

Critical Success Factors in Enterprise Resource Planning Systems: Review of the Last Decade

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Organizations perceive ERP as a vital tool for organizational competition as it integrates dispersed organizational systems and enables flawless transactions and production. This review examines studies investigating Critical Success Factors (CSFs) in implementing Enterprise Resource Planning (ERP) systems. Keywords relating to the theme of this study were defined and used to search known Web engines and journal databases for studies on both implementing ERP systems per se and integrating ERP systems with other well-known systems (e.g., SCM, CRM) whose importance to business organizations and academia is acknowledged to work in a complementary fashion. A total of 341 articles were reviewed to address three main goals. This study structures previous research by presenting a comprehensive taxonomy of CSFs in the area of ERP. Second, it maps studies, identified through an exhaustive and comprehensive literature review, to different dimensions and facets of ERP system implementation. Third, it presents studies investigating CSFs in terms of a specific ERP lifecycle phase and across the entire ERP life cycle. This study not only reviews articles in which an ERP system is the sole or primary field of research, but also articles that refer to an integration of ERP systems and other popular systems (e.g., SCM, CRM). Finally it provides a comprehensive bibliography of the articles published during this period that can serve as a guide for future research.

Categories and Subject Descriptors: H.4.2 [Information Systems Applications]: Types of Systems—Logistics

General Terms: Management, Theory, Standardization

Additional Key Words and Phrases: Critical success factors, CSFs, enterprise resource planning, ERP, literature review, information systems

ACM Reference Format:

Shaul, L. and Tauber, D. 2013. Critical success factors in enterprise resource planning systems: Review of the last decade. *ACM Comput. Surv.* 45, 4, Article 55 (August 2013), 39 pages.

DOI: <http://dx.doi.org/10.1145/2501654.2501669>

1. INTRODUCTION

Enterprise system software constitutes a multi-billion dollar industry that produces components to support a variety of business functions [Chellappa and Saraf 2010]. IT investments have grown to be the largest category of capital expenditures in US-based businesses over the past decade [Ranganathan and Brown 2006]. Organizations consider ERP to be a vital tool for organizational excellence because it integrates varied organizational systems and enables flawless transactions and production [Framinan et al. 2004]. Successful implementation of an ERP system can reduce inventory, production, shipping, labor, and IT maintenance costs, and thus lead to greater effectiveness and a better competitive edge in terms of improved strategic initiatives and responsiveness to customers [O’Leary 2000; Sandoe et al. 2001; Bharadwaj et al. 2007]. As a result, ERP

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DOI: <http://dx.doi.org/10.1145/2501654.2501669>

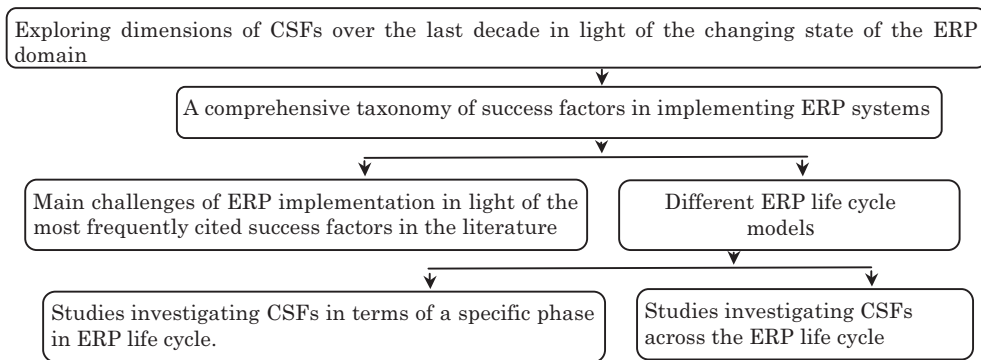


Fig. 1. Themes investigated in the present study.

is perceived as playing a crucial role in today's enterprise management and is becoming the backbone of many organizations [Al-Mashari et al. 2003; Parthasarathy et al. 2007].

Although ERP has been depicted as a panacea in both the literature and in practice, there are many reports of companies that run into costly implementations, suffer fatal difficulties, and must cope with severe maintenance problems along the implementation process [Chang 2004]. Organizations continue to underestimate the complexity of implementing an ERP system throughout its life cycle [Olson and Zhao 2007; Motiwalla and Thompson 2009]. Chang [2004] indicates that: (a) 90% of ERP implementations are delivered late or are over budget, (b) enterprise initiatives show a 67% fail rate in achieving corporate goals and are considered negative or unsuccessful, (c) more than 40% of all large-scale projects fail. Moreover, ERP projects fail due to errors in managing the following dimensions: leadership (42%), organizational and cultural (27%), human and people (23%), technology and other issues (8%) [Waters 2006].

The success factors approach dominates the ERP literature and primarily focuses on identifying, developing, and analyzing CSFs through case studies [Livermore and Ragowsky 2002; Moon 2007]. The ERP implementation literature has extensively examined ways to identify or develop CSFs. Some articles generate a list of CSFs and others analyze data regarding these factors [Moon 2007]. However, several studies have criticized the current literature for providing different sets of CSFs [Ngai et al. 2008]. In addition, a few studies on CSFs for ERP implementation have presented in-depth analyses of subfactors [Nah et al. 2003]. Nevertheless, only a small number of studies have addressed the identification of CSFs and their relevance along the ERP life cycle, unlike most studies that only focus on CSF identification [Esteves and Pastor 2006].

The remainder of this article is divided into five sections and overviews the themes presented in Figure 1. Section 2 explores dimensions of CSFs over the last decade in light of the changing state of the ERP domain. Section 3 presents the research methodology. Section 4 is divided into three subsections to cover three goals in the context of ERP implementation. First, it presents a comprehensive taxonomy of CSFs. Second, it describes the main challenges. Third, it discusses different ERP life-cycle models and studies investigating CSFs across the ERP life cycle as well as in terms of a specific phase. Section 5 pinpoints the limitations of this study and the article concludes with Section 6.

2. OVERVIEW OF PREVIOUS IT AND ERP STUDIES

This article classifies Critical Success Factors (CSFs) and subfactors that play a role in today's ERP implementation and management. Studies of the CSFs affecting an ERP implementation have examined different dimensions [Chiasson and Davidson

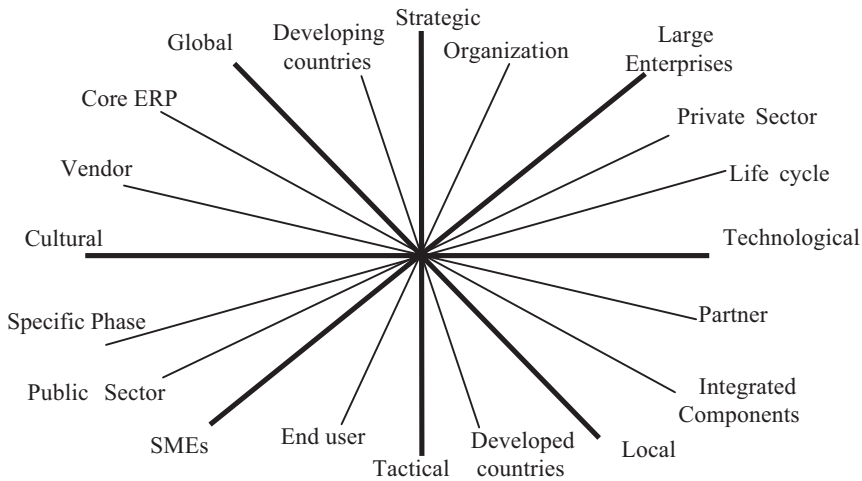


Fig. 2. Critical success factor dimensions.

2005]. Figure 2 summarizes the dimensions on which these CSFs have been explored. The perception of the role of ERP systems has changed throughout the last decade. Table I lists the key research dimensions in the context of the development of the ERP domain to highlight time-dependent insights concerning the role of ERP systems. The decade has been split into four main periods. First, in the late 1990s, the ERP system evolved from a material requirements planning system to cover all inter-organizational activities apart from the business network.

In the early 2000s companies internalized the need for collaborative commerce by electronically streamlining the interactions between customers and suppliers via a shift from a large number of unintegrated information systems to a single integrated backbone. In the mid decade, companies preferred to implement an ERP suite from one vendor that incorporated stand-alone point solutions (that once filled functionality gaps in older ERP releases) to achieve higher levels of integration and improve customer relationships and the supply chain's overall efficiency [Huang et al. 2003]. To support companies' "good enough" integrated component strategies and to enhance the competitive edge delivered by "best of breed" applications, ERP vendors began to either acquire or develop extensions such as CRM and SCM [Jacobson et al. 2007]. Late in the decade, alternative approaches such as hosting, subscription-based pricing, and SaaS (Software as a Service) technology have attracted increasing attention by offering ways to: (1) automatically collect and aggregate large-scale information, (2) enable companies to react quickly to structural changes, (3) deliver manageable or cost-effective applications for smaller plants, etc. In these approaches, core functionality and goals of ERP remain the same as with traditional ERP but the model for consuming the technology is different [Bhardwaj et al. 2010].

2.1. Late 1990s – The Enterprise Era

Technological. ERP had a different technical composition such as a graphical user interface, relational database, client-server architecture, and open system portability [Markus and Tanis 2000].

LEs-SMEs. The ERP market has traditionally been limited to LEs (Large Enterprises) [Liang and Xue 2004]. The main reasons for adopting an ERP system were: Y2K problem, Euro conversion, and integration with other companies of the group.

