and discussion

Table 3 represents the CSFs with their corresponding ITG driver in a particular phase. For example, CSF numbers (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) were discussed with the SA driver of the ITG in the evaluation phase. Notwithstanding the bounded phase, most CSFs are explored using the SA driver instead of the RM or RK drivers. Table 3 shows strong support for SA, which appears to be a key driver and foundation in ITG throughout the life cycle of ERP.

Table 3 provides CSF discussions from three ITG drivers in the expansion phase. The trend will encourage organizations with ERP system to manage and upgrade their systems and stabilize the cogitation of RK and RM drivers of ITG. The table shows the top five frequencies of CSFs, which are rendered in boldface in the cell across the different phase and driver. For example, the top five CSFs with the SA driver of the ITG in the evaluation phase are CSF numbers (1), (2), (4), (5), (6), (7), (8), (14), (16), (18), and (21). The top five CSFs in the evaluation phase from SA driver from ITG perspective are (1) top management support, (2) project team competence, (4) clear goals and objectives, (5) project management, (6) interdepartmental communication, (7) management of expectations, (8) project champion, (14) user training on software, (16) business process reengineering, (18) change management, and (21) alignment of the business with the new information system. Controlling these high-ranking CSFs will help enterprises effectively engage in SA of ITG during the evaluation phase of ERP system.

4.1. Strategic alignment

Fig. 2 shows the CSF frequencies in the SA driver in different stage of system life cycle. Top management support [CSF (1)] and user training on software [CSF (14)] are the two most popular CSFs in each phase. CSF research from 1998 to 2011 mostly focused on the first four phases.

Table 3 shows that SA is the most important factor in the success of a system. Malhotra and Temponi [43] identify key decisions in selecting and implementing an ERP system; they also recommend best practices in making critical decisions. These best practices consider (1) project team structure, (2) implementation strategy, (3) database conversion strategy, (4) transition technique, (5) risk management strategy, and (6) change management strategy. The results of their study indicate that strategies significantly influence the success of ERP implementation. Bernroider [5] reports the key management practices involved in defining and aligning ERP strategy, management commitment, inclusion of stakeholders, team building strategies, and ERP value delivery; this study uses a multivariate validated model of ERP success, which is applied to the operational/usage stage of the ERP life cycle. Strategies involving interior planning within an organization that are aligned with implemented systems are a prerequisite for smooth operations.

Implementation climate affects effectiveness by enhancing user skills, reducing obstacles, and increasing incentives [54]. An in-house IT/system is a proven prerequisite among adopting organizations [26]. Effective training must be provided to all users. Besides acquiring

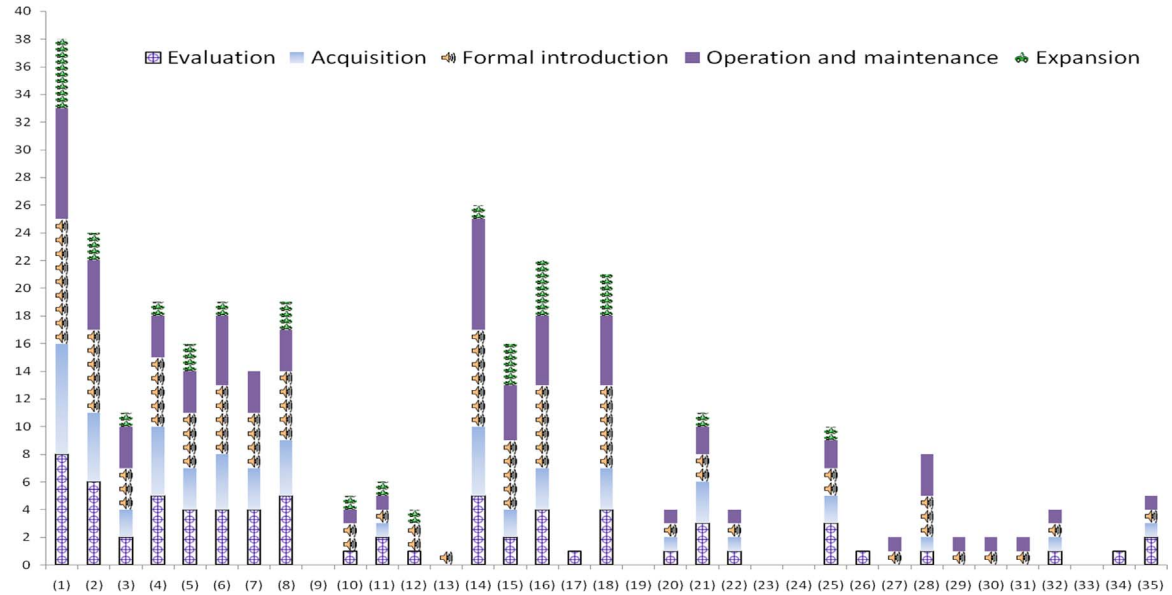

Fig. 2. Frequency of each CSF with SA driver in ERP system life cycle span.

technical skills, users must be clearly informed and instructed on the usefulness of the technology [42]. Overcoming organizational inertia [70] and enhancing assimilation level [42] can enhance the capacities of users. These approaches require a significant level of organizational commitment and actions, such as establishing an appropriate performance evaluation scheme, monitoring individual progress, removing job specification barriers, and conducting effective user training. The significance of top management in the overall picture of technology assimilation should never be underestimated.

