Success Factors for ERP Implementation: a Systematic Literature Review

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Abstract:

Many organisations perceive enterprise resource planning (ERP) as a potential, vital and crucial solution to their businesses to gain efficiencies and be competitive. ERP implementation can reap enormous benefits, or it can be disastrous for organisations that fail to manage the implementation process. The adoption of a new ERP system is a highly complex process, and it is not as easy as people imagine, it is a challenging task that requires rigorous efforts, a careful thinking, and proper planning; also it demands to have a detailed analysis of such factors that are critical to the implementation. The field has invoked immense interest in the research community, and several previous studies have tried to assess the success of these systems and highlight the CSF's based on some theoretical models. A better understanding of the CSFs will shrink the field of failure and help the practitioners and managers to improve the chance of success. The purpose of this study is to form a basis for future studies which may help future ERP initiatives to achieve greater success and less failure, it seeks to investigate the critical success factors of Enterprise Resource Planning (ERP) implementation, and then determine what factors are the most highly correlated with the success of ERP projects. To evaluate each element, we used a statistical data analysis. The approach used in this research consisted of both a quantitative and qualitative analysis, the study consisted of a literature review. The data collected were analyzed, and several conclusions were drawn.

KEYWORDS
ERP + CSF, ERP+ KSF, ERP+ success, ERP system+ CSF, ERP system+ KSF, ERP system+ Implementation+ Success

Introduction:

Nowadays, Organizations are increasingly dependent on ERP system. It occupies a growing place in today's businesses, whether large or small and medium-sized enterprises. The main goal that drives companies to implement an ERP system is to adopt a single and consistent system to centralize information and facilitate their circulation. The deployment of an ERP system is supposed to provide the company with more flexible management, an improvement of the productivity and thus to obtain a competitive advantage on their market. It's now a tool for standardization of business processes and multinational groups and offers rich and proven features based on best practices.

Despite the many benefits of this solution, the rate of success of the implementation project announced by organizations is sobering: it was reported that three-quarters of the ERP projects were judged to be unsuccessful by the ERP implementing firms *(Hong et al., 2002).* ,ERP projects that fail are rare, but few succeed in achieving all the objectives announced at the beginning of the project, and as a result, the solution which is a source of productivity and performance for companies, becomes a break in some of them.

ERP implementation is like any other type of project, it require a rigorous evaluation, and a significant level of resources, commitment, and changes throughout the organization to ensure successful implementation (Moon, 2007), it can not merely be seen as a simple IT project. It is also a strategic development process within a company that involves different phases for its preparation and implementation, and to take advantage of an ERP solution, this solution must be carefully administered (Al-Mashari et al., 2003): its benefits are the result of an active and supported preparation of implementation.
The failure of the implementation of ERP solutions becomes a significant problem that is important to consider. This led us to carry out a systematic literature review to identify and clarifies the different critical success factors that need to be considered to ensure the efficient implementation of ERP project and even the innovative use of ERP. The identification was made through the many scientific texts that tried to describe them. Our primary goal is to study how the implementations should be carried out and to define the critical elements in the success of the implementation. The objective was not just to identify an exhaustive list of CSFs but focus on key aspects that have a vital role in ERP implementation.

2. Background:

2.1 ERP system:

The Enterprise Resource Planning (ERP) system, Enterprise Information System (EIS), Enterprise-Wide Systems (EWS) or Enterprise System (ES) is a software solution that has been conceived to unify all information systems of all departments into a single integrated system, and helps to manage and store information from the entire the organization in one central database *(Brooks, 2013).* It is used by many companies to integrate business functions and disseminate common information and processes throughout the organization *(Seddon et al., 2003)*. ERP gained popularity in the early 1990s and became one of the best software to manage business processes. The business management system derives from the MRP (Material Resource Planning) *(Orlicky, 1975)* and MRPII (Manufacturing Resource Planning) *(Hwa Chung et al., 2000)* mainly used in industrial management and production management.
The ERP is considered as a backbone of the information systems in an enterprise, and it supports all parts of business processes by providing a flow of information between all business functions on all levels within an enterprise. This system offers a competitive advantage, especially regarding the value of the information. For many users, an ERP is a "do it all" system that performs everything from the entry of sales orders to customer service *(Gupta, 2000)*. Typically, ERP software is an integrated system that allows the company to standardize its information system to link and automate its underlying processes. It also provides intra-organizational information-sharing mechanisms *(Bendoly et al., 2006)*, by offering accurate and up-to-date information accessibility, faster transaction processing, and data quality *(Ekman et al., 2014).*
ERP systems allow the unification and centralization of all the IS of the firm into a single system; it provides to organizational actors a common language and a shared database *(O'Doherty et al., 2000).* The shared database can allow every department of a business to store and retrieve information in real-time, and the information should be reliable, accessible, and easily shared. The modular software design should mean a business can select the modules they need, mix and match modules from different vendors, and add new modules of their own to improve business performance.
Nowadays, we reach a new generation of ERP, considered as an extended version (ERPII) "the ERP software is often presented as a solution for the future, having a wide field of extension". ERP II has been defined as a next-generation of ERP system and optimizes the collaborative capability of an organization for many stakeholders, including business to business, business to employee and business to customer *(Møller, 2005).* One important aspect of ERP II is the adoption of electronic customer relationship management (e-CRM) practices, which are driven by the organizational database *(Pan et al., 2003).* ERP has also expanded to encompass business intelligence (BI) while also handling "front-office" functions such as sales force automation (SFA), marketing automation and eCommerce. However, ERPs are still expensive and difficult to implement because they involve an organizational request that aims to homogenize databases and procedures used in the company.