Table 1. Key Research Dimensions in ERP Development over the Last Decade Divided into Four Main Periods

	Dimensions	Late 1990s	Early 2000s	Mid decade	Late decade
1	Strategic	Business process reengineering (BPR) vs. customization. Strategic factors were related to the early planning phase	Vanilla vs. Big-Bang. Companies preferred a fully integrated ERP system rather than a “best of breed” approach, to have a solution that was “good enough”.	Companies preferred implementing an ERP suite from one vendor that incorporated stand-alone point solutions, hence eliminating the need for integration and upgrading.	Although most companies still follow the single source approach, a significant number of firms employ a strategy of “best of breed” ERP to maintain or create a competitive advantage.
	Tactical	Concerned issues such as client consultation, personnel, monitoring, troubleshooting and acceptance	New best practices concerning the implementation per se.	Changes in management emerged as one of two most widely cited tactical factors.	Tighter project controls and budget adherence have led to decreased payback, cost and duration periods. Yet some companies still suffer from overruns.
2	Technological	Less than 25% of research ERP articles focused on IT issues.	A shift from a large number of unintegrated information systems to a single integrated backbone.	ERP vendors had a different view of customization (than the adopting organizations) who considered customization as an evolving process.	Alternative approaches, such as hosting, subscription-based pricing, and SaaS (Software as a Service) technology have attracted enormous attention.
	Cultural	Cultural factors were very often critical in the implementation phase. Organizational culture was embedded within a national culture and was viewed as a unique factor.	Investigation of conflicts between the standardization imposed by ERP systems and the localization of business practices.	Cultural consequences were associated with best practices, business process reengineering, information access and empowerment.	Firms incorporate an implementation model cohesive with local environment issues (e.g. organizational, cultural, political and economic) and achieve superior business performance.
3	Global	Regional products and manufacturing.	Increasing transparency of the global marketplace due to greater electronic interaction between customers and suppliers	Differences between local and global ERPs were analyzed (such as price, cultural fitness, technical, complexity, functionality, trust, etc).	ERP system features developed by local vendors have become more user- friendly for domestic or local users by incorporating culture-specific factors.
	Local				

Table I. (Continued)

	Dimensions	Late 1990s	Early 2000s	Mid decade	Late decade
4	Core ERP	ERP vendors traditionally offered a single ERP system. ERP systems suffered from limitations in coping with integration challenges dealing with changing requirements.	Integration is a leading investment due to functionality gap and the need to extend and integrate the ERP system to other enterprises or “best of breed” applications.	ERP license revenue remained steady as companies continued their efforts to broadly deploy core applications and then added complementary functionalities in later phases.	More mobile ERP. ERP vendors are working to extend ERP to these devices along with users’ other business applications.
	Integrated ERP				
	Private Sector	ERP system was implemented mostly in the private sector.	Private sector organizations usually had more involvement with ERP vendors than the public-sector organizations.	The public sector represented huge potential areas for new ERP sales, and required a different approach and model.	The ERP concept of a pre-integrated suite from a single-vendor has made headway in non-manufacturing markets (e.g. retail, public sector)
6	Public Sector				
	Large Enterprises (LEs)	Traditionally limited to LEs. SMEs were generally restricted in their ability to implement ERP systems due to resource concern.	ERP adoption curve of LEs was flattening. Focus was shifted toward SMEs. Vendors offered simplified and cheaper versions.	Globalization, centralization and regulatory compliance - key drivers for continued ERP investment among LEs.	CSFs for the implementation of ERP in a SMEs environment may differ substantially from LEs and cannot be extrapolated to SMEs because of the additional focus on environmental factors.
	Small and Medium Enterprises (SMEs)			Continued to outgrow the overall market. Organizations bought new ERP systems to enter into the global market.	
7	Vendors	ERP vendors developed ERP systems internally.	Industry consolidation occurred. Vendors began to go to the market with a broad portfolio of products targeted to specific industries and departmental buyers.	To overcome competitive advantage delivered by “best of breed” apps., ERP vendors began to either acquire or develop add-on functionalities such as CRM and SCM.	ERP vendors continue to acquire products or develop their own functionality that is either comparable to or better than many of the “best of breed” applications.

Table 1. (Continued)

Dimensions	Late 1990s		Early 2000s	Mid decade	Late decade
	Developed Countries	Developing Countries			
8	A wide acceptance of ERP in developed countries in North America and Europe.	Narrow acceptance of ERP.	Most of the ERP software was developed in technically advanced countries, standards were often too high for under-developed or developing countries.	North America lost some of its market share to emerging markets in Asia-Pacific and Latin America. Europe's overall share remained steady. Eastern European countries continued to be low-cost centers for global firms.	National cultures of developing countries impact ERP implementation. Developing country companies depend more on ERP vendors. Developing countries underestimate business process reengineering (BPR).
	ERP life Cycle	Focused primarily on the early planning and implementation phases but neglected post-implementation.	ERP system life cycle involved major iterations of subsequent revisions and re-implementations and went far beyond "normal" system maintenance.	A small number of studies addressed the identification of CSFs and their relevance along the ERP life cycle, unlike most studies that focused on CSF identification	Organizations continue to underestimate the complexity of implementing an ERP system throughout its life cycle.
9	Specific Phase		Stabilization phase was discussed and its scope varied from adequate phase to less characteristic and merged with the implementation.	The upgrade phase attracted incremental attention to keep up with latest trends. The decision was usually not driven by code deterioration or efficiency alone.	Apparently there is still a shortage of research into post implementation issues and the strategies and methods required to address them.

ERP sales to large companies underwent a considerable decline. As a result, more and more ERP vendors valued the potential of Small and Medium Enterprises (SMEs) market [Hung et al. 2004]. However, the complexity of these systems, their massive implementation processes, and associated high costs generally restricted the ability to commit an ERP implementation [Bernroider and Koch 2001; Rao 2000].

Strategy. Starting in the late 1990s, new best practices for ERP software implementation surfaced. It focused on the speed of the process as a whole, to streamline the process with higher success rates [Murray and Coffin 2001].

Global. Holland and Light [1999b] argued that IT factors, in addition to known business and management factors, played a key role in the context of global ERP implementation.

2.2. Early 2000s – Collaborative Commerce Era

Local-Global. The days of regional products and manufacturing were over, regardless of company size, due to increased competition driven by growing consumer power along with the increasing transparency of the global market place [Akkermans et al. 2003]. For many companies, it was essential to shift from a large number of unintegrated information systems to a single integrated backbone. Thus, much of the interaction between customers and suppliers was electronically enabled [Davenport and Brooks 2004].

Core ERP – Integrated Components. Enterprises that rolled out ERP grasped that it did not provide 100% support for business process automation and could not work all by itself [Davenport and Brooks 2004]. Integration was ranked as one of the leading investments for 2003, and well over 80% of US companies budgeted for some type of integration in 2002 and roughly one-third of US companies defined application integration as one of their top three IT investments in 2003 [Caruso 2003].

Vendors. Industry consolidation took place. Vendors saw substantial revenue growth from the acquisition of other software. In addition, the ERP market saw merger and acquisition activity: larger ERP companies took control of smaller ones to gain critical mass and expand customer bases [Arnesen and Thompson 2003].

Strategy. These acquisitions by major vendors enabled them to fill solution gaps, primarily by offering modules that competed with current small but “industry specific” vendors. While these modules did not offer “best of breed” functionality, they were fully integrated and, for many companies, provided a solution that was “good enough” [Brown and Vessey 2003].

Organizational. Parr and Shanks [2000] argued that organizational factors were equally important throughout the life cycle whereas technical factors were more crucial during the early phases. Hong and Kim [2002] analyzed failures and applied an organizational fit perspective to examine the relationship between organizational fit, implementation approaches, and the implementation success of enterprise systems.

SMEs-LEs. The ERP adoption curve of large companies flattened, revealing the difficulties for ERP vendors to penetrate the large company market sector further, while the SME market showed steady growth. To penetrate the SME segment, vendors offered simplified and inexpensive versions of their products [Buonanno et al. 2005]. Several studies conducted a comparative ERP implementation analysis of LEs versus SMEs [Bernroider and Koch 2001; Wu and Wang 2003].

Information technology. Until 2002, less than 25% of research ERP articles focused on IT. These questions emerged in 2003 when 40% of the articles focused on ERP and architecture, design, data models, Web services, enterprise application integration, etc.

[Botta-Genoulaz et al. 2005]. The technical stakes of the ERP concerned integration: this involved hardware, applications, networking, and supply chains and covered more functions and roles including decision making, stakeholders' relationships, standardization, transparency, globalization, etc. [Akkermans et al. 2003; Lim et al. 2005; Botta-Genoulaz et al. 2005].

Developed-Developing countries. While there was wide acceptance of ERP in developed countries such as the USA, Canada, the UK, and Australia, developing countries lagged far behind. North America occupied 66% of the ERP market at that time; Europe had 22%, whereas the whole of Asia was only at 9% [Huang and Palvia 2001]. One frequent claim was that most of the ERP software was developed in technically advanced countries, and the standards were often too high for underdeveloped or developing countries.

Public Sector. ERP implementation in the context of the organizational sector was investigated by Chang et al. [2001] and Gable et al. [2002] who looked at the specific characteristics of the public sector ERP life cycle and provided insights into factors affecting ERP implementation along with the strengths and weaknesses of ERP systems for public sector organizations.

ERP Life cycle. Similar to traditional information systems, ERP systems must be maintained and upgraded. CSFs are much richer when viewed within the context of their importance in each phase of the implementation process [Shaul and Tauber 2011]. However, a limited number of authors focused on ERP maintenance activities to better represent ERP maintenance activities, including ERP enhancement [Botta-Genoulaz et al. 2005].

2.3. Mid Decade – Leveraging the Integration

Core ERP: Integrated Components. ERP license revenue remained steady as companies continued their efforts to broadly deploy core applications and then added complementary functionalities in later phases. The major growth area for most ERP vendors was from add-on functionalities such as CRM, Human Capital Management (HCM), and SCM as revenues grew over 40% in 2006 [Jacobson et al. 2007].

Strategy. As a result of the wide implementation of “good enough” strategies in the past, ERP models tended to differ in terms of entry into specific vertical markets. Implementing an ERP suite from one vendor that incorporated stand-alone point solutions (that once filled functionality gaps in older ERP releases) eliminated the need for integration or upgrading to new releases [Gulledge et al. 2005]. However, “industry specific” vendors were still a threat to major ERP vendors in that they promised “best of breed” functionality [Mabert and Watts 2005].

Vendors. To edge out “best of breed” applications, ERP vendors began to either acquire or develop extensions such as CRM and SCM. ERP vendors that traditionally offered a single, internally developed product line went to market with a broad portfolio of products targeted to specific industry and departmental buyers [Jacobson et al. 2007]. However, few ERP vendors had the internal resources to fully develop these strategic extensions, resulting in a shift in favor of purchasing many of these extensions from a single ERP vendor.

Information technology.

—*Integration.* The balance between integration and “best of breed” functionality started to shift [Cheng 2009]. For the most part, until few years later, the development of SCM or CRM systems was not spearheaded by major vendors but rather

by smaller, more focused software solution providers, usually with extensive familiarity and expertise in specific industries [Davenport and Brooks 2004]. After the main ERP vendors added these capabilities, most organizations preferred to use an ERP suite solution which provided a complete and expensive solution although it meant adopting a small subset rather than integrating “best of breed” applications that might be less expensive [Wieder et al. 2006].

- Customization.* To avoid ERP software modifications which were perceived as slowing down the project, the cause of risky bugs needing to be rewritten in an upgrade, many organizations were committed to a “vanilla” implementation [Al-Mudimigh 2007; Finney and Corbett 2007]. However, ERP vendors had a rather different view of customization than adopting organizations, in that most vendors considered customization to be an evolving process [Luo and Strong 2004].
- Flexibility and Scalability.* According to Mathrani and Viehland [2010], technology-critical success factors included enterprise system flexibility and scalability.

Developed-Developing countries. North America lost some of its market share to emerging markets in Asia-Pacific and Latin America, especially as the spending trends for the midmarket continued on their upward course. In addition, Europe’s overall share remained steady at 39%. Eastern European countries continued to be low-cost centers for global firms, and drew away some of the share from Western Europe countries [Jacobson et al. 2007].

LEs-SMEs. Globalization, centralization, and regulatory compliance were the key drivers for continued ERP investment among LEs. In the SMEs segment, which continued to outgrow the overall market, organizations bought new ERP systems in response to new customer and supplier requirements and the aspiration to participate in the global market [Jacobson et al. 2007].