ERP training should not be a one-time preparation for initial ERP system use. ERP training should be an ongoing set of communications, educational opportunities, and support for new business processes [20,23,3,54,70,73,85]. Continuous learning is important because it allows users to develop expertise in problem solving and adapting to novel situations/processes in the dynamic and complex environment of an integrated enterprise. Ke and Wei [35] contend that the success of ERP implementation is positively related to organizational culture along the dimensions of learning and development, participative decision-making, power sharing, support and collaboration, and tolerance for risk and conflicts.

The core process of an efficient cycle of any successful ERP implementation should consist of mutually reinforcing communication and collaboration between project team members from different departments and business functions [1]. The success of ERP implementation is facilitated by creating trust based on relationships or new coalitions based on the interactions between the management approach of project team and the modes of behavior of the stakeholder [80]. A successful evaluation of ERP systems should stress interdepartmental communications [21,49]. Therefore, the interdepartmental communications and collaboration of top management play an important role in managing organizational strategies and structures.

Building sound communication plans includes identifying the value of such a plan in facilitating social networks for trust and shared sense of obligation that will induce positive behavior and enhance business performance [3]. Employee perceptions of fair treatment generate responsive performance [37,42,5]. Cooperation is linked to trust [1,37,60,73], which is a foundation for advancing new initiatives. Cooperation can be strengthened by active team building, wherein frequent communication and gender mix have positive effects [1]. Training processes and strategies are important in enhancing skills and breaking down barriers for knowledge acquisition, particularly in acquiring technical knowledge [71]. Training processes is considered successful if they foster motivation [42]. Communication is enhanced by encouraging involvement and commitment, and this process is important for overcoming resistance [37] and perceived pressures [7] from new initiatives. IT facilitates its own success, and ITG should proactively foster links across organizational boundaries and challenge technical limitations to encourage knowledge sharing.

Implementation success is significantly and positively influenced by the support/involvement of top management [1,35,37,49,51,54,55,60,67,7,74,85], including organizational fit [23,70,85]. Hong and Kim [23] explore the causes of high failure rate in ERP implementation. Their results indicate that data fit, process fit, and user interface fit of ERP with the organization have a significant influence. They also indicate the moderating effects of ERP and process adaptation levels of organizational contingency factors.

Operations and process re-engineering become complex and challenging tasks because ERP implementations are linked to the firm's operational structure and business processes. Therefore, change management and BPR must emphasize the need for a strategic alignment between ERP system deployment and strategic management [20,23,39,43,51,55,73,85]. Business processes are key elements in a well-rounded strategy for change management and should broadly consider diverse areas in ERP implementation. Updated ERP systems should fully support the company's existing business processes; otherwise, users will be reluctant to accept the ERP system.

To achieve continuity of system performance, user knowledge must continue to expand and incorporate ongoing education [20,23,3,49,54,70,73,85]. This training must address knowledge acquisition [71] and behavioral change [3] after system implementation. CSF interaction [19] is similar across contexts or life cycle stages. A consistent underlying factor or set of factors or a complex, hidden environmental contingency exists in CSF interaction. Thus, companies should establish detailed performance evaluation schemes that include ERP assimilation indicators, such as providing feedback on ERP system performance, suggesting future improvements for the system, and providing ideas for redesigning work processes [42].

The articles in this sample have rethought and explored CSFs for ERP system from perspective of the SA driver of ITG. CSFs for ERP systems from filtered articles with high SA will achieve improved system performance and will increase the value of a business. ITG can be enforced by controlling the relevance between CSFs for ERP and SA (Strategic Alignment). CSFs as drivers of ERP system should become moderators for the implementation of strategies. This study provides practical guidelines, namely, CSFs, to align organizational strategies to ensure the success of ERP systems in different phases.

4.2. Risk management

Willson and Pollard (2010) describe RK as the management and assistance of IT related-risks; they identify the broad application of RK, which considers financial, operational, systemic risks, and technological issues. This issue requires risk awareness, tolerance, and measurement, and the establishment of responsibilities by top management. RK is a process of managing risk that includes risk identification, responses, reduction/mitigation, sharing/transfer, and risk acceptance. The Committee of Sponsoring Organizations of the Treadway Commission provides a widely accepted control framework for enterprise governance and RK (Control Objectives for Information and related Technology, COBIT 4.1). Corporate governance and related accountability strengthened the importance of RK.

Fig. 3 shows that the three most popular CSFs in RK for ERP are package selection/customization [CSF (10)], data analysis and conversion [CSF (11)], and risk management [CSF (26)]. Research sample from 1998 to 2011 fail to consider the risks involved in the life cycle of ERP.

The paper presents evidence of RK in the sample. However, RK is limited to assessment, management, and mitigation of project risk and does not have a broad application and consideration of operational and systemic risks as suggested in the literature on CSFs for ERP [83]. The current study argues that RM [CSF (26)] focuses on SMEs in recent research on CSF for ERP [2,43,61]. RK factor mainly indicates prevention of problems, whereas RK driver in ITG is an active process of risk identification in response to risk.