2.2 ERP Implementation:

Implementing an ERP system is not an easy task to achieve, and not just involves a great deal of expenditure, efforts and time. More than that, it consists of a change in some of the complex business processes and also requires significant changes in staff and work practices.
In fact, The Implementation of ERP software is a substantial investment and differs from any traditional information system due to its integrated nature which causes dramatic changes on workflow, organizational

structure, and on the way people does their jobs *(Matende et al., 2013),* and the decision to invest in an ERP system can make or break an organization.

In 2010, the average company invested over $5 million in ERP implementations, using a range of business justifications, such as the replacement of legacy systems, reduction in cycle times, and operating costs *(Galy et al.,2014)*. In 2017, the average implementation cost was 1.3$ million, and on average, organizations spend 3.6% of their annual revenue on their project (Report of Panorama consulting, 2017). It has many issues that confront ERP implementation, and organizations continue to underestimate the complexity of implementing an ERP system throughout its life cycle *(Olson et al., 2007) (Motiwalla et al., 2009)*.

Implementation of a new ERP is an essential issue for a company, both financially and concerning the quality of its operation. It is, therefore, a strategic issue. It is necessary to give every means to succeed, starting with human resources. To have a general idea about the implementation of an ERP, and thus about the critical success factors, we will define it in the next section.

2.3 Critical Success factors:

The CSFs can be described as the limited number of areas in which results if they are satisfactory, will ensure the successful competitive performance of the organization, the concept of CSFs was developed in the early 1960s. Ronald Daniel first discussed the idea of CSFs in the management literature, stating that information analysis must focus on "success factors" when as a new approach to help achieve organizational goals *(Bullen et al., 1981)*. The critical success factors are areas of activity that should receive constant and careful attention from management. The purpose of any CSF approach is “the determination of the set of factors that the manager considers critical for his or her success. Once identified, these factors are stated as his or her objectives and the information required to monitor their performance is then determined.

Critical success factors (CSFs) are often used to identify and state the essential elements required for the success of a business operation *(Hossain et al., 2001),* it can be described in more details as a small number of easily identifiable operational goals shaped by the industry, the firm, the manager, and the environment that assures the success of an organization *(Leyh et al., 2015).* It is a new approach for businesses to achieve goals, which provide an overview of what is essential for successful implementation *(Saade et al., 2016).* It is a common occurrence to establish CSFs in an ERP implementation, but despite the large amount of research available on CSFs, ERP implementation is still more common than they succeed *(Ram et al., 2014)*. For ERP projects, CSFs has been defined as a reference to any condition or element that was deemed necessary for the ERP implementation to be successful *(Finney et al., 2007)*. It is considered as a set of activities that needs special considerations and continual attention for planning and implementing an ERP system. CSFs are particularly useful, as they provide clear insight and guidance on where to focus special consideration and resources and continual attention in planning for successful ERP project implementation.

There is considerable debate, though as to whether CSFs are universal or not. Some researchers believe that CSFs are universal and reusable and can be applied in all situations *(Borman et al.,2013).* On the other hand, others researchers argue that CSFs differ depending on which company, industry and management that is being observed *(Bullen et al., 1981),* and in the result, it is difficult to make a generic compilation of CSFs that can be applied to all ERP implementations.