Culture. Organizational culture is embedded within national culture and it is regarded as a unique factor affecting ERP systems implementation success [Zhang et al. 2005]. It was recognized that human and cultural factors are very often critical in the implementation phase [Botta-Genoulaz et al. 2005]. Studies in this perspective investigated organizations in their societal contexts such as power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity, etc. [Hung et al. 2004].

2.4. Late Decade – Seeking a Better Utilization of IT Infrastructure

Information Technology. Alternative approaches, such as hosting, subscription-based pricing, and SaaS technology, have generated increased attention. In addition, the spread of mobile devices has prompted ERP vendors to extend ERP to them [Bhardwaj et al. 2010].

Tactical. Companies with strained IT budgets have been forced to be more prudent with their software implementation spending. Tighter project controls and budget adherence have led to decreased cost, duration, and payback periods in comparison to earlier years. However, a substantial number of companies still suffer from ERP project overruns because of unrealistic expectations concerning duration and resources allocated [Panorama 2011].

Vendors. ERP vendors continue to acquire products or develop their own functionality that is either comparable to or better than many of the “best of breed” applications, and hence enable companies the opportunity, via single source, to maintain or create a competitive advantage based on unique business processes, rather than adopting the same business processes which would leave no firm with an advantage [Bradley 2008].

Global-Local. Kwahk and Ahn [2010] showed that ERP system features developed by local vendors tend to be more user friendly for domestic or local users by incorporating culture-specific factors into their systems, whereas those developed by global vendors are likely to be less localized than domestic ERP systems due to their orientation toward the global market.

SMEs-LEs. According to Doom et al. [2010] critical success factors for the implementation of ERP in an SME environment may differ substantially from ERP implementations in LEs and cannot be extrapolated to SMEs.

Private – Public sector. The basic ERP concept of a single-vendor, preintegrated suite of packaged business applications has made headway in non-manufacturing markets such as retail, financial services, and the public sector [Panorama 2011].

Previous overviews of ERP systems have presented taxonomies of CSFs based on these research dimensions and have been conducted, for the most part, up to 2002 [Somers and Nelson 2003; Ehie and Madsen 2005; Finney and Corbett 2007; Aloini and Dulmin 2007; Esteves and Bohorquez 2007; Moon 2007; Ngai et al. 2008; Dezdar and Suliman 2009]. By contrast, the comprehensive taxonomy of CSFs presented in this study serves three goals.

- (1) It presents an updated and comprehensive taxonomy of CSFs in implementing ERP systems based on a review of academic studies published over the last decade, 52% of which were published in the last five years (2005–2010).
- (2) It describes the main challenges of ERP implementation in light of the success factors that are the most frequently cited in the ERP literature.
- (3) It describes different ERP lifecycle models and presents studies investigating CSFs across the ERP life cycle and in terms of a specific phase in the ERP life cycle.

3. RESEARCH METHODOLOGY

In order to provide a comprehensive bibliography of the literature on CSFs in the context of ERP system implementation, a search through the ERP literature was conducted in 2009 and 2010. Main IS journals and conferences were scanned for academic activity relating to ERP systems for the period between 1999–2009 and early 2010. Articles were identified, analyzed, and classified based on a computerized search in journals, conference Web sites, and databases, as presented in Table II. Following Botta-Genoulaz et al. [2005] the most recent literature on the subject was explored not only for one specific community but also in complementary fields related to ERP systems such as research in computer science, information systems, sociology, and management.

Four criteria were applied to detect articles. First, the article must have been published in a peer-reviewed, archival journal or conference proceedings. Second, April 2010 was chosen as the cutoff date in order to avoid neverending revisions of the article. Third, the article had to meet at least one of the 52 search criteria listed in Table II (13 cases for the first argument multiplied by 4 cases for the second argument). Fourth, exceptional articles could be selected ad hoc by the authors, based on a manual search of the references in the articles that were initially selected, despite not meeting the search criteria. Finally, the search criteria included the terms “enterprise systems” and “enterprise software” to detect studies in the context of an ERP system not titled or indexed as such.

These studies were screened, before further investigation, to make sure they met one of the following conditions: (1) the ERP system was the sole or primary field of research, (2) the study referred to an integration of an ERP system and other popular systems (e.g., SCM, CRM) whose importance to business organizations and academia is

Table II. Journal, Conference and Database List with Search Criteria

Search criteria-First Argument: Critical success factors, Factors, CSF, Issues, Barriers, Taxonomy, Success, Failure, Implementation, Utilization, Adoption, Deployment, Risks		
Second Argument: ERP, Enterprise resource planning, Enterprise systems, Enterprise software		
Journals	Databases	Conferences
Harvard Business Review	Academic Search Premier	ECIS
Information Systems Research	AIS e-Library	ICIS
Sloan Management Review	ACM Digital Library	ICEIS
MIS Quarterly	Business Source Premier	ACIS
European Journal of Information Systems	Emerald Full-text	AMCIS
Information Systems Research	IEEE Xplore Digital Library	PACIS
Communications of the ACM	InformaWorld	
Decision Sciences	JSTOR	
European Journal of Operational Research	ProQuest	
IEEE Journals	Science Direct	
Information & Management	Springer Link	
Information Systems	Web of Science	
Information Systems Management	Wiley InterScience	
Journal of Management		
Business Process Management		

acknowledged to work in a complementary fashion, (3) the study was based on previous ERP research.

4. RESULTS OF THE LITERATURE REVIEW

This search yielded 341 articles. The full text of each article was reviewed to eliminate those articles that were not actually related to CSFs for the implementation of an ERP. Articles were excluded if they were not empirical studies published in English. To avoid duplication in the case of publication in two or more conference proceedings, only the article with the most detailed findings was included, or the version published by a journal. The authors examined the articles identified through the computerized search in journals, conference Web sites, and databases, as presented in Table II. In addition, the authors manually searched the references in the articles that were initially selected. The complete list of the article sources along with the number of publications appears for each source in Table III. This collection of articles was carefully examined in light of common success factor constructs described in extensively cited studies [Al-Mashari et al. 2003; Holland and Light 1999a; Nah et al. 2001; Somers and Nelson 2004; Umble et al. 2003]. This careful examination yielded 94 CSFs in ERP implementations as listed in Table IV.

The literature postulates several causes for these failures. First, ERP systems are perceived as a single, mandatory platform for all business processes [Amoako-Gyampah and Salam 2004; Xue et al. 2010]. Since ERP involves a large portion of the organization, companies can experience difficulties in convincing employees to commit to the implementation process, who then fail to implement the ERP system in an effective manner [Davenport 2000; Gargeya and Brady 2005; Parthasarathy et al. 2007]. Second, a substantial number of organizations plunge into ERP implementation despite the fact that near-term success and long-term survival is difficult to predict. Third, most leading Enterprise Systems (ES), including ERP, follow basic design rules such as a maximum integration of information flows and standardization, and therefore are less suitable for firms that have decentralized, nonhierarchical structures and nonuniform cultures [Fan et al. 2003]. Fourth, organizations increasingly find they are obligated to accept ERP project outcomes that emerge from compromises between an

Table III. List of Sources of Articles (ordered by number of publications in parentheses- one publication if not indicated)

Type of publication: Journal	Decision Support Systems	Journal of Systems and Software
Business Process Management Journal (15)	Expert Systems with Application	Journal of the Brazilian Computer Society
Information Systems Research (12)	Global Journal of Enterprise Information System	Management Science
Industrial Management & Data Systems (12)	Government Finance Review	MIS Quarterly
Journal of Enterprise Information Management (9)	Human Systems Management	MIS Quarterly Executive
Information & Management (9)	IEEE Engineering Management Review	Omega-International Journal of Management
European Journal of Operational Research (8)	IEEE Software	Production Planning and Control
European Journal of Information Systems (7)	Industrial Engineering Research	Qualitative Market Research: An International
Computers in Industry (6)	Industrial Marketing Management	Sloan Management Review
Int. Journal of Production Economics (5)	Information System Frontiers	Strategic Finance
Information Systems Management (4)	Int. J. of Internet and Enterprise Management	Technovation
Int. Journal of Enterprise Information Systems (4)	Int. J. of Management and Enterprise	The Business Review
Journal of Computer Information Systems (4)	Int. J. of Physical Distribution & Logistics	Type of publication: Conference
Journal of Information Technology (4)	Int. Journal of Engineering and Technology	Americas Conference on Information Systems (9)
Int. J. of Operations & Production Management (4)	Int. Journal of Human-Computer Interaction	Hawaii International Conference on System
Int. J. of Accounting Information Systems (3)	Int. Journal of Technology Marketing	IEEE Conferences (7)
Communications of the AIS (3)	Issues in information systems	Pacific Asia Conference on Information Systems (4)
Int. J. of Business Information Systems (3)	J. of Information Systems and Technology	Australasian Conference on Information Systems (3)
Journal of Strategic Information Systems (3)	J. of Theoretical and Applied Information	Int. Conference on Management and Service Science
Information Technology for Development (2)	Journal Internet Commerce	European Conference on Information Systems (2)
Communications of the ACM (2)	Journal of Business and Management	Int. Conference on Enterprise Information Systems
Int. J. of Manufacturing Technology &	Journal of Computer Science	Int. Conference on Information systems (2)
Int. J. of Information Management (2)	Journal of Computing in Civil Engineering	European and Mediterranean Conference on IS (2)
Enterprise Information Systems (2)	Journal of Database Management	Other conferences (15)
Computers in Human Behavior (2)	Journal of Decision Systems	Books/Chapter in a book (12)
Int. Journal of Project Management (2)	Journal of Enterprise Information Systems	Total number of journal publications
Beyond Computing	Journal of Knowledge Management	Total number of conference
Decision Sciences	Journal of Management in Medicine	Total number of books (or chapters)
		174
		57
		12

Table IV. A Comprehensive Success Factors Categorization for ERP Implementation that Presents the Taxonomy of 94 CSFs Grouped under 15 Constructs along with an Indication of Sources