Malhotra and Temponi [43] suggest that RK strategies must minimize the risk associated with business location by identifying adequate strategies for management change and by deploying strategies through buy-in. Decision-makers of companies should also conduct careful analysis of alternatives before adopting an ERP implementation system. Company management and staff should avoid massive customization to achieve objectives within the limitations of their financial, technical, and human resources. RK strategy consists of two approaches. The first approach aims to reduce risky circumstances, and the second one deals with risk treatment after risk is identified.

A recent review of risk management in ERP projects [2] indicates that the majority of frequent risks occur during the early conceptual

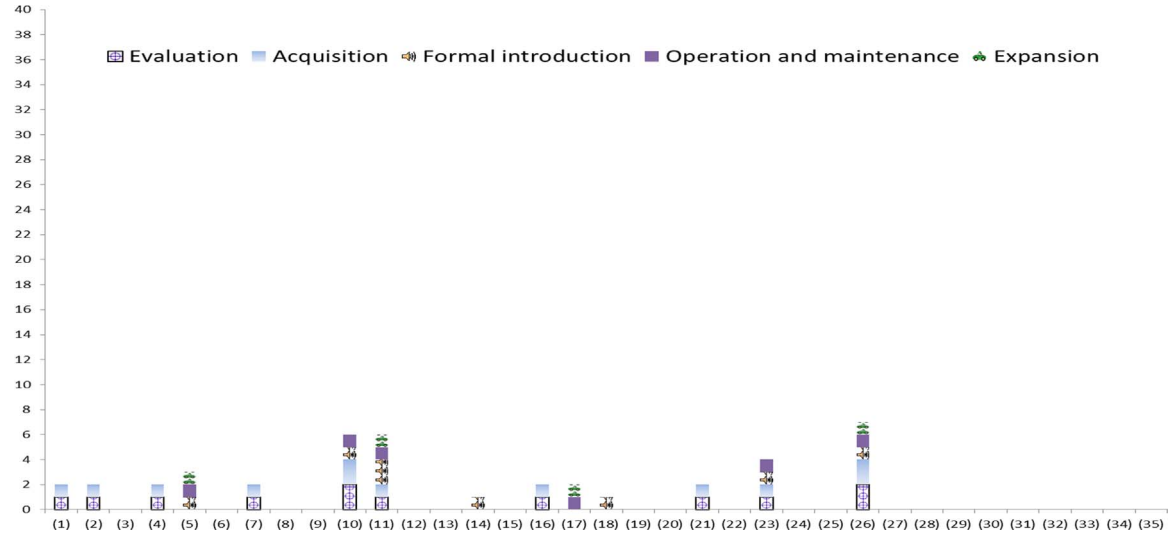

Fig. 3. Frequency of each CSF with RK driver in ERP system life cycle span.

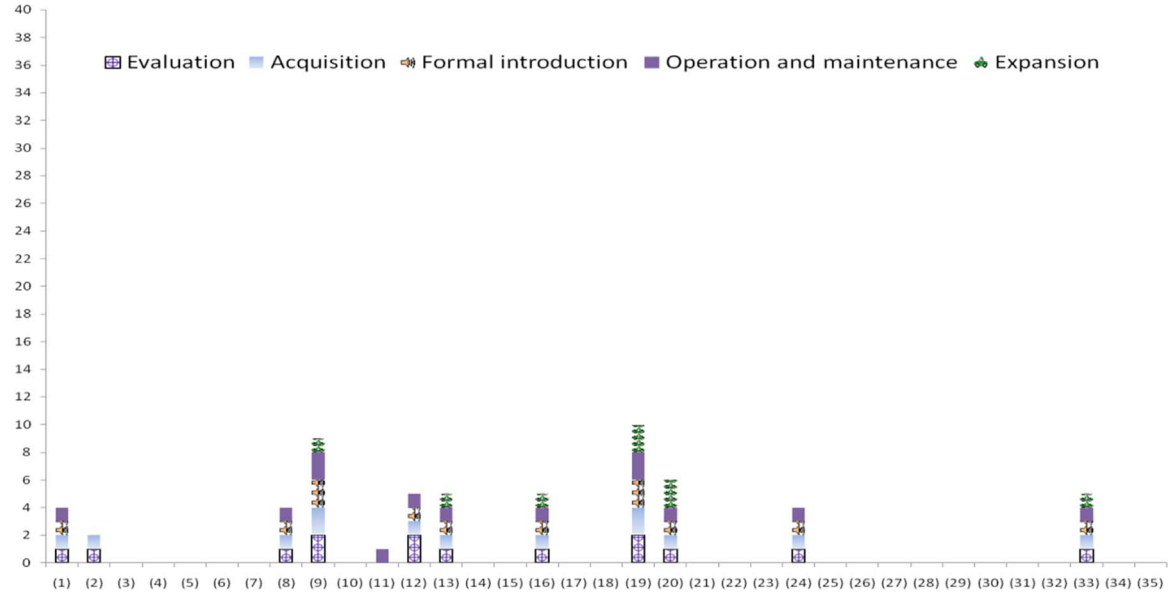

Fig. 4. Frequency of each CSF with RM driver in ERP system life cycle span.

phase. Aloini et al. [2] highlight top 10 risk factors, namely, inadequate selection [1,70], poor skills of project team, low involvement of top management, low involvement of key user, inadequate training and instruction, inadequate BPR, bad managerial conduct, ineffective project management techniques [85], inadequate change management strategies, and ineffective strategic thinking and planning in the ERP life cycle and their impact on projects. A key goal in system implementation is the functional fit of software selection. Misfit of software can cause problems. Increased functional fit will enable a large number of people to play their part in the collective organizational endeavor [70]. Wrong choices could force the company to deal with a misfit between the package and business processes and strategy or could compel the company to undergo major modifications. These solutions are time-consuming, costly, and risky.