We tracked the recent academic and trade literature to find research in this field. Some researchers produce their CSFs after their investigation. Other studies give a compilation of previous research by making a list of CSFs and rank them in importance. We will provide more insight into the literature and so on the research methodology in the next section.

3. Research Methodology:

In this study, we are interested in critical success factors and are attempting to extract factors influencing implementation in organizations. For that, we examine the literature on ERP system to determine which Critical Success Factors (CSFs) have been empirically deemed "critical", We used a systematic approach to review a large number of refereed papers published between 2006 and 2018, from which a large number of documents relating to CSFs on ERP could be extracted, and they were selected for analysis. Most of these papers are qualitative studies without quantitative data. Therefore, the systematic review might be an appropriate method for us to achieve a comprehensive synthesis of factors based on primary qualitative studies. This is an approach that uses a more rigorous and well-defined approach to reviewing the literature in a specific subject area. It is ‘research of research' which incorporates analysis of the theory, methods, and findings of existing qualitative research studies and subsequent synthesis of these insights to provide new understandings of the phenomenon. It is based on a formulated question, identifies relevant studies, appraises their quality and summarises the evidence by use of

specific methodology. We determined, evaluated and interpreted all available research related to, and we were based on five steps, we give more details in the following:

3.1 Research objectives and research questions:

- ***Search string***

The first step in our study was to specify a problem and reformulate a goal in the form of a clear, structured, and unambiguous question before starting. The interest of this study is to allow a good understanding of critical success factors for ERP implementation which will enable companies to manage their projects properly.

RQ1: Which publication channels are the primary targets for ERP research?
RQ2: How has the paper publication frequency on the topic of Critical success factors of ERP implementation changed over time?
RQ3: What are the type of papers (conference/Journal)?
RQ4: What are the factors used in the ERP implementation context? Which are the most common factors?

The search terms used in our study are organized into specific groups. An attempt has been made to combine different conditions using the OR and AND logic operator. The search string used is: [(ERP OR ERP system) AND (CSF OR KSF OR Success OR (Implementation AND Success)]
The focus was on the document having a direct relationship with our field, and that contains the following keywords and also which belongs to the journals that are concerned with the ERP research.

- ***Literature resources***

The second step was to identify resources of the relevant literature. Using the specified search string searches were performed in the following digital databases:

Table 1. Databases and search terms

Databases	Search terms/Keywords
Science Direct	ERP + CSF ERP+ KSF ERP+ success ERP system+ CSF ERP system+ KSF ERP system+ Implementation+ Success
Google Scholar	
Springer Link	
Research Gate	

The digital libraries used in this study were selected through previous articles and paper in the same field or with a similar scope. Researchers have always used the Springer Link, Research gate, ScienceDirect and Google Scholar libraries, and all studies were selected from these databases.
Through the digital databases and search engines, we have done our research, but using different methods with a specific configuration of the search string used with each search engine. During the initial selection, we did not apply any restrictions. The search was not limited, and papers from other research fields were included in the results. Thus, these papers had to be excluded. This was done by reviewing the abstracts of the documents and if necessary by examining the paper content.

- ***Article filtering phases***

The discovered papers should be relevant to the implementation of the ERP system, and more specifically to its CSFs. They would be filtered according to some quality measures to filter the found publications. These standards are:

1-Through the selection procedure previously described, a pre-selection of a set of candidate primary studies is carried out.

2-A manual Check of the title, the abstracts and the content of the full text of each article. The inclusion/exclusion criteria have been used:

-Inclusion criteria:

-The study should be related to CSF of ERP implementation and must refer to the research question.
-The publication must have a clear methodology
-The research must come from trusted resources and journals
-The publication year of the papers must be 2006 or above

-Exclusion criteria:

-The study is an editorial, Keynote, opinion, tutorial, workshop, summary report, poster or paper such as unpublished articles, master's theses, and books. Such documents have been excluded since such articles are usually not peer-reviewed.

-Study's full text is not available.

-Paper was not in English.

The exclusion criteria were applied using OR logical operator between them.

3.2 Data extraction and synthesis:

All articles and paper chosen must meet the RQ mentioned above. For that, and in order to have the exact data, we have explored the abstract and the full text of each article. The data was collected on a set of variables. For every study, we have extracted much information. We have summarised all the data information in Table 2 to have a vision on the data concerning each element.

Table 2. Summary of data extraction

Authors	Pub. Title	Pub.source	Year	Type of paper
**	**	RQ1	RQ2	RQ3

RQ1 the publication channels and source for each paper are listed.