Implementation strategy	Akkermans and van Helden 2002; Al-Fawaz et al. 2010; Al-Mashari et al. 2003; Al-Mudimigh 2006; Al-Mudimigh et al. 2001; Bhatti 2005; Brown and Vessey 1999; Brown and Vessey 2003; Buckhout et al. 1999; Chuang and Shaw 2005; Clemons 1998; Davenport 2000; Dezdar and Sulaiman 2009; Doom et al. 2010; Dowlatshahi 2005; Ehie and Madsen 2005; Esteves and Pastor 2000; Finney and Corbett 2007; Francoise 2009; Garcia-Sanchez and Perez-Bernal 2007; Gibson et al. 1999; Gunson and de Blasis 2001; Gupta 2000; Ho and Lin 2004; Holland and Light 1999a; Holland and Light 1999b; Hong and Kim 2002; Ifinedo and Nahar 2007; Jafari et al. 2009; Kamhawi 2007; Kansal 2007; Kraemmerand et al. 2003; Lam 2005; Law and Ngai 2007; Lee and Lee 2001; Loh and Koh 2004; Mabert et al. 2003; Mandal and Gunasekaran 2003; Motwani et al. 2005; Nah and Lau 2001; Nah et al. 2001; Nah et al. 2003; O'Leary 2000; Olson and Zhao 2007; Osman et al. 2006; Parr and Shanks et al. 2000; Plant and Willcocks 2007; Rajagopal 2002; Reimers 2003; Remus 2007; Robey et al. 2002; Ross and Vitale 2000; Sarker and Lee 2003; Shanks et al. 2000; Skok and Legge 2002; Soja 2008; Somers and Nelson 2003; Somers and Nelson 2004; Stefanou 1999; Sumner 2000; Trimmer and Wiggins 2002; Tsai et al. 2004; Tsai et al. 2010; Umble et al. 2003; Verville et al. 2005; Welti 1999; Wong et al. 2005; Woo 2007; Wu and Wang 2010; Yusuf et al. 2004; Zhang et al. 2005
Use of consultants	
A thorough decision making process style	
Focused performance measures plan	
Planning the cost of ERP implementation	
Macro implementation perspective	
Alignment between business and IT strategies	
Ensuring fair time to fulfill the implementation	
Business change is first to be considered	
Architecture choice examination	
Open and honest communication	Akkermans and van Helden 2002; Al-Fawaz et al. 2010; Al-Mashari et al. 2003; Al-Mashari et al. 2006; Al-Mudimigh 2007; Al-Mudimigh et al. 2001; Brown and Vessey 1999; Brown and Vessey 2003; Buckhout et al. 1999; Chua and Lim 2009; Chuang and Shaw 2005; Chung et al. 2008; Clemons 1998; Davenport 2000; Dawson and Owens 2008; Dezdar and Sulaiman 2009; Dowlatshahi 2005; Ehie and Madsen 2005; Esteves and Pastor 2000; Falkowski et al. 1998; Francoise 2009; Garcia-Sanchez and Perez-Bernal 2007; Gargeya and Brady 2005; Gunson and de-Blasis 2001; Holland and Light 1999a; Ifinedo and Nahar 2007; Jing and Qiu 2007; Kalling and Selandar 2007; Kansal 2007; King and Burgess 2006; Koh and Koh 2004; Mandal and Gunasekaran 2003; Motwani et al. 2005; Muscatello and Chen 2008; Muscatello et al. 2003; Nah and Delgado 2006; Nah and Lau 2001; Nah et al. 2003; Nah et al. 2007; Nah et al. 2001; Ngai et al. 2008; Nguyen et al. 2008; Noudoostbeni et al. 2009; Olson and Zhao 2007; Parr and Shanks 2000; Parr et al. 1999; Plant and Willcocks 2007; Reimers 2003; Remus 2007; Saini and Nigam 2010; Shanks et al. 2000; Skok and Legge 2002; Soja 2008; Somers and Nelson 2001; Somers and Nelson 2003; Somers and Nelson 2004; Sumner 2000; Taube and Gargeya 2005; Trimmer and Wiggins 2002; Tsai et al. 2004; Umble et al. 2003; Umble et al. 2003; Verville et al. 2005; Wang et al. 2008; Wong et al. 2005; Woo 2007; Yusuf et al. 2004; Zhang et al. 2005
Functional requirements are clearly defined	
Continued focus on organizational resistance	
Implementation approach examination	
Support of top management	
Senior Project champion	
Use of managerial and professional steering committees	
Willingness to become involved	
Developing an understanding of needs, capabilities & IT limitations	
Active involvement of senior project champion	
Resolving political conflicts	Akkermans and van Helden 2002; Al-Fawaz et al. 2010; Al-Mashari et al. 2003; Al-Mashari et al. 2006; Al-Mudimigh 2007; Al-Mudimigh et al. 2001; Brown and Vessey 1999; Brown and Vessey 2003; Buckhout et al. 1999; Chua and Lim 2009; Chuang and Shaw 2005; Chung et al. 2008; Clemons 1998; Davenport 2000; Dawson and Owens 2008; Dezdar and Sulaiman 2009; Dowlatshahi 2005; Ehie and Madsen 2005; Esteves and Pastor 2000; Falkowski et al. 1998; Francoise 2009; Garcia-Sanchez and Perez-Bernal 2007; Gargeya and Brady 2005; Gunson and de-Blasis 2001; Holland and Light 1999a; Ifinedo and Nahar 2007; Jing and Qiu 2007; Kalling and Selandar 2007; Kansal 2007; King and Burgess 2006; Koh and Koh 2004; Mandal and Gunasekaran 2003; Motwani et al. 2005; Muscatello and Chen 2008; Muscatello et al. 2003; Nah and Delgado 2006; Nah and Lau 2001; Nah et al. 2003; Nah et al. 2007; Nah et al. 2001; Ngai et al. 2008; Nguyen et al. 2008; Noudoostbeni et al. 2009; Olson and Zhao 2007; Parr and Shanks 2000; Parr et al. 1999; Plant and Willcocks 2007; Reimers 2003; Remus 2007; Saini and Nigam 2010; Shanks et al. 2000; Skok and Legge 2002; Soja 2008; Somers and Nelson 2001; Somers and Nelson 2003; Somers and Nelson 2004; Sumner 2000; Taube and Gargeya 2005; Trimmer and Wiggins 2002; Tsai et al. 2004; Umble et al. 2003; Umble et al. 2003; Verville et al. 2005; Wang et al. 2008; Wong et al. 2005; Woo 2007; Yusuf et al. 2004; Zhang et al. 2005
Business vision	
Willingness to adopt modern technologies	
Allocating valuable resources	

Table IV. Continued

Enterprise system Level of customization Ensuring system flexibility to changing conditions Ensuring system integration Ensuring system reliability Ensuring system interoperability Ensuring system cross functionality Ensuring system support Suitable considerations of software and hardware	Al-Fawaz et al. 2010; Al-Mashari et al. 2003; Al-Mudimigh 2007; Al-Mudimigh et al. 2001; Bingi et al. 1999; Botta-Genoulaz et al. 2005; Brown and Vessey 1999; Buonanno et al. 2005; Chang et al. 2008; Chung et al. 2008; Davenport 2000; Dawson and Owens 2008; El Amrani et al. 2006; Esteves and Pastor 2000; Francoise 2009; Holland and Light 1999a; Holland and Light 1999b; Hong and Kim 2002; Jafari et al. 2009; Kamhawi 2007; Kansal 2007; Kumar et al. 2003; Lam 2005; Law and Ngai 2007; Lee and Lee 2001; Legare 2002; Loh and Koh 2004; Mandal and Gunasekaran 2003; Mathrani and Viehland 2010; Murray and Coffin 2001; Muscatello and Chen 2008; Nah and Lau 2001; Nah et al. 2001; Ngai et al. 2008; O'Leary 2000; Olson and Zhao 2007; Osman et al. 2006; Parr and Shanks 2000; Parr et al. 1999; Plant and Willcocks 2007; Reimers 2003; Remus 2007; Saini and Nigam 2010; Shanks et al. 2000; Sharif et al. 2005; Soja 2006; Somers and Nelson 2003; Somers and Nelson 2004; Stefanou 2001; Sumner 2002; Sun et al. 2005; Trimmer et al. 2002; Tsai et al. 2010; Wang et al. 2008; Wong et al. 2005; Woo 2007; Yusuf et al. 2004; Zhang et al. 2005			
		Software maintenance Developing a plan for testing interfaces with integrated legacy systems Developing proper troubleshooting tools Working closely with vendors and consultants Developing proper troubleshooting skills and techniques		
			Developing a testing and troubleshooting architecture	
			Data Management Develop a data analysis Plan Data model is compatible with data requirements Data quality control Developing a plan for migrating and cleaning up data	
				Develop a Data conversion Plan
				Develop a Data accuracy Plan

Table IV. Continued

Project Management	Akkermans and van Helden 2002; Al-Fawaz et al. 2010; Allen et al. 2002; Al-Mashari 2003; Al-Mashari et al. 2003; Al-Mashari et al. 2006; Buckhout et al. 1999; Chua and Lim 2009; Chuang and Shaw 2005; Clemons 1998; Davenport 2000; Dawson and Owens 2008; Dezdar and Sulaiman 2009; Doom et al. 2010; Dowlatshahi 2005; Dowlshahi 2005; Esteves and Pastor 2000; Falkowski et al. 1998; Finney and Corbett 2007; Francoise 2009; Gargeya and Brady 2005; Gargeya2005; Gunson and de Blasis 2001; Holland and Light 1999a; Holland and Light 1999b; Ifinedo and Nahar 2007; Jafari et al. 2009; Jing and Qiu 2007; Kalling and Selander 2007; Kamhawi 2007; Kumar et al. 2003; Law and Ngai 2007; Lee and Lee 2001; Legare 2002; Mandal and Gunasekaran 2003; Markus et al. 2000; Mathrani and Viehland 2010; Murray and Coffin 2001; Nah and Delgado 2006; Nah et al. 2001; Nah et al. 2003; Ngai et al. 2008; Noudoostbeni et al. 2009; O'Leary 2000; Osman et al. 2006; Parr et al. 1999; Plant and Willcocks 2007; Reimers 2003; Remus 2007; Saini and Nigam 2010; Shanks et al. 2000; Sharif et al. 2005; Soja 2008; Somers and Nelson 2003; Somers and Nelson 2004; Stefanou 1999; Sumner 2000; Sumner and Bradley 2009; Taube and Gargeya 2005; Trimmer and Wiggins 2002; Tsai et al. 2004; Umble et al. 2003; Verville et al. 2005; Welti 1999; Wong et al. 2005; Woo 2007; Yusuf et al. 2004; Zabjek et al. 2009; Zhang et al. 2005
Strong control over change requests	
Knowledge transfer management	
Management of conflicts	
Management of legacy systems	
Clear and defined project plan	
Planning required upgrades	
Management of expectations	
Management of risks	
Project tracking	
Total quality management approach	
Interdepartmental communication	
Interdepartmental coordination	
Professional training services	
Setting realistic deadlines	
Enterprise system selection process	Akkermans and van-Helden 2002; Al-Fawaz et al. 2010; Al-Mashari et al. 2003; Al-Mudimigh et al. 2001; Al-Mudimigh et al. 2003; Esteves and Pastor 2000; Sanchez and Bernal 2007; Gargeya and Brady 2005; Holland and Light 1999a; Hong and Kim 2002; Jafari et al. 2009; Kamawi 2007; King and Burgess 2006; Lam 2005; Lee and Lee 2001; Motwani et al. 2005; Muscatello and Chen 2008; Nah and Delgado 2006; Osman et al. 2006; Plant and Willcocks 2007; Remus 2007; Sharif et al. 2005; Soja 2008; Somers and Nelson 2003; Somers and Nelson 2004; Taube and Gargeya 2005; Umble et al. 2003; Verville et al. 2005; Wong et al. 2005; Woo 2007; Wu and Wang 2007
Careful and professional package selection process	
Planning the package selection process	
Fit between ERP system and business process	
Change management	Al-Fawaz et al. 2010; Allen et al. 2002; Al-Mashari et al. 2003; Al-Mudimigh 2007; Brown and Vessey 1999; Brown and Vessey 2003; Buckhout et al. 1999; Buonanno et al. 2005; Davenport 2000; Esteves and Pastor 2000; Francoise 2009; Gunson and de Blasis 2001; Hong and Kim 2002; Huang and Palvia 2001; Ifinedo and Nahar 2007; Kalling and Selander 2007; Kamhawi 2007; Legare 2002; Nah et al. 2007; Nah et al. 2001; Ngai et al. 2008; Olson and Zhao 2007; Plant and Willcocks 2007; Remus 2007; Skok and Legge 2002; Soja 2008; Somers and Nelson 2004; Sumner 2000; Trimmer and Wiggins 2002; Tsai et al. 2004; Umble et al. 2003; Verville et al. 2005; Wong et al. 2005; Woo 2007; Yusuf et al. 2004; Zhang et al. 2005
Change management program	
Understanding the political structure	
Understanding the organizational culture	