The biggest challenge of system integration often involves data [70]. Data analysis and conversion are complex processes because various systems and data formats are involved. Hence, data must be exported and properly reformatted before they are imported into the ERP [55]. A good architecture of ERP system is helpful in defining the seamless acceptance of an ERP system into the organization. By contrast, an ambiguous architecture may store potential crises resulting from the dysfunctional operations of an ERP system [85]. When users perceive their ERP system as a complex business solution, they will accept it slowly, which might result in user resistance. Such outlook will lead to poor user satisfaction and system performance [7].

The selection and assessment of an ERP software require several considerations. These considerations include understanding the organization's exact demands and ensuring the fit of an ERP with the characteristics of organization. Data integration is conducted after acquiring appropriate software. Data integration includes data analysis and conversion, process fit, and user interface fit. This undertaking must allow adequate access across individuals or departments. The

current study suggests that RK mostly considers the first three stages of the system life cycle and only focuses on the information system itself. Only a few studies have considered the reciprocation between information system and the organizational context and most of these involve SMEs.

4.3. Resource management

For the RM driver, Fig. 4 shows that the two most popular CSFs for ERP are ongoing vendor support [CSF (9)] and vendor partnership/tools [CSF (19)] Research sample from 1998 to 2011 considers risk during the ERP life cycle span.

The RM for ITG is concerned with overcoming potential resistance to new initiatives and gaining commitment. Improved employee perceptions of initiatives is directly related to commitment and employee retention, which are critical to achieving successful outcomes (Willson and Pollard, 2010). Somers and Nelson [73] point out an important problem in understanding the key players and activities associated with ERP implementations in determining the phase when the effect of ERP implementation is most prevalent across the stages of IT development. Their results provide guidance to managers on how to utilize limited resources within the activities of key players. Key players include top management support, project team competence, project champion [37], ongoing vendor support [1,37,55], use of the steering committee [77], vendor partnerships/tools [55,70,77], and consultants [55,77]. The RM of ITG that relies on people must understand the implications of relationships and interworking.

ERP vendors could provide rapid implementation technologies and programs that play pivotal roles in the evaluation and acquisition stages [73]. Vendors use accelerators that include business process modeling tools, templates for industry-specific business practices, bundling of server hardware with ERP software, and combined packages of software, services, and support [55,70,73,77]. Vendors are important for transferring knowledge on software use, understanding the business processes within the organization, and recognizing best practices. Positive vendor–customer partnerships are important to successful ERP projects. A good fit between the software vendor and user organization is positively associated with the successful implementation of a packaged software [1,37,73,77]. This partnership is critical during the life cycle of an ERP system.

The careful choices of project manager, personnel training, and a champion supporter are linked to the success of ERP implementation [8]. The success of technological innovations is often linked to the presence of a champion who performs the crucial functions of transformational leadership, facilitation, and marketing of the project to users [73]. Literature highlights the importance of a project champion in new initiatives and in educating business users about IT to improve their capacity [37,73]. Training and development in change management and large IT undertakings should be holistic rather than technical; such a training should focus on trust, relationships, communication, and team building [3]. A good project champion is critical to overcoming resistance against RM of ITG. Investigation into how to manage power and conflict to ensure commitment will help in the development of appropriate policies and structures of RM distributions.

The resource-based view of the firm posits that organizations can develop unique internal capabilities to gain competitive advantage. An ERP system is a capability that provides the infrastructure for managing information and coordinating activities within the firm to develop efficient operations and take advantage of new opportunities. Thus, when a firm embarks on an ERP implementation, other industry players feel the pressure of eliminating their competitor's advantage [7]. Obtaining the potential benefits of an ERP system depends highly on data accuracy. In after-sales organizations, data inaccuracies will have direct effects on sales and may cause operational disruptions [21]. IT resources are an effective moderators of the relationship between ERP success and main contingency factors, such as organizational size, structure, and culture [25]. An IT department with dedicated assets/resources is important in system implementation and continuous business operations to achieve maximum system performance and value for the organization.

An ERP system provides the infrastructure for efficient operations and advantageous competition. The software of an ERP system requires dedicated assets/resources, especially people. The literature review underscores the need for RM. Majority of the studies concentrate on the first three stages of system life cycle and primarily focus on vendors. Hence, only a few studies provide guidance for managers on how to utilize limited resources in post-implementation through top management support, project team competence, project champion, ongoing vendor support, use of the steering committee, vendor partnerships/tools, and consultants.

5. Conclusion

How does an organization minimize the risk of costly ERP failures and ensure that its technology is aligned with the needs of the business? Board members and senior managers are increasingly looking into ITG to obtain the right answers. Existing the literature highlights the importance of leadership and champion respectively in a company and a project, and shows the clear relationship between ERP success and individuals who confidently understand their roles. Several models have been proposed that relate contingency factors to ITG. Hence, literature in the area of "organizational fit" is expanding. A novel contribution of the present study is the importance of ITG drivers in rethinking CSFs for ERP systems from 1998 to 2011. Our results support the need for a holistic perspective on each CSF across all phases of the ERP life cycle. Hence, the current paper, which is based on the system life cycle span and the driver of ITG, provides a systematic perspective for rethinking CSFs as a tool for enforcing and practicing ITG. Suitable ITG frameworks that fit the organizational and historical contexts of a firm can result in improved system performance and delivery of IT values. Communication and collaboration must be encouraged within the organization because these factors drive the core virtuous of ITG during the life cycle of an ERP system.