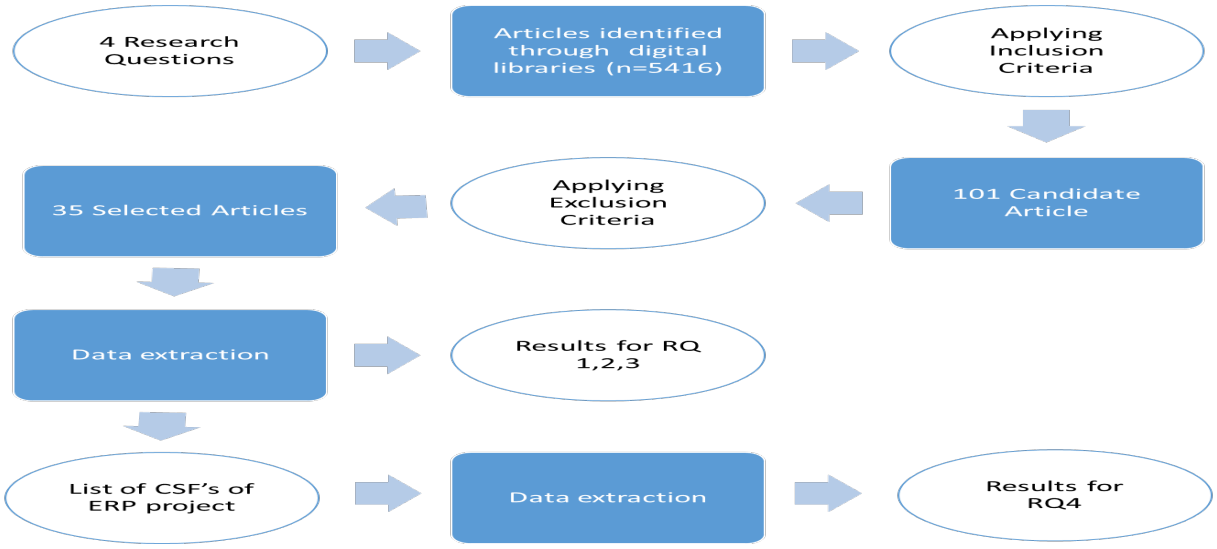
RQ2 The publication year for each paper is listed, and the aggregated result will provide an overview of the publication frequency on the topic of Critical success factors of ERP implementation.

RQ3 the type of paper is classified in a journal paper, and a conference paper.

After conducting the phase of searching the article and filtering as described in the last section. A discovered result from the previous phases would be analyzed to conclude the aspects or elements that need to be considered carefully to have a successful ERP project.

First, in this section, we present the selection procedure for the selected paper. Then, results for the data extraction are exposed, analyzed and discussed.

Figure 1. Summary of the selection procedure



After completing the procedure of selection explained in the previous section, 35 articles were selected. The application of the search string in the various digital databases allowed us to generate a considerable number of articles (5416). Based on their title, keywords, abstract and perhaps the full text, we have been able to select the articles that will allow us to answer the RQs already presented in Table 4. **Figure 1** shows the results of the selection procedure, with N the number of articles selected in the different phases of the selection procedure. Table 4 lists the 35 articles that have been examined and accepted.