Table IV. Continued

Project team competence	Team members' knowledge	Al-Fawaz et al. 2010; Al-Mashari et al. 2006; Barker and Frolick 2003; Bingi et al. 1999; Bradley 2008; Brown and Vessey 1999; Brown and Vessey 2003; Chua and Lim 2009; Chuang and Shaw 2005; Davenport 2000; Dawson and Owens 2008; Esteves and Pastor 2000; Falkowski et al. 1998; Finney and Corbett 2007; Gargeya and Brady 2005; Holland and Light 1999a; Ifinedo and Nahar 2007; Jing and Qiu 2007; King and Burgess 2006; Law and Ngai 2007; Legare 2002; Mabert et al. 2003; Mandal and Gunasekaran 2003; Marsh 2000; Motwani et al. 2005; Motwani et al. 2008; Muscatello et al. 2003; Nah et al. 2001; Ngai et al. 2008; Nguyen et al. 2008; Noudoostbeni et al. 2009; O'Leary 2000; Parr et al. 1999; Plant and Willcocks 2007; Saini and Nigam 2010; Sarker and Lee 2003; Shanks et al. 2000; Skok and Legge 2002; Soja 2008; Somers and Nelson 2003; Somers and Nelson 2004; Sumner 2000; Taube and Gargeya 2005; Trimmer et al. 2002; Tsai et al. 2004; Tsai et al. 2010; Umble et al. 2003; Verville et al. 2005; Wang et al. 2008; Willcocks and Stykes 2000; Wong et al. 2005; Woo 2007; Xu et al. 2002; Yang and Seddon 2004; Zhang et al. 2005
	Good relations between project team and users	
	Build team morale and motivation	
	Full time team members	
	Balanced and cross functional project team	
	Staff retention	
	Empowered decision makers	
	Deep understanding of key ERP implementation issues	
	Organizational experience of major change	
	Former major organizational change experience	Allen et al. 2002; Bradley 2008; Davenport 2000; Doom et al. 2010; Gargeya and Brady 2005; Ho and Lin 2004; Mabert et al. 2003; O'Leary 2000; Parthasarathy et al. 2007; Saini and Nigam 2010; Taube and Gargeya 2005; Yusuf et al. 2004
Acceptance control	Monitoring and evaluation of performance metrics	Al-Fawaz et al. 2010; Al-Mashari 2003; Al-Mashari et al. 2003; Al-Mudimigh et al. 2001; Bradley 2008; Dowlatshahi 2005; Falkowski et al. 1998; Francoise 2009; Garcia-Sanchez and Perez-Bernal 2007; Holland and Light 1999a; Kansal 2007; Loh and Koh 2004; Mabert et al. 2003; Murray and Coffin 2001; Nah and Lau 2001; Nah et al. 2003; Nah et al. 2001; Nguyen et al. 2008; Olson and Zhao 2007; Remus 2007; Soja 2008; Tsai et al. 2004; Umble et al. 2003; Welter 1999; Woo 2007; Yusuf et al. 2004
	Monitoring progress against clear milestones	
	User acceptance feedback management	
	Education and training	
	Education and training of technical and support staff	Al-Fawaz et al. 2010; Al-Mashari et al. 2006; Al-Mudimigh et al. 2001; Davenport 2000; Dowlatshahi 2005; Esteves and Pastor 2000; Gupta 2000; Ifinedo and Nahar 2007; Jafari et al. 2009; Jing and Qiu 2007; Kalling and Selander 2007; Kumar et al. 2003; Lee and Lee 2001; Legare 2002; Mabert et al. 2003; Mandal and Gunasekaran 2003; Muscatello et al. 2003; Noudoostbeni et al. 2009; O'Leary 2000; Osman et al. 2006; Plant and Willcocks 2007; Rao 2000; Remus 2007; Robey et al. 2002; Saini and Nigam 2010; Shanks et al. 2000; Soja 2008; Somers and Nelson 2004; Sumner 2000; Sumner and Bradley 2009; Trimmer et al. 2002; Tsai et al. 2004; Umble et al. 2003; Welter 1999; Wong et al. 2005; Woo 2007; Yusuf et al. 2004; Zhang et al. 2005;
	Education and training of end users	
	Education on future business processes	
	Developing a clear education and training plan	

Table IV. Continued

Vendor	Akkermans and van Helden 2002; Al-Fawaz et al. 2010; Amoako-Gyampah 2004; Bingi et al. 1999; Chung et al. 2008; Colmenares 2004; Davenport 2000; El-Sawah et al. 2008; Esteves and Pastor 2006; Gargeya and Brady 2005; Ifinedo2007; Jing and Qiu 2007; Kansal 2007; King and Burgess 2006; Mabert et al. 2003; Nah et al. 2001; Ngai et al. 2008; O'Leary 2000; Plant and Willcocks 2007; Palaniswamy and Frank 2002; Reimers 2003; Skok and Legge 2002; Somers and Nelson 2003; Somers and Nelson 2004; Stefanou 1999; Sumner and Bradley 2009; Taube and Gargeya 2005; Trimmer and Wiggins 2002; Tsai et al. 2004; Tsai et al. 2010; Verville et al. 2005; Wang et al. 2008; Wei and Wang 2004; Yusuf et al. 2004; Zhang et al. 2005
ERP vendor characteristics	
Partnership with vendor	
Vendor support	
Use of vendors' tools	
Keeping suppliers and customers informed	Bradford and Florin 2003; Buonanno et al. 2005; Chan 2008; Davenport 2000; Holland and Light 1999b; Hsiao et al. 2007; Huang and Palvia 2001; Hung et al. 2004; Koh and Saad 2006; Lee and Myers 2004; Mabert et al. 2003; Raymond et al. 2006; Santamaria et al. 2010; Seethamraju and Seethamraju 2008; Shanks et al. 2000; Stafyla and Stefanou 2000; Stefanou 2001; Tsai et al. 2010; Umble et al. 2003; Verville et al. 2002; Wu and Wang 2007; Zhang et al. 2005;
Environment	
Opportunities for growth	
Competition in industry	
External pressure	
Competitors' adoption of ERP	Al-Fawaz et al. 2010; Barker and Frolick 2003; Bhatti 2005; Davenport 2000; Dowlatshahi 2005; Esteves and Pastor 2000; Francoise 2009; Garcia-Sanchez and Perez-Bernal 2007; Gefen 2002; Holland and Light 1999; Holland and Light 1999a; Kansal 2007; Lee and Lee 2001; Olson and Zhao 2007; Plant and Willcocks 2007; Remus 2007; Skok and Legge 2002; Somers and Nelson 2003; Somers and Nelson 2004; Verville et al. 2005; Woo 2007; Yusuf et al. 2004
Uncertainty about environment	
User involvement	
User participation in the overall process approach	
User participation in defining new processes	
User uses the system according to guidance	
Enhance users' trust	
Using ERP to fulfill cross functional areas	

installed consultancy base or software vendor solutions and the local context [Wagner et al. 2004]. Fifth, some legacy systems are not replaced, and new in-house systems continue to be developed despite the fact that companies have adopted ERP solutions because of the risks and time involved in replacing these legacy systems and current processes [Tanriverdi et al. 2007].

4.1. Main Challenges of ERP Implementation

The importance of the planning phase is often disregarded in less successful ERP adoptions. In the planning phase, key business decisions related to the ERP system are made, including business cases, user requirements, usage scenarios, operational requirements, and system requirements. The steps toward preventing and resolving future problems must be taken well before the project phase even begins since in many cases only senior executives can address the preexisting organizational challenges that threaten ERP success [Markus et al. 2000].

The most critical part of the ERP implementation project occurs early in the selection of the software package itself and in the preparation to make this selection [Somers and Nelson 2001]. Authors present several recommendations that focus on building a solid foundation to support and overcome the main upcoming challenges to the ERP implementation [Esteves and Pastor 2000; Finney and Corbett 2007; Holland and Light 1999a; Nah et al. 2001; Parr and Shanks 2000; Somers and Nelson 2001; Stefanou 2001].

Selection process of an ERP system. Companies often suffer poor fit between ERP system and organization. A misfit between the best practice processes implemented within the ERP system and the organization's preimplementation business processes leads to more software process customization, more cycles of reimplementation, greater complexity, increases in resources, and a longer project schedule. To overcome this misfit, companies can establish a framework that takes the primary failures of poor leadership, poor project management, poor data quality, poor training, and users' resistance into consideration. The project team can eventually be equipped with comprehensive and useful information on the current business processes and how information is accessed and flows across divisions or systems since most ERP software vendors make assumptions about management philosophy and business practices.

Thus, buying an enterprise application means much more than purchasing software and involves buying into the software vendor's view of best practices for many of the company's processes. To do so, the company must have detailed requirements specifications before selecting an ERP package [El-Sawah et al. 2008]. Selecting an ERP system is not only about choosing an ERP system but also about choosing a consultation partner and vendor [Skok and Legge 2002]. In addition, ERP managers should be aware of the tension between certain inflexibilities built into enterprise systems and potential flexibilities enabled by the use of enterprise systems. Implementing innovative systems such as ERP systems accrues more capabilities and endowments, and increases the level of managerial flexibility as well as the expected value of potential returns [Fichman 2004].

However, ERP managers should be aware that an ERP evaluation does not only refer to the analysis of the ERP product per se but primarily to the overall implementation perspectives of the organizational, financial, sociological, managerial, and operational issues involved in selecting, purchasing, implementing, operating, maintaining, and enhancing the proposed ERP system with additional applications throughout its life cycle.

Project management. Organizations continue to underestimate the complexity, size and scope of ERP implementation throughout the life cycle [Basu and Kumar 2002; Motiwalla and Thompson 2009]. Occasionally, project managers are not empowered

to make strategic and operational decisions, do not promote detailed project planning, underestimate continuous commitment activities, or fail to acknowledge the importance of actors operating inside and outside the organization's boundaries such as customers, suppliers, and business partners in the value chain. It is essential to set up a full-time project team with well-defined functional divisions and management levels to facilitate active ownership of the project by all stakeholders. In addition, the project team should be empowered to define a clear program and required resources, set realistic milestones, and ensure interdepartmental cooperation. Unrealistic expectations on the part of vendors and the intangible system prior to implementation can lead companies to misinterpret the role of senior management in ERP implementation outcomes. Furthermore, there can also be underestimation of the available funding, human resources, hardware, suppliers, consultants and physical space, etc., needed for successful ERP implementation.