An ERP system provides the infrastructure for achieving efficient operations and advantageous competitions. ITG can be enforced by controlling the relevance between CSFs for ERP systems and SA, RK, or RM. This study provides practical guidelines, namely, CSFs, for aligning organizational strategies and disposing a firm's resources to achieve success in ERP system implementation and manage risk factors at different phases. CSFs for ERP systems could serve as moderators for disposing the relevant strategies and resources of an organization. Our results show that the need for RM and RK is underestimated. The driver of RM is more inactive than that of RK and SA. Only a few studies provided guidance for managers on how to utilize their limited resources in post-implementation. Rethinking CSFs for ERP system encourages future research to demonstrate passion for achieving high-quality outcomes of ITG. This study acknowledges the failure of CSFs for ERP systems to consider interdependencies between the phases and relationship between ITG drivers and outcomes. These observations should be explored in future research. Researchers can verify causal relationship as interdependencies between the phases from single driver perspective. Future research can explore whether CSFs for ERP systems with ITG drivers positively create impact on ITG outcome (VD and PM).

Appendix A

See Table A1.

Table A1
Articles in the sample research on CSFs in different drivers of ITG facets and phases of the ERP system life cycle.

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

Note: **[1]**, Seddon et al. [70]; **[2]**, Ifinedo, [26]; **[3]**, Ward et al. [80]; **[4]**, Tsai et al. [77]; **[5]**, Ke and Wei [35]; **[6]**, Akkermans and Helden [1]; **[7]**, Liu et al. [42]; **[8]**, Bradley [8]; **[9]**, Grabski and Leech [19]; **[10]**, Bradford and Florin [7]; **[11]**, Ifenedo [25]; **[12]**, King and Burgess [37]; **[13]**, Malhotra and Temponi [43]; **[14]**, Pan et al. [55]; **[15]**, Zhu et al. [85]; **[16]**, Hong and Kim [23]; **[17]**, Somers and Nelson [73]; **[18]**, Law, and Ngai [39]; **[19]**, Sarker and Lee [67]; **[20]**, Aloini et al. [2]; **[21]**, Amoako-Gyampah and Salam [3]; **[22]**, Plant and Willcocks [60]; **[23]**, Nah and Delgado [49]; **[24]**, Grabski et al. [20]; **[25]**, Newman and Zhao [51]; **[26]**, Osei-Bryson et al. [54]; **[27]**, Häkkinen and Hilmola [21]; **[28]**, Staehr [74]; **[29]**, Poba-Nzaou and Raymond [61]; **[30]**, Sedera and Gable [71]; **[31]**, Bernroider [5]; **[32]**, Morton and Hu [48]. .This table uses **[xx]** with bold to refer to the article number.

[a] ALL includes three drivers of ITG.
[b] Represents the CSF discussed from driver of RK.
[c] Represents the CSF discussed from driver of RM.

References

[1] H. Akkermans, K. van Helden, Vicious and virtuous cycles in ERP implementation: a case study of interrelations between critical success factors, Eur. J. Inform. Syst. 11 (2002) 35–46. http://dx.doi.org/10.1057/palgrave.ejis.3000418.
[2] D. Aloini, R. Dulmin, V. Mininno, Risk management in ERP project introduction: review of the literature, Inform. Manag. 44 (6) (2007) 547–567.
[3] K. Amoako-Gyampah, A.F. Salam, An extension of the technology acceptance model in an ERP implementation environment, Inform. Manag. 41 (6) (2004) 731–745.
[4] N.H. Bancroft, H. Seip, A. Sprengel, Implementing SAP R/3, Greenwich: Manning, 1998.
[5] E.W.N. Bernroider, IT governance for enterprise resource planning supported by the DeLone–McLean model of information systems success, Inform. Manag. 45 (5) (2008) 257–269.
[6] V. Botta-Genoulaz, P.A. Millet, B. Grabot, A survey on the recent research literature on ERP systems, Comput. Indus. 56 (6) (2005) 510–522.