Table 4. The accepted articles

#	Title	Authors	Year	Type of paper	Pub. Source
1	ERP implementation: a compilation and analysis of critical success factors	Finney, S. et al.	2007	Journal	Business Process Management Journal
2	Critical Success Factors for enterprise resource planning implementation success	Mohmed Al-Sabaawi, M.Y.	2015	Journal	International Journal of Advances in Engineering & Technology
3	A model of critical success factors for software projects	Sudhakar, G.P.	2012	Journal	Journal of Enterprise Information Management
4	Selection and critical success factors in successful ERP implementation	Beheshti, H.M. et al.	2014	Journal	Competitiveness Review
5	A Comparative Study on Critical Success Factors (CSFs) of ERP Systems Implementation among SMEs and Large Firms in Developing Countries	Aarabi, M. et al.	2012	Journal	International Journal of Advancements in Computing Technology
6	Critical Success Factors for Enterprise Resource Planning implementation in Indian Retail Industry: An Exploratory Study	Garg, P.	2010	Journal	International Journal of Computer Science and Information Security
7	The Critical Success Factors Of The ERP System Project: A Meta-Analysis Methodology	Zouine, A.	2014	Journal	The Journal of Applied Business Research
8	Critical Success Factors of Enterprise Resource Planning Systems Implementation in Venezuela	Colmenares, L.	2006	Conference	Americas Conference on Information Systems
9	A Comparative Study of Critical Success Factors (CSFs) in Implementation of ERP in Developed and Developing Countries	Moohebat, M. R.	2010	Journal	International Journal of Advancements in Computing Technology
10	Critical success factors in enterprise resource planning implementation: a review of case studies	R. Saade et al.	2016	Journal	Journal of Enterprise Information Management
11	Critical success factors for ERP implementations in Belgian SME	Doom, C. et al.	2010	Journal	Journal of Enterprise Information Management
12	ERP implementation through critical success factors' management	Bourgault, M. et al.	2009	Journal	Business Process Management Journal
13	Grouping of Critical Success Factors for ERP implementations	Suganthalakshmi, T. et al.	2011	Journal	International Journal of Management
14	A framework for applying critical success factors to ERP implementation projects	Gupta, R. et al.	2014	Journal	International Journal of Business Information Systems
15	Evaluation of Key Success Factors Influencing ERP Implementation Success	Hailu, A. et al.	2012	Conference	IEEE Eight World Congress on Services
16	Factors affecting ERP system implementation effectiveness	Maditinos, D. et al.	2011	Journal	Journal of Enterprise Information Management
17	Examining the critical success factors in the adoption of enterprise resource planning	Ngai, E.W.T et al.	2008	Journal	Computers in industry
18	Successful ERP implementation: an integrative model	Schniederjans, D. et al.	2011	Journal	Business Process Management Journal

19	The road of ERP success: a framework model for successful ERP implementation	Candra, S.	2011	Journal	Binus Business Review
20	A study of the effectiveness of ERP implementations	Fok, L. et al.	2010	Conference	Allied Academic International Conference
21	Determination of critical success factors in implementing an ERP system: a field study in Mexican enterprises	Garcia-Sanchez, N. et al.	2007	Journal	Information Technology for Development
22	Critical factors for successful ERP implementation: exploratory findings from four case studies	Motwani, J. et al.	2006	Journal	Computers in Industry
23	Investigating Critical Success Factors in ERP Implementation Projects	Salimifard, K. et al.	2010	Conference	IEEE International Conference on Advanced Management Science
24	The influence of organizational factors on successful ERP implementation	Dezdar, S. et al.	2011	Journal	Management Decision
25	Critical Success Factors in International ERP Implementations: A Case Research Approach	Pant, R. et al.	2007	Journal	Journal of Computer Information Systems
26	Critical success factors for ERP implementation in SMEs	Munir, A. M.	2013	Journal	Robotics and Computer-Integrated Manufacturing
27	Critical Success Factors of ERP Implementations – An Analysis	Saravanan, R.	2014	Journal	International Journal of Multidisciplinary Research in Social & management sciences
28	Success factors in ERP systems implementations: lessons from practice	Soja, P.	2006	Journal	Journal of Enterprise Information Management
29	Challenges and Influential Factors in ERP adoption and Implementation	Al-Fawaz, K. et al.	2010	Conference	European, Mediterranean and Middle Eastern Conference on Information Systems
30	Critical Success Factors for Enterprise Resource Planning implementation and Upgrade	Nah, F.et al.	2006	Journal	Journal of Computer Information Systems
31	Empirical Assessment of Factors Influencing Success of Enterprise Resource Planning Implementations	Nah, F. et al.	2007	Journal	Journal of Database Management
32	Determination of Critical Success Factors in implementing an ERP System: A Field Study in Mexican Enterprises	Sanchez, N. G et al.	2007	Journal	Information Technology for Development
33	Critical Success Factors for ERP implementation	Amini, M. et al.	2013	Journal	International Journal of Information Technology & Informations systems
34	Analysis of the Critical Success Factors for Enterprise Resource Planning Implementation from Stakeholders' Perspective: A Systematic Review	Tarhini, A. et al.	2015	Journal	International Business Research
35	ERP implementation process analysis based on the key success factors	Yanhong, Z.	2009	Conference	Information Technology and Applications, 2009, IFITA'09. International Forum on 2009, IEEE

3.3 Data analysis:

In this section, we will present the data analysis phase. This phase will be divided into two steps:

1) *After the step of finding and summarizing, the next step is to identify and to conclude categories of Critical success factors in the ERP implementation.*
2) *Then, we can classify the discovered CSFs from the previous step, and also measure their relevance.*

A total of 101 articles were discovered and reviewed, and only 35 were accepted and the most relevant for our topic. The first stage of the analysis is to categorize and group similar concepts into similar categories. Success factors that seemed to be related to the same phenomenon were grouped. The factors involved in the ERP implementation can be divided into three categories through which several possible success factors have been identified producing 12 CSFs in total.