Senior leadership. Top management must be fully committed to the entire process of ERP implementation. A lack of leadership can jeopardize implementation considerably since it negatively influences the roles and activities of other stakeholders [Ngai et al. 2008]. Ettlie et al. [2005] argued, based on social learning theory, that leadership through exemplary action promotes the successful adoption of discontinuous change, especially when the adopting firm's general managers demonstrate cohesive support for a new ERP system. Therefore, it is crucial to appoint a senior project champion (e.g., CEO) to take on the leadership role of the ERP implementation, whose job it is to bring respected and active contributing top management promoters into the system selection decision process rather than relying on the vendor's or consultant's efforts to overcome resistance. Senior management often assumes that performance will increase instantly after the initial implementation, whereas a short-term decline in effectiveness and productivity is the general rule [Yu 2005]. Such consequences can be avoided by open communication with top management, vendors, and consultants through the establishment of senior and professional steering committees, a balanced project team, and a "responsible" definition of success measures.

Data management. The existence of inaccurate, incomplete, inconsistent, inaccessible, or doubtful data can negatively impact any implementation because the ERP is widely deployed throughout the organization. Correcting data errors after system implementation obviously leads to increased operational costs and thus lowers effectiveness and limits the competitive edge in that it can undermine strategic initiatives and responsiveness to customers [Xu et al. 2002]. Thus, identifying data quality requirements is imperative since problems in ERP implementation can arise from a lack of forethought about data quality. A number of preventive steps can be taken. First, plan the architecture of the data model for each module and the way it will be exposed to other modules. Second, consider data analysis decisions, activities, responsibilities, priorities, implemented processes, legacy systems, methods, and test plans. Third, convert data from previous systems by adding and enriching for use in the ERP system. Fourth, deploy supporting tools to control the data quality process by monitoring all dimensions, that is, amount, accuracy, timeliness, completeness, consistency, accessibility, and multiple sources of the same data. This can lead to decisions regarding which data to incorporate.

Training program. All stakeholders must be well-trained to retain knowledge on how the business processes are implemented in the ERP system to fully exploit the system functionalities. Project managers often postpone training activities for executives and users [Al-Mudimigh et al. 2001]. Identifying strategies to reskill the IT workforce and training decision makers is extremely important since an ERP implementation is not

and should not be treated as a turnkey project. Few organizations have the experience in-house to run a large-scale integrated solution such as an ERP implementation. It is essential to acquire external expertise and generate a “common language” since the vendor and consulting firms do not share this responsibility.

User involvement. As a result of these frequently cited failures, companies often encounter user resistance. Very often users are afraid that ERP implementation will change their ease of use, job status, importance, responsibilities, and access to valuable information and eventually job security. Since both the implementation process and the system per se involve many users, functions, and significant processes, users’ resistance must be dealt with as of the planning phase. Companies can cope successfully with user resistance by establishing a change management team and a program made up of top and project management. This involves procedures for constant feedback, achievement monitoring, and rules for reporting responsibility. This makes it possible to assess the project itself and all the stakeholders involved. Another crucial activity is to nominate user delegates with solid knowledge of organizational processes to be in charge of cross-functionality requirements since an ERP implementation redesigns the organization processes, activities, and functional areas not only during the initial implementation but also over time. These user delegates need to be informed that the project activity is high priority, to prevent them from being distracted by other roles and duties. These activities are run by a professional steering committee in which “low-level” stakeholders get a chance to air their views and reduce uncertainties regarding business concerns.

4.2. CSFs Across the ERP Life Cycle

Previous studies have shown that the factors associated with the ERP life cycle make it a multifaceted phenomenon of immense complexity that defies any simple solution and therefore needs a thorough analysis [Chang 2004]. CSFs should be analyzed in each stage of the implementation process [Esteves and Pastor 2006]. Thus, a broad perspective of the ERP system evaluation process throughout the life cycle of ERP systems is needed due to the complexity of ERP software, its intangible nature which evolves over time, and the organizational, technological, and behavioral impact of an ERP [Stefanou 2001]. In addition, some factors are temporally bounded in that they are only significant in certain ERP implementation phases [Somers and Nelson 2001]. Generic IS life cycle models should fit the context of the ERP system’s project life cycle. However, the strength of generic life cycles can become their weakness.

The ERP life cycle is assumed different from the software life cycle since the ERP package involves configuring and adapting the generic functionality to fit organizational structures and processes developed by a known vendor. Moreover, it is customized by the client rather than by programming and creating new software functionalities developed by the client for internal use [Brehm and Markus 2000]. Unlike the traditional view of operational information systems that describes a system life cycle in terms of development, implementation, and maintenance, an ERP system life cycle involves major iterations of subsequent revisions and reimplementations that follow the initial implementation and go far beyond what would normally be considered system maintenance [Chang 2004]. In general, none of the authors listed here depicted the ERP implementation phases in terms of three fundamental phases. Different ERP life-cycle models are presented in Table V.

Instead, the ERP life cycle covers four fundamental phases which are frequently cited in the literature: planning, implementation, stabilization of the ERP system into normal operation, and enhancement, in which the business process is continuously improved and additional user skills are delivered [Markus and Tanis 2000]. Three

Table V. ERP Life Cycle Models (presented in alphabetical order by Authors in Article column)

Articles	Stages in life cycle									
	Setting up	Implementation	Evaluation				Evolution			
Al Mashari et al. [2003]	Selection	Deployment and Integration	Stabilization	Stabilization	Progression		Use & Maintenance	Progression	Evolution	
Berchet and Habchi [2005]	Consideration	Evaluation	Implementation	Stabilization	Use & Maintenance		Knowledge	Evolution	Up and running	
Bernroider and Leseure [2005]	Planning	Design and build	Testing	Implementation	Evolution		Retirement phase			
Chang [2004]	Adoption decision	Acquisition	Realization	Implementation	Go on Live & Support					
Esteves and Pastor [2001]	Preparation	Blueprint	Stabilization	Stabilization	Ascending					
Esteves and Pastor [2006]	Programming	Executive	Go live	Stabilize	Synthesize					
Guang-hui et al. [2006]	Planning	Build	Package Selection	Pre Implementation	Implementation					
Hawking et al. [2004]	Feasibility	Planning	Implementation	Implementation	Maintenance					
Ibrahim et al. [2008]	Preparation,	Implementation								
Loh and Koh [2004]	Chartering	Project	Shakedown	Stabilization	Onward and upward					
Markus and Tanis [2000]	Planning	Implementation	Backlog	New module	Major upgrade					
Motiwalla and Thompson [2009]	Pre-implementation	Implementation	Post implementation and evaluation							
Motwani et al. [2005]	Decision for ERP	ERP Selection	Design of ERP	Implementation	After going alive					
O'Leary [2000]	Planning	Project	Enhancement	Implementation	Training					
Parr and Shanks [2000]	Initiation	Adoption	Acceptance	Routinization	Infusion					
Rajagopal [2002]	Design	Implementation	Continuous improvement	Improvement	Transformation					
Ross and Vitale [2000]	Planning	Implementation	Stabilizing	Improvement						
Shanks et al. [2000]	Initiation	Adoption	Acceptance	Routinization	Infusion					
Somers and Nelson [2001]	Business vision	ERP selection	Implementation	Operation, maintenance and evolution						
Stefanou [2001]	Planning	Analysis	Design	Implementation	Maintenance					
Summer [2000]										

Colored cells represent a fundamental phase based on the Shanks et al. [2000] definition of ERP lifecycle model: Green ("Planning"), Light Blue ("Implementation"), Orange ("Stabilizing"), Dark Blue ("Enhancement"), Orange ("Modifications").

subphases of enhancement termed backlog, new module, and major upgrade were further defined; it was pointed out that these subphases are unique as regards the postimplementation periods and their activities [Motiwalla and Thompson 2009]. Although they are sometimes viewed as similar to those in the initial implementation period, they still are carried out in the different reality of the current operating system. Specifically, the new module phase considers the major additional capabilities that are integrated into the ERP when the ERP system has already become the backbone of the organization and can change and extend organizational boundaries, leading to significant benefits such as business process improvements, customer responsiveness, and strategic decision making [Bharadwaj et al. 2007]. The major upgrade phase typically requires a considerable amount of resources, both financial and human, and a need to keep pace with ERP vendor upgrades to guarantee vendor support for the system by providing upgrades to “fix” outstanding “bugs,” current best practices, or design weaknesses [Agerfalk et al. 2009].

Although ERP systems offer broad functionalities to support all the core functions of an organization, many expected benefits of ERP do not materialize for a variety of reasons such as environmental changes and users’ increased requirements during utilization because of positive perceptions of their legacy and in-house developed systems [Gargeya and Brady 2005]. Therefore, there is still a need to continuously adapt and enhance an ERP after its first implementation to resolve users’ dissatisfactions regarding expectations and the requirement backlog given the gap between actual functionality and benefits promised by the ERP [Motiwalla and Thompson 2009].

Studies conducted on CSFs for ERP implementations and dimensions discussed in them are presented in Table A-I in the Appendix.

An examination of CSFs across the ERP life cycle is essential for several reasons. First, it differs from attempting to define CSFs for each phase of the implementation life cycle [Esteves and Pastor 2006]. Second, in terms of effective project monitoring, it identifies, anticipates, and allocates time and resources across those factors that require attention. Third, it provides an understanding of the factors, their varying meanings, and importance across the entire ERP implementation life cycle, guiding all parties in the entire implementation process [Somers and Nelson 2001]. Fourth, such an examination can provide a better grasp of how to make sure the ERP implementation avoids failure [Guang-Hui et al. 2006].

In order to determine which CSFs are necessary within each phase, a project phase model was developed. Two case studies dealing with instances of unsuccessful and successful ERP implementation within the same organization were reported and analyzed based on this model [Parr and Shanks 2000]. Several studies have addressed both the identification of CSFs and their relevance over the entire life cycle of ERP system implementation as presented in Table VI.