[7] M. Bradford, J. Florin, Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems, Int. J. Account. Inform. Syst. 4 (3) (2003) 205–225.
[8] J. Bradley, Management based critical success factors in the implementation of Enterprise Resource Planning systems, Int. J. Account. Inform. Syst. 9 (3) (2008) 175–200.
[9] E. Brynjolfsson, A. Saunders, Wired for Innovation: how Information Technology Is Reshaping the Economy, The MIT Press, Cambridge, MA, 2009.
[10] S. Buckhout, E. Frey, J. Nemec Jr., Making ERP succeed: turning fear into promise, IEEE Eng. Manag. Rev. 19 (1999) 116–123.
[11] C. Bullen, J. Rockart, A Primer on critical success factors, in: C. Bullen, J. Rockart (Eds.), The Rise of Managerial Computing: The Best of the Center for Information System Research, Dow Jones-Irwin, Homewood, Illinois, 1986, pp. 383–423.
[12] S.I. Chang, D.C. Yen, S.M. Huang, P.Q. Hung, An ERP system life cycle-wide management and support framework for small- and medium-sized companies, Commun. Assoc. Inform. Syst. 22 (15) (2008) 275–294.
[13] T.H. Davenport, Putting the enterprise into the enterprise system, Harv.Business Rev. (1998) 121–131.
[14] S. De Haes, W. Van Grembergen, R.S. Debreceny, COBIT 5 and Enterprise Governance of Information Technology: building Blocks and Research Opportunities, J. Inform. Syst. 27 (1) (2013) 307–324. http://dx.doi.org/10.2308/isys-50422.
[15] J. Esteves, J. Pastor.. Towards the unification of critical success factors for ERP implementation, in: Proceedings of the 10th Annual BIT Conference, Manchester, UK, 2000, pp. 60–69.
[16] G.G. Gable, J. Scott, T. Davenport, Cooperative ERP Life cycle Knowledge Management, in: Proceedings of the Ninth Australasian Conference on Information Systems, Sydney, Australia, 1998, pp. 227–240.
[17] Gartner, Develop a Strategic Road Map for Postmodern ERP in 2013 and Beyond, in: A. Drobik, N. Rayner (Eds.), 31 July assume fixed output costs of a default, 2013
[18] C. Gellings, Outsourcings Relationships: The Contract as IT Governance Tool, in: Proceedings of the 40th Hawaii International Conference on System Sciences, Big Island, Hawaii, IEEE. 236c, 2007.
[19] S.V. Grabski, S.A. Leech, Complementary controls and ERP implementation success, Int. J. Account. Inform.Syst. 8 (1) (2007) 17–39.
[20] S.V. Grabski, S.A. Leech, P.J. Schmidt, A Review of ERP Research: a future agenda for accounting information systems, J. Inform. Syst. 25 (1) (2011) 37–78. http://dx.doi.org/10.2308/jis.2011.25.1.37.
[21] L. Häkkinen, O.-P. Hilmola, ERP evaluation during the shakedown phase: lessons from an after-sales division, Inform. Syst. J. 18 (1) (2008) 73–100. http://dx.doi.org/10.1111/j.1365-2575.2007.00261.x.
[22] H. Heier, H.P. Borgman, M.G. Maistry, Examining the Relationship between IT Governance Software and Business Value of IT: Evidence from Four Case Studies, in: Proceedings of the 40th Hawaii International Conference on System Sciences, (p. 234c) Big Island, Hawaii, 3–6 January, 2007. IEEE.
[23] K.-K. Hong, Y.-G. Kim, The critical success factors for ERP implementation: an organizational fit perspective, Inform. Manag. 40 (1) (2002) 25–40.
[24] C.P. Holland, B. Light, A stage maturity model for enterprise resource planning systems use, Datab. Adv. Inform. Syst. 32 (2) (2001) 34–45.
[25] P. Ifenedo, Interactions between organizational size, culture, and structure and some it factors in the context of erp success assessment: an exploratory investigation, J. Comput. Inform. Syst. 47 (4) (2007) 28–44.
[26] P. Ifinedo, Internal IT knowledge and expertise as antecedents of ERP system effectiveness: an empirical investigation, J. Organizat.Comput. Electron. Commerce 21 (1) (2011) 1–23. http://dx.doi.org/10.1080/10919392.2011.540979.
[27] ISACA. Top Business/Technology Issues Survey Results. Retrieved from ⟨http://www.isaca.org/Template.cfm?Section=Home & template=/ContentManagement/ContentDisplay.cfm & ContentID=43978⟩, 2008.
[28] ITGI Board Briefing on IT Governance, 2nd Edition. Retrieve from ⟨http://www.isaca.org/Knowledge-Center/Research/Documents/BoardBriefing/26904_Board_Briefing_final.pdf⟩, 2003.
[29] ITGI, COBIT 4.1: framework, control objectives, management guidelines, maturity models, IT Governance Institute, Rolling Meadows, Illinois, USA, 2007.
[30] ITGI, Unlocking Value: An Executive Primer on the Critical Role of IT Governance. Retrieve from ⟨http://www.isaca.org/Knowledge-Center/Research/Documents/Unlocking-Value-VerPost-12Nov08-Research.pdf⟩, 2008.
[31] F.R. Jacobs, F.C. Weston Jr., Enterprise resource planning (ERP)—A brief history, J. Operat. Manag. 25 (2) (2007) 357–363.
[32] S.M. Jafari, M.R. Osman, R.M. Yusuf, S.H. Tang, ERP systems implementation in Malaysia: the importance of critical success factors, Eng. Technol. 3 (1) (2006) 125–131.
[33] M.L. Kaarst-Brown, S. Kelly, IT Governance and Sarbanes-Oxley: The latest sales pitch or real challenges for the IT function? In R. H. Sprague, Jr. (Ed.), Proceedings of the 38th Hawaii International Conference on System Sciences, (236a), Big Island, IEEE, 2005.
[34] D. Kang, Categorizing post-deployment IT changes: an empirical investigation, J. Database Manag. 18 (2) (2007) 1–24.
[35] W. Ke, K.K. Wei, Organizational culture and leadership in ERP implementation, Decision Supp. Syst. 45 (2) (2008) 208–218.
[36] P. Ketikidis, S.L. Koh, N. Dimitradis, A. Gunsekaran, M. Kehajova, The use of information systems for logistics and supply chain management in south east Europe: current status and future direction, Int. J. Manag. Sci. 36 (4) (2008) 592–599.
[37] S.F. King, T.F. Burgess, Beyond critical success factors: a dynamic model of enterprise system innovation, Int. J. Inform. Manag. 26 (1) (2006) 59–69.