3.3.1 Categorization & Explanation of CSF:

In order to provide a comprehensive understanding of the different CSFs which were chosen, we tried to describe them in this section.

Our research in the literature for ERP implementations led us to discover more than 40 CSFs. Only 12 CSFS was considered according to their importance for a successful implementation. Table 5 present the determined factors according to their categories:

Table 5. CSFs identified according to their types

ERP Organization	1- Top Management Support 2- Effective Communication 3- Training and Education 4-Business plan and vision
ERP Project	5- Project Management 6- BPR management 7- Change Management 8- Project team Composition/ Teamwork 9- Project champion
ERP Technology	10-ERP Choices 11-Technical Implementation, Technological Infrastructure 12-Legacy systems consideration

-ERP Organization:

-Top management support:

Top management support is recognized as one of the most important critical success factors of ERP implementation, and several types of research on the CSF of an ERP project insist on the importance of the roles that can be played by the top management to succeed such a project. This factor is often included in models of ERP implementation success. The principal function of the top management is the establishment of clear objectives and goals for the ERP project, which allows moving all parties in the same direction.

-Effective communication:

The effective communication in the organization must occur between the various functions and levels of the organization, between the institution's departments, and, specifically, between the business staff and the IT staff in the ERP system implementation *(Leandro et al., 2017) (Nah et al., 2006) (Ngai et al., 2008)* consider communication to be a critical success factor. It includes communication of expectations at all company levels, formal presentations by the project teams and the announcement of the project results within the company and announcement of the project scope, objectives and activities before the project onset *(Doom et al.,2010)*.

-Training and Education:

Training and Education are considered actually as one of the preconditions of building a successful ERP system. Training employees is a vital part of making an ERP implementation successful, the objective of training is to reskill users in new technologies and training in the use of specific application modules, to provide a practical understanding of the new business processes and applications as well as the new workflows that are created by the ERP implementation *(Leyh et al., 2016)*. By using the system effectively, the users improve their performance,

and the overall performance of the organization grows. Therefore, establishing a suitable plan for the employees' training is important *(Al-Mashari et al., 2003).* The training program allows a strong acceptance and progress of the project.

-Business plan and vision:

There should be a clear business plan and vision behind the ERP implementation project. The project goal is not only implementing the ERP system but achieving specific business objectives. It is important to have a business plan, and it must be a general overview of the strategic and tangible benefits, resources, cost, risk and timeframe (Rosario, 2000). Organizations need to establish a long-term vision, while continually improving the ERP implementation process. The project of ERP need for clear goals that are easy to recognize and measure, and also goals should be clearly defined and understandable. These goals are necessary to be tracked and measured during the implementation cycle.

-ERP project:

-Project management:

The project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. It involves the use of skills and knowledge in coordinating the scheduling and monitoring of defined activities to ensure that the stated objectives of implementation projects are achieved *(Leyh et al.,2016).* The formal project implementation plan defines project activities, commits personnel to those activities, and promotes organizational support by organizing the implementation process *(Bhatti, 2005)(ALdayel et al., 2011)*. Furthermore, continuous project management allows focus to remain on the important aspects of the ERP implementation and ensures that timelines and schedules are met *(Al-Mashari et al., 2003)*.

-BPR management:

The Business Process Management is recognized as a crucial step of an ERP implementation, supposed to make possible the mapping between the company activity and the ERP standard processes, this approach is used to evaluate, improve and align business processes to an organization's overall goals and strategy. It is an approach consisting of computer modeling of the business processes of the company, in both their application and human aspect, The ERP systems are built on best practices for the specific industry, and to successfully install ERP, all the processes in a company have to conform to the ERP model. This approach aims to gain a better understanding of all the company's business processes, their progress, and their interactions. It enables businesses to be more efficient and flexible to change.

-Project team Composition/ Teamwork:

The project team is one of the most critical factors is the roles and responsibilities of those selected to participate in the project. In general, a project team consists of at least two persons working together for a common goal whereby each team member has defined responsibilities and functions.