CSFs analysis is also crucial in the context of postimplementation as a company may go through several processes. First, the company can experience a three- to six-month productivity decline. It can overcome this by redefining jobs, establishing new procedures, fine-tuning ERP software, and managing the new streams of information created by the ERP system. Second, it can become involved in skills development, structural changes, process integration, and add-on technologies that expand ERP functionalities [Nicolau 2004]. Some researchers have investigated CSFs and their relevance to a specific ERP lifecycle phase. CSFs for ERP implementations were analyzed in terms of the selection and purchasing process of an ERP system [Stefanou 2001; Brown et al. 2000]. In addition, research on CSFs in ERP system implementation has revealed some of the complexities that can affect planning and implementation, the two major stages in the ERP life cycle [Mandal and Gunasekaran 2003]. Moreover, critical issues and factors were analyzed not only during the initial phases of implementation, but also

Table VI. Studies of CSFs across the Life Cycle (in alphabetical order of "Source" column)

Source	Study	Phases discussed	
Accelerated SAP implementation methodology, 1996	[Esteves and Pastor 2006]	1. Project planning 2. Business blueprint	3. Realization 4. Final preparation 5. Go Live
[Abdinnour-Helm et al. 2003]	[Fulla 2007]	1. Pre adoption 2. Adoption 3. Pre-implementation	4. Pilot study 5. Implementation 6. Post implementation
[Ahituv et al. 2002]	[Ahituv et al. 2002]	1. Selection 2. Parallel definition	3. Development and implementation 4. Operation
[Akkermans and van Helden 2002]	[Akkermans and van Helden 2002]	1. ERP vendor Selection 2. Implementation	3. Going alive 4. Operation 5. Improvements
[Al-Mashari et al. 2003]	[Al-Mashari et al. 2003]	1. Setting-up 2. implementation, revisions and	re-implementations 3. Evaluation
[Chang et al. 2001]	[Chang et al. 2001]	1. Initial implementation	2. Subsequent 3. Maintenance
[Cooper and Zmud 1990]	[Somers and Nelson 2001] [Somers and Nelson 2004]	1. Initiation 2. Adoption 3. Adaptation	4. Acceptance 5. Routinization 6. Infusion
[Guang-Hui et al. 2006]	[Guang-Hui et al. 2006]	1. Programming 2. Executive	3. Stabilization 4. Ascending
[Loh and Koh 2004]	[Loh and Koh 2004]	1. Preparation, analysis and design.	2. Implementation. 3. Maintenance
[Mandal and Gunasekarn 2003]	[Mandal and Gunasekaran 2003]	1. Pre-implementation 2. Implementation	3. Post-implementation
[Markus and Tanis 2000]	[El Amrani et al. 2006] [Kumar et al. 2003] [Markus et al. 2000] [Nah et al. 2001] [Nah and Delgado 2006] [Wong et al. 2005]	1. Chartering 2. Project	3. Shakedown 4. Onward and Upward
[Motiwalla and Thompson 2009]	[Shaul and Tauber 2011]	1. Planning 2. Implementation 3. Stabilization	4. Backlog 5. New module 6. Major upgrade
[Parr and Shanks 2000]	[Parr and Shanks 2000]	1. Planning 2. Setup 3. Re-engineering 4. Design	5. Configuration 6. Testing and installation 7. Enhancements
[Plant and Willcocks 2007]	[Plant and Willcocks 2007]	1. Pre-implementation	2. Post- implementation
[Shanks et al. 2000]	[Shanks et al. 2000]	1. Planning 2. Implementation	3. Stabilization 4. Improvement
[Stefanou 2001]	[Stefanou 2001]	1. Business vision 2. Selection 3. Implementation	4. Operation, maintenance and Evolution
[Tsai et al. 2004]	[Tsai et al. 2004]	1. Pre-implementation	2. Post-implementation
[Ward et al. 2005]	[Ward et al. 2005]	1. Project	2. Service (support)
[Yusuf et al. 2004]	[Yusuf et al. 2004]	1. Strategy and direction 2. Planning	3. Implementation 4. Waves

for the successful upgrade of packaged ERP [El-Amrani et al. 2006]. Studies investigating CSFs for a specific ERP lifecycle phase are presented in Table VII. Although the examination was detailed, the importance of the CSFs across the life cycle varied considerably when comparing the overall importance of CSFs for the entire ERP life cycle [Esteves and Pastor 2006].

Table VII. Studies Investigating CSFs in Terms of a Specific ERP Life Cycle Phase

Study	Phase	Short Definition
Dawson and Owens [2008]	Chartering	"Ideas to dollars" – Decisions defining the business case and solution constraints.
Gunson and de-Blasis [2001]	Planning	The outset of the project implementation with a transformation toward new business paradigms.
Al-Mashari et al. [2008]	Selection	Setting vision and direction for the business, harnessing employees' energy and creativity and implementing modern concepts
Livermore and Ragowsky [2002]	Selection (mainly)	A detailed examination and definition of business needs, company capabilities, constraints and modules of the core system to support critical business practices and partners.
Olson and Zhao [2007]	Upgrade	To take advantage of new technologies and business strategies to ensure that the organization keeps up with the latest business development trends. The decision is usually not driven by code deterioration or anticipated efficiency alone.
Verville et al. [2005]	Acquisition	Acquisition team operates information search, screening and evaluation of technologies and vendors, pre-selection, final plan and negotiation.
Stefanou [2000]	Selection	Selection of the specific modules of the core system that support critical business practices and any additional applications the enterprise may need in view of requirements analysis.

5. LIMITATIONS

This comprehensive framework of CSFs is based on the literature in ERP implementation which has had enormous impact on companies in developed countries. It also draws on the smaller but growing number of studies on companies in developing countries. The first limitation is thus its greater emphasis on ERP in Western settings. Second, it is clear that businesses can no longer effectively compete in isolation from their suppliers and customers, and are beginning to improve their shared business processes across trading communities [Stefanou et al. 2003]. As a result, companies seek to better integrate their enterprise-centric ERP with customer-oriented solutions such as SCM and CRM [Sharif et al. 2005]. However, it is difficult to state what precisely constitutes use and the minimal number of ERP modules employed before an organization can truly be said to be using an integrated ERP system [Palmer and Markus 2000]. The study presented here did not include the literature on modules such as CRM and SCM, which have developed considerably in recent years. However, King and Burgess [2008] found similarities between ERP and CRM implementations and between their respective CSFs as they both are large-scale integration technologies, and often are packages supplied by large software vendors.

Third, the majority of studies in which the ERP vendor was mentioned focus on SAP and Oracle systems although there are several other ERP systems on the market. Gargeya and Brady [2005], based on earlier studies, indicated that SAP was recognized as the leader with more than 50% of the market. However, according to an independent research report by the Panorama Consulting group [2011] each of the top three vendors (i.e., SAP, Oracle, and Microsoft Dynamics in some segments) showed a drop in market share. Moreover, Tier II and Tier III vendors continue to expand their reach into all market segments and comprise a substantial portion of overall activity. Although SAP continues to lead with 24% of the market share, its share represents a drop from 2010 when it had 31% of the market. Today, Oracle is at 18% whereas in 2010 it was at 25%. Microsoft Dynamics' share has decreased from 15% to 11%. Tier II implementations on the whole command 11% of the market whereas Tier III/others make up 36%. Thus, the final limitation concerns the absence of generalization of the findings to other ERP systems.

6. CONCLUSION

As ERP implementations are considered to be one of the most complicated COTS projects, this study can serve as a comprehensive up-to-date bibliography to assist both researchers and practitioners by identifying related publications, providing a comprehensive taxonomy of CSFs in the area of ERP, as well as by presenting research investigating CSFs across the ERP life cycle. Previous overviews of ERP systems have presented taxonomies of success factors based on research conducted, for the most part, up to 2002 [Somers and Nelson 2003; Ehie and Madsen 2005; Finney and Corbett 2007; Aloini and Dulmin 2007; Esteves and Bohorquez 2007; Moon 2007; Ngai et al. 2008; Dezdar and Suliman 2009]. By contrast, the comprehensive taxonomy of success factors presented in the present study is based on a review of academic studies published over the last dozen years (1998–2010), 52% of which were published in the last five years (2005–2010). Publications identified in this article originate from quite a large number of sources. ERP studies still tend to focus on the implementation phase of the ERP life cycle. However, the other phases are starting to attract interest, especially the operation and improvement phases. Until recently, few studies referred to the environmental factors that influence an organization's decision to implement an ERP system. The majority have centered on SAP and Oracle systems despite the existence of many ERP vendors on the market.

Huang et al. [2009] showed that business processes, process efficiency, and profitability tend to increase in the fourth or fifth years, and therefore the benefits of ERP are only likely to be seen in the long term. Few SMEs have the resources or willpower to adequately address every CSF as they should. Shaul and Tauber [2011] showed that SMEs, unlike LEs, face much greater constraints in terms of resources that can be committed to all stages of information gathering in order to reduce uncertainty, although the complexity and amount of IT functionality and integration requirements are often similar. As a result, SMEs are forced to make implementation compromises according to resource constraints, which increases the risks inherent to the implementation process [Sun et al. 2005]. Thus, the present article addresses the factors in all dimensions to deliver a more qualitative foundation to assist practitioners in assessing a large number of potential problems that may arise in both initial implementation and future deliveries.

7. FUTURE RESEARCH

Several less studied dimensions deserve greater attention. First, a further more detailed examination of CSFs across the ERP lifecycle phases could provide a better understanding of both the success factors and the ERP life cycle. Postimplementation activities such as the operation, enhancement, upgrading, and maintenance of the software are also important in the life cycle of an ERP system to maximize the organizational benefits of the system. This type of integrated research can help analyze the different outcomes and importance of CSFs across the ERP life cycle, and contribute to designing a better implementation program for the entire ERP life cycle to ensure higher rates of success in both the first and subsequent implementations. Second, most of the identified CSFs are nonindustry specific. Research on whether the identified CSFs vary across industry sectors is needed. Third, more indepth research on ERP implementation is needed to examine CSFs as they apply to less studied perspectives such as SMEs, key stakeholders, and exogenous and endogenous features. Fourth, there is a need to enrich this framework based on literature on modules such as CRM and SCM. Lastly, more effort needs to be made to deliver a better generalization of findings to other ERP vendors than SAP and Oracle.