[38] H.C. Lai, S.Y. Hwang, T.P. Liang, S.Y. Hung, H.L. Wu, A survey of journal publications of MIS departments in Taiwan, Acad. Res. Fields Depart. Human. Soc.Sci. 12 (2) (2011) 58–68 [in Chinese].
[39] C.C.H. Law, E.W.T. Ngai, ERP systems adoption: an exploratory study of the organizational factors and impacts of ERP success, Inform. Manag. 44 (4) (2007) 418–432.
[40] Chuck C.H. Law, Charlie C. Chen, Bruce J.P. Wu, 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, Comput. Ind. 61 (3) (2010) 297–308.
[41] W.T. Lin, B.B.M. Shao, The business value of information technology and inputs substitution: the productivity paradox revisited, Decision Support Syst. 42 (2) (2006) 493–507.
[42] L. Liu, Y. Feng, Q. Hu, X. Huang, From transactional user to VIP: how organizational and cognitive factors affect ERP assimilation at individual level, Eur. J. Inform. Syst. 20 (2) (2011) 186–200. http://dx.doi.org/10.1057/ejis.2010.66.
[43] R. Malhotra, C. Temponi, Critical decisions for ERP integration: small business issues, Int. J. Inform. Manag. 30 (1) (2010) 28–37.
[44] M.L. Markus, S. Axline, D. Petrie, C. Tanis, Learning from adopters' experiences with ERP: problems encountered and success achieved, J. Inform. Technol. 15 (4) (2000) 245–265.
[45] M.L. Markus, C. Tanis, The enterprise systems experience – from adoption to success, Claremont Graduate University, California, 1999.
[46] M.L. Markus, C. Tanis, The enterprise system experience - from adoption to success, in: R.W. Zmud (Ed.)Framing the Domains of IT Management: Projecting the Future through the Past, Pinnaflex Educational Resources, Cincinnati, OH, 2000, pp. 173–207.
[47] T.C. McGinnis, Z. Huang, Rethinking ERP success: a new perspective from knowledge management and continuous improvement, Inform. Manag. 44 (7) (2007) 626–634.
[48] N.A. Morton, Q. Hu, Implications of the fit between organizational structure and ERP: a structural contingency theory perspective, Int. J. Inform. Manag. 28 (5) (2008) 391–402.
[49] F.F.-H. Nah, S. Delgado, Critical success factors for enterprise resource planning implementation and upgrade, J. Comput. Inform. Syst. 47 (2006) 99–113 Special issue.
[50] F. Nah, S. Faja, T. Cata, Characteristics of ERP software maintenance: a multiple case study, J. Soft. Mainten. Evol. 13 (6) (2001) 399–414.
[51] M. Newman, Y. Zhao, The process of enterprise resource planning implementation and business process re-engineering: tales from two Chinese small and medium-sized enterprises, Inform. Syst. J. 18 (4) (2008) 405–426. http://dx.doi.org/10.1111/j.1365-2575.2008.00305.x.
[52] E.W.T. Ngai, C.C.H. Law, F.K.T. Wat, Examining the critical success factors in the adoption of enterprise resource planning, Comput. Ind. 59 (6) (2008) 548–564.
[53] A. Noudoostbeni, N.A. Ismail, H.S. Jenatabadi, N.M. Yasin, An effective end-user knowledge concern training method in enterprise resource planning (ERP) based on critical factors (CFs) in Malaysian SMEs, Int. J. Business. Manag. 5 (7) (2010) 63–76.
[54] K.-M. Osei-Bryson, L. Dong, O. Ngwenyama, Exploring managerial factors affecting ERP implementation: an investigation of the Klein-Sorra model using regression splines, Inform. Syst. J. 18 (5) (2008) 499–527. http://dx.doi.org/10.1111/j.1365-2575.2008.00309.x.
[55] G. Pan, R. Hackney, S.L. Pan, Information Systems implementation failure: insights from prism, Int. J. Inform. Manag. 28 (4) (2008) 259–269.
[56] Panorama Consulting Solutions, 2013 ERP REPORT, original report at ⟨http://Panorama-Consulting.com/resource-center/2013-erp-report/⟩, 2013.
[57] A. Parr, G. Shanks, A Model of ERP Project Implementation, J. Inform. Technol. 15 (4) (2000) 289–303.
[58] R. Peterson, Crafting Information Technology Governance, Inform. Syst. Manag. 21 (4) (2004) 7–22.
[59] R. K.Peterson, M. M. Parker, P.M.A. Ribbers, Information Technology Governance Processes under Environmental Dynamism: Investigating Competing Theories of Decision Making and Knowledge Sharing, In Twenty-Proceedings of the third International Conference on Information Systems pp. 563–576, Barcelona, Spain, 15–18 December, 2002.
[60] R. Plant, L. Willcocks, Critical success factors in international erp implementations: a case research approach, J. Comput. Inform. Syst. 47 (3) (2007) 60–70.
[61] P. Poba-Nzaou, L. Raymond, Managing ERP system risk in SMEs: a multiple case study, J. Inform. Technol. 26 (3) (2010) 170–192. http://dx.doi.org/10.1057/jit.2010.34.
[62] P. Rajagopal, An innovation-diffusion view of implementation of enterprise resource planning systems and development of a research model, Inform. Manag. 40 (2) (2002) 87–114.
[63] T.J. Read, Discussion of director responsibility for IT governance, Int. J. Account. Inform. Syst. 5 (2) (2004) 105–107.
[64] Rimini Street, Seven Reasons Why Software Licensees Choose Third-Party Support. Retrieve from: ⟨http://lineastargazer.eu/pdf/4._RSI_-_Third-Party_Support_White_Paper.pdf⟩, 2009.
[65] J.W. Ross, M.R. Vitale, The ERP Revolution: surviving vs. Thriving, Inform. Syst. Front. 2 (2) (2000) 233–241.
[66] J. Ross, M. Vitale, C. Beath, The untapped potential of IT chargeback, MIS Q. 23 (2) (1999) [215-37].
[67] S. Sarker, A.S. Lee, Using a case study to test the role of three key social enablers in ERP implementation, Inform. Manag. 40 (8) (2003) 813–829.
[68] S. Sathish, L. Shan, K. Pan, Using stakeholder theory to analyze knowledge sharing during enterprise systems implementation, in: Proceedings of the 8th Pacific Asia Conference on Information Systems (PACIS '04), Shanghai, China, 2004.