Some of the ERP project team roles and responsibilities below are often utilized to put together the winning team who will achieve implementation success that meets the expectations and objectives set forth by company management. An ERP project involves all of the functional departments in an enterprise. It needs the cooperation of technical, business experts and external consultants as well as the involvement of end-users in different project phases *(Fui-Hoon Nah et al., 2001)*. The success of ERP projects is related to the knowledge, the skills, the abilities and the experiences of the project team members but externals should be used as right consultants and not as long-term additions to internal staff *(Al-Mashari et al., 2003)*.

-Change management & Culture:

Change management is one of the most overlooked success factors in an ERP project. The integration of a new ERP system is a massive change in the whole organization. If these changes are not managed effectively, they can cause resistance, confusion, and redundancies. Change management is related to the company's transformation guidance, aligning it to the strategy and the implementation of the ERP plan. The way people do their jobs needs to change, change management is essential for preparing a company for the introduction of an ERP (Kemppainen, 2004). Furthermore, ERP project changes the way the company is organized, often acting against the prevailing company culture, and any organization planning to introduce an ERP system needs to perform a socio-technical analysis before the actual implementation *(Chen, 2001)*. Integrating the employees early in the planning and implementation process is essential to achieve this understanding *(Leyh et al., 2016)*.

- ERP Technology:

-ERP Choices:

The selection of the specific ERP package is one that requires careful attention *(Kronbichler et al., 2009) (Hasibuan et al., 2012) (Al-Fawaz et al., 2010)*. It is also necessary to keep in mind that the system must match the business processes *(Chen, 2001).*

-Technical Implementation, Technological Infrastructure:
Infrastructure is the adequacy of IT availability in the organization, including architecture and skills. If necessary, the infrastructure needs to be refreshed and renewed for the ERP implementation. The executives are required to have a complete understanding of the technical challenges involved in adopting a new enterprise-wide system and proposed that the three elements to consider are, a) network upgrade, b) hardware upgrade and c) providing global support [28]. Also, technical requirements of the implementation may change due to a new version of the software released which may create temporal complexity challenges as well.
-Legacy systems Consideration:
There must also be consideration of the current legacy system in place as this will be a good indicator of the nature and scale of potential problems. This factor could directly affect the technical and organizational change required *(Fui-Hoon Nah et al., 2001) (Al-Mashari et al., 2003)*. Whether or not there is a reasonably well working manual system in place is another consideration.

3.3.2 The CSFs Frequency:

To determine the most critical success factors, we were able to analyze the agreement between the authors and the different CSFs in the implementation of the ERP. The analysis will focus just on the articles that have been accepted. Table 6 records the interactions between the authors and the 12 CSFs already cited. The numbers in the first column of the table represent the authors of the different papers that were accepted and the numbers in the first row represent the CSFs.

Table 6. CSFs frequency in the accepted articles

Authors/CSFs	1	2	3	4	5	6	7	8	9	10	11	12		Total
1	x	x	x	x	x	x	x	x	x	x	x	x		12
2	x	x	x	x	x		x				x			7
3	x	x	x	x	x	x	x	x	x	x	x	x		12
4	x	x	x	x	x	x	x			x				8
5	x		x	x	x	x	x	x	x	x		x		10
6	x		x		x			x		x				5
7	x		x		x	x		x		x				6
8	x	x	x	x	x	x			x	x				8
9	x	x		x	x	x	x	x	x	x	x			10
10	x					x	x	x				x		5
11	x	x	x	x	x	x	x	x	x		x	x		11
12	x	x		x	x	x	x	x	x					8
13	x		x			x	x	x	x		x	x		8
14	x	x	x		x	x	x	x		x	x			9
15	x	x	x	x	x		x	x						7
16	x	x	x		x									4
17	x	x			x	x	x	x	x			x		8
18	x		x		x	x	x	x	x	x	x			9
19	x	x	x		x			x			x			6
20	x		x	x	x	x	x	x			x	x		9
21	x	x	x	x	x	x	x	x		x	x	x		11
22		x				x	x				x	x		5
23	x	x	x	x	x	x	x	x		x				9
24	x	x	x		x									4
25	x	x	x	x	x	x	x	x	x	x				10
26	x	x	x	x	x	x	x	x	x	x				10
27	x	x	x	x	x	x	x	x		x	x			10
28	x		x				x	x						4
29	x	x	x	x	x	x	x	x	x	x	x	x		12
30	x	x	x	x	x	x	x	x		x	x			10
31	x	x	x	x	x	x	x	x	x	x	x	x		12
32	x	x	x	x	x	x		x			x			8
33	x	x		x		x					x	x		6
34	x	x	x	x	x	x	x	x	x	x	x	x		12
35										x	x	x		3
Total	**33**	**26**	**28**	**22**	**29**	**27**	**26**	**27**	**15**	**19**	**19**	**14**	**285**	
A	11,58%	9,12%	9,82%	7,72%	10,18%	9,47%	9,12%	9,47%	5,26%	6,67%	6,67%	4,91%	100%	
B	1	6	3	8	2	4	7	5	11	9	10	12		
C	94,28%	74,28%	80,00%	62,85%	82,85%	77,14%	74,28%	77,14%	42,85%	54,28%	19,00%	40,00%		