APPENDIX

Table A-1. Studies Conducted on CSFs in ERP Implementation along with Dimensions Discussed

Author	Dimensions discussed
Ahituv et al. 2002	Strategic, Tactical, Technological, End User, Organizational
Akkermans and van Helden 2002	Strategic, Tactical, Organizational, Managerial
Akkermans et al. 2003	Technological, Operational, Global
Al-Fawaz et al. 2008	Strategic, Tactical, End User
Al-Fawaz et al. 2010	Strategic, Tactical, Organizational, Managerial, Technological, Cultural
Allen et al. 2002	Strategic, Tactical, Organizational, Cultural, Public
Al-Mashari 2001	Organizational, Managerial, Strategic
Al-Mashari et al. 2003	Strategic, Tactical, Managerial, Operational, Technological
Al-Mashari et al. 2006	Developing countries, SMEs, Strategic, Tactical
Al-Mudimigh 2007	Strategic, Tactical, Organizational
Al-Mudimigh et al. 2001	Strategic, Tactical, Operational
Aloini and Dulmin 2007	Strategic, Tactical, Technological, Managerial, Organizational, End user
Amoako-Gyampah 2004	End User, Tactical, Managerial, Vendor
Barker and Frolik 2003	End User, Managerial
Beheshti and Beheshti 2010	Organizational, Tactical
Bingi et al. 1999	Strategic, Tactical, Technological, Managerial
Bhatti 2005	Tactical, Managerial, End User
Botta-Genoulaz et al. 2005	Technological, Cultural, Managerial
Bose et al. 2008	Technological, Managerial, Organizational
Bradford and Florin 2003	Technological, Organizational, Exogenous
Bradley 2008	Strategic, Tactical, Managerial
Brown and Vessey 1999	Strategic, Tactical, Organizational, Global, Cultural
Brown and Vessey 2003	Strategic, Organizational
Buckhout et al. 1999	Strategic, Organizational, Cultural
Buonanno et al. 2005	Operational, Technological, Exogenous, SMEs, Ls
Chan and Sin 2010	Technological
Chan 2008	Exogenous, Strategic, Tactical, Organizational, Managerial
Chang et al. 2008	Organizational, End User, Technological, Cultural
Chang 2004	Operational, Technological, Organizational
Cheng 2009	Operational, Technological, Exogenous
Chang et al. 2001	Public sector, Managerial
Chua and Lim 2009	Strategic, End user
Chuang and Shaw 2005	Strategic, Tactical, Organizational, Managerial, Technological
Chung et al. 2008	Technological, End user, Operational
Clemons 1998	Strategic, Global
Colmenares 2004	National, Managerial, Technological
Constantinos 1999	Organizational, Technological
Davenport and Brooks 2004	Technological, Strategic
Dawson and Owens 2008	Strategic, Tactical
Dezdar and Sulaiman 2009	Organizational, Managerial, Technological
Doom et al. 2010	Strategic, Organizational, Cultural, Managerial
Dowlatshahi 2005	Strategic
Ehie and Madsen 2005	Strategic, Tactical, Managerial
El Amrani et al. 2006	Operational, Technological
El Sawah et al. 2008	Strategic, Managerial, Cultural, End user, Technological, Vendor
Esteves and Pastor 2000	Strategic, Tactical, Organizational, Technological

Table A-1. Continued

Esteves and Pastor 2006	Strategic, Tactical, Organizational, Technological, Vendor
Falkowski et al. 1998	Strategic, Tactical, Organizational, Cultural
Finney and Corbett 2007	Strategic, Tactical
Frank 2004	Technological
Francoise 2009	Strategic, Organizational, Technological, Cultural
Fulford and Love 2004	Technological, Exogenous, End user, Managerial
Fulla 2007	Cultural, Organizational, Strategic, Tactical, Managerial
Gable et al. 2002	Public Sector, Strategic, Tactical, Managerial, Organizational
Garcia-Sanchez and Perez-Bernal 2007	Strategic, Tactical, Organizational, Managerial, SMEs, Ls
Gargeya and Brady 2005	Organizational, Cultural, Vendor
Gibson et al. 1999	Strategic, Managerial, Operational
Grant 2003	Strategic, Global
Guang-Hui et al. 2006	Strategic, Tactical, Managerial, Technological, National
Gulledge 2006	Technological
Gunson and de-Blasis 2001	Strategic, Managerial
He and Brown 2005	National, Strategic, Technological
Ho and Lin 2004	Strategic, Tactical, Organizational, Cultural
Holland and Light 1999a	Strategic, Tactical
Holland and Light 1999b	Strategic, Global, Operational, Technological
Hong and Kim 2002	Organizational, Strategic, Technological
Hsiao et al. 2007	Strategic, Managerial, Exogenous, Organizational, Operational
Huang and Palvia 2001	Technological, Cultural, Exogenous, Developed and Developing
Huang et al. 2004	Organizational, End user, Managerial, Technological
Huin 2004	Organizational, Operational
Hung et al. 2004	Managerial, Technological, Exogenous, SMEs, National
Hvolby and Trienekens 2010	Technological
Ifinedo and Nahar 2007	Organizational, Technological, Cultural
Jafari et al. 2009	Strategic, Tactical, Technological, Managerial
Jarrar et al. 2000	Strategic, Organizational, Operational, Technological
Jing and Qiu 2007	Strategic, Organizational, Managerial
Kalling and Selander 2007	Organizational, Cultural
Kamhawi 2007	Managerial, Organizational, Strategic
Kansal 2007	Strategic, Tactical, Organizational, End user, Managerial
Kim et al. 2005	LEs., Operational, Managerial, Technological, Cultural
King and Burgess 2006	Organizational, Strategic, Managerial
Koh and Sadd 2006	Exogenous, SMEs
Koh et al. 2006	Strategic, Managerial
Kraemmerand et al. 2003	Strategic, Tactical, Organizational, End User
Kumar et al. 2003	Managerial, Strategic, Tactical, Organizational, Technological
Lam 2005	Strategic, Managerial
Law and Ngai 2007	Organizational, Strategic, Managerial
Lee and Lee 2001	Tactical, Public sector
Lee and Myers 2004	SMEs, Ls, Strategic, Organizational, Global
Legare 2002	Organizational
Li and Zhang 2009	Technological, Operational
Liew 2008	Strategic, Tactical, Technological
Liu and Seddon 2009	Strategic, Organizational, Operational, Managerial
Livermore and Ragowsky 2002	Cultural, National
Loh and Koh 2004	Strategic, Managerial, Technological, Cultural, SMEs

Table A-1. Continued

Mabert et al. 2003	Strategic, Tactical, Managerial
Mandal and Gunasekaran 2003	Strategic, Tactical
Markus et al. 2000	Strategic, Tactical
Marsh 2000	Strategic, Managerial, Cultural, SMEs
Mathrani and Viehland 2010	Technological, Organizational, Managerial
Motwani et al. 2008	Strategic, Cultural, Technological, Managerial, Organizational
Motwani et al. 2005	Strategic, Tactical, Cultural, Technological, Organizational
Murray and Coffin 2001	Strategic, Tactical, Operational, End user
Murphy 2007	Strategic, Tactical, Technological, Managerial, Organizational
Muscatello et al. 2003	SMEs, National, Strategic, Managerial, Operational
Nah et al. 2007	Strategic, Tactical, Technological, Cultural, Organizational, Managerial
Nah et al. 2003	Strategic, Tactical, Technological, Managerial, Organizational
Nah et al. 2001	Strategic, Tactical, Technological, Cultural, Managerial
Nah and Delgado 2006	Strategic, Managerial, Operational, Technological, Cultural
Ngai et al. 2008	Strategic, Tactical, Managerial, Organizational, Technological, Cultural
Nguyen et al. 2008	Strategic, Managerial, Technological
Noudoostbeni et al. 2009	Strategic, Tactical, SMEs, National
Olson and Zhao 2007	Strategic, Tactical, End User
Osman et al. 2006	Strategic, Tactical, Technological, Managerial
Palaniswamy and Frank 2002	National, Vendor
Parr and Shanks 2000	Strategic, Tactical
Parthasarathy et al. 2007	Technological
Plant and Willcocks 2007	Strategic, Tactical, Organizational
Ramayah et al. 2007	Strategic, Tactical, Managerial, Organizational, National
Ramayah and Sawaridass 2010	Strategic, Tactical, Organizational, End user, Technological
Ramdani et al. 2009	Technological, Organizational, Exogenous, SMEs
Rao 2000	Strategic, Tactical, Technological, SMEs
Raymond et al. 2006	Operational, Cultural, Exogenous, SMEs, National
Reimers 2003	Strategic, Managerial, Organizational, User, Vendor, Local
Remus 2007	Strategic, Tactical, Organizational, Technological
Robey et al. 2002	Knowledge, Technological, Operational
Saini et al. 2010	Organizational, End User, Technological
Salimifard et al. 2010	Strategic, Tactical, Cultural, Technological, Organizational
Santamaría-Sánchez et al. 2010	Exogenous, Vendor, End user
Sarker and Lee 2003	Strategic, Organizational
Sarkis and Sundarraj 2003	Global, Strategic, End user
Seethamraju and Seethamraju 2008	Exogenous, Organizational, Operational
Shafiei and Sundaram 2004	Technological
Shanks et al. 2000	Strategic, Organizational, Cultural, Technological
Sharif et al. 2005	Technological, Organizational, Managerial
Shaul and Tauber 2010	Strategic, Tactical, Technological, Managerial, Organizational
Singla 2008	Strategic, Tactical, Organizational, SME, Public sector
Skok and Legge 2002	Managerial, Operational, Cultural, End User
Snider et al. 2009	Strategic, Tactical, Organizational, Managerial
Soh et al. 2000	Cultural, Operational
Soja 2006	Strategic, Tactical, National, Technological
Soja 2008	Strategic, Managerial, Local, Developing country, Technological
Somers and Nelson 2004	Strategic, Tactical, Organizational
Stefanou 1999	Technological, Organizational

Table A-1. Continued

Stefanou 2001	Strategic, Technological
Stefanou and Revanoglou 2006	Technological, Organizational, Cultural
Stratman and Roth 2002	Technological, Organizational, Organizational, Managerial, Local
Su and Yang 2010	Operational, Managerial, Strategic, Technological, Organizational
Sumner 2000	Managerial, Operational, Organizational, Cultural, Strategic
Sumner 2006	Strategic, Managerial, Cultural
Sumner and Bradley 2009	Strategic, Managerial, Cultural, SME, Vendor
Sun et al. 2005	Organizational, Technological, End User
Tarn et al. 2002a	Technological, Organizational
Taube and Gargeya 2005	Strategic, Organizational, Managerial
Themistocleous et al. 2001	Technological, Managerial
Themistocleous et al. 2005	Strategic, Technological, Public, Exogenous
Trienekens et al. 2005	Organizational, End User, Technological, Cultural
Trienekens and van Grinsven 2008	Organizational, End User, Cultural
Trimmer et al. 2002	Strategic, Technological
Tsai et al. 2004	Operational, Tactical, End user, Managerial, National
Tsai et al. 2010	Exogenous, Managerial, Technological
Turner and Chung 2005	Technological
Umble et al. 2003	Managerial, Operational, Organizational, User, Strategic, Global
Verville et al. 2005	Strategic, Tactical, End user
Verville and Haltingten. 2002	Exogenous, Technological, Cultural, Organizational, User
Wang et al. 2008	Strategic, Tactical
Ward et al. 2005	Organizational
Wei and Wang 2004	Managerial, Technological, Vendor
Welch and Kordysh 2007	Strategic, Tactical, Technological, Organizational, End User
Wicramasing and Gunawarden 2010	Strategic, Tactical, Technological, Managerial, Organizational, End User
Willcocks and Syke 2000	Technological
Woo 2007	Strategic, Tactical, Technological, Cultural, Managerial, Organizational
Wong et al. 2005	Strategic, Technological
Wu and Wang 2007	End User, Technological, Tactical
Yang and Seddon 2004	Managerial, Organizational, Technological
Yanjing 2009	Technological, Operational
Yusuf et al. 2004	Strategic, Tactical, Technological, Organizational
Zabjek et al. 2009	Strategic, Tactical, Technological, Organizational, End User
Zhang et al. 2005	Organizational, End User, Technological, Cultural, National

ACKNOWLEDGMENTS

The authors wish to thank the editor and the anonymous reviewers of the ACM Computing Surveys journal for providing very helpful comments and constructive suggestions for improving the quality of the article.

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Received August 2012; accepted September 2012