[69] A. Schwarz, R. Hirschheim, An extended platform logic perspective of IT governance: managing perceptions and activities of IT, J. Strat. Inform. Syst. 12 (2) (2003) 129–166.
[70] P.B. Seddon, C. Calvert, S. Yang, A multi-project model of key factors affecting organizational benefits from enterprise systems, MIS Q. 34 (2) (2010) 305–328.
[71] D. Sedera, G.G. Gable, Knowledge management competence for enterprise system success, J. Strat. Inform. Syst. 19 (4) (2010) 296–306.
[72] T.M. Somers, K. Nelson, The impact of critical success factors across the stages of enterprise resource planning implementations. Proceedings of the 34th Hawaii International Conference on Systems Sciences (HICSS-3), Maui, Hawaii (CD-ROM), 2001.
[73] T.M. Somers, K.G. Nelson, A taxonomy of players and activities across the ERP project life cycle, Inform. Manag. *41* (3) (2004) 257–278.
[74] L. Staehr, Understanding the role of managerial agency in achieving business benefits from ERP systems, Inform. Syst. J. 20 (3) (2010) 213–238. http://dx.doi.org/10.1111/j.1365-2575.2008.00316.x.
[75] Standards Australia, AS8015-2005 corporate governance of information and communication technology, 2005.
[76] K. Thomas, A new era of accountability. Financial Times, 2. Retrieve from ⟨http://www.ft.com/cms/s/2/996f0d58-de5a-11d9-92cd-00000e2511c8.html#axzz30Giw0L5A⟩, 2005.
[77] W.-H. Tsai, M.J. Shaw, Y.-W. Fan, J.-Y. Liu, K.-C. Lee, H.-C. Chen, An empirical investigation of the impacts of internal/external facilitators on the project success of ERP: a structural equation model, Decision Supp. Syst. 50 (2) (2011) 480–490.
[78] P. Upadhyay, P.K. Dan, ERP in Indian SME's: a post implementation study of the underlying critical success factors, Int. J. Manag. Innovat. Syst. 1 (2) (2009) E1, 1–10.
[79] T. Wailgum, ERP Investments Still Top the List for Corporate IT Spending," Forrester Research. Retrieve from ⟨http://www.cio.com/article/507663/ERP_Investments_Still_Top_the_List_for_Corporate_IT_Spending⟩, 2009.
[80] J. Ward, C. Hemingway, E. Daniel, A framework for addressing the organizational issues of enterprise systems implementation, J. Strat. Inform. Syst. 14 (2) (2005) 97–119.
[81] P. Webb, C. Pollard, G. Ridley, Attempting to Define IT Governance: Wisdom or Folly? in: Proceedings of the 39th Hawaii International Conference on System Sciences, (p. 194a), Kauai, Hawaii. IEEE, 2006.
[82] P. Weill, J.W. Ross, IT governance—How Top Performers Manage IT Decision Rights for Superior ResultsBoston, Harvard Business School Press, MA, 2004.
[83] C.L. Wilkin, R.H. Chenhall, A review of IT governance: a taxonomy to inform accounting information systems, J. Inform. Syst. 24 (2) (2010) 107–146.
[84] L. Willcocks, N.A. Olson, P. Petherbridg, Making IT count: strategy, delivery, infrastructureComputer weekly professional series, Butterworth-Heinemann, Woburn, MAP. Willson, and C. Pollard, Exploring IT governance in theory and practice in a large multi-national organisation in Australia, *Inform. Syst. Manag.* 26(2), 2009, 98-109., 2002.
[85] Y. Zhu, Y. Li, W. Wang, J. Chen, What leads to post-implementation success of ERP? An empirical study of the Chinese retail industry, Int. J. Inform. Manag. 30 (3) (2010) 265–276.