**A Means of each factor in % (Sum of each column / Sum of the column)*
**B ranking according to A*
**C Percentage of the publications which identified the CSF (Sum of each line/ Total Number of the authors)*

3.4 Findings:

This section will allow us to present the different results obtained through the previous section, which will be based on Table 6. It will enable us to identify the most relevant CSFs as well as their classification. The classification will be based on the work already done in the previous section and will give a clear view on the most critical factors that make it possible to guarantee the success of the implementation, which will help the future participants in this project to establish the best way to exploit ERP systems fully.

Table 7. Ranking of CSF according to their appearance frequency

Order	CSF Description	Frequency
1	Top Management Support	33
2	Project Management	29
3	Training and Education	28
4	BPR management	27
5	Project Team composition/Team Work	27
6	Effective Communication	26
7	Change management	26
8	Business plan and vision	22
9	ERP Choices	19
10	Technical implementation/IT infrastructure	19
11	Project champion	15
12	Legacy systems consideration	14

4 Conclusion

The implementation of ERP becomes more complex and therefore requires particular attention from all parties, especially in their implementation. The complexity of implementing ERP systems within organizations has been the subject of several studies. The majority of research has primarily focused on Critical success factors. It dominates the ERP literature and mainly focused on identifying and analyzing all the factors that affect the success of such a project. The identification of CSFs for an ERP implementation is complicated because it includes the understanding of many variables, and it is, therefore, difficult to follow a coherent list. The purpose of this systematic review was to give a clear overview of the area of research of critical success factors in ERP implementation projects, by highlighting the elements that need to be considered during implementation, to facilitate the continued success of ERP system and ensure a better impact on the business performance.

Initially, a literature review was done, to obtain the CSFs cited by the authors. In the literature, we identified more than 40 CSFs, among these 12 were selected. Then, through the recording of occurrence frequencies of the 12 factors identified in the literature it was possible to provide a classification, which should help further investigations and ERP implementers to identify potential problems and to detect the possible negative influence on the project success in an early phase and to manage a successful course during the ERP implementation.

Through this study, new interesting research opportunities have been found for future research. Another possible research question is the risk of failure of the implementation of ERPs, or otherwise the factors of failure during the implementation of such a system.

REFERENCES

[1] Adam, F. and O'Doherty, P. (2000) 'Lessons from enterprise resource planning implementation in Ireland – towards smaller and shorter ERP projects', Journal of Information Technology, Vol. 15, No. 4, pp.305–316.

[2] Ahmad, M. Munir, and Ruben Pinedo Cuenca. "Critical Success Factors for ERP Implementation in SMEs." Robotics and Computer-Integrated Manufacturing 29, no. 3 (June 2013): 104–11. https://doi.org/10.1016/j.rcim.2012.04.019.

[3] ALdayel, Abeer I., Mashael S. Aldayel, and Abdullah S. Al-Mudimigh. "The Critical Success Factors of ERP Implementation in Higher Education in Saudi Arabia: A Case Study." Journal of Information Technology and Economic Development 2, no. 2 (2011): 1.

[4] Al-Fawaz, Khaled, Tillal Eldabi, and Aisha Naseer. "Challenges and Influential Factors in ERP Adoption and Implementation," 2010.

[5] Al-Mashari, Majed, Abdullah Al-Mudimigh, and Mohamed Zairi. "Enterprise Resource Planning: A Taxonomy of Critical Factors." European Journal of Operational Research 146, no. 2 (2003): 352–364.

[6] Al-Mashari, Majed. "Enterprise Resource Planning (ERP) Systems: A Research Agenda." Industrial Management & Data Systems 102, no. 3 (April 2002): 165–70. https://doi.org/10.1108/02635570210421354.

[7] Al-Sabaawi, Mohmed Y. Mohmed. "Critical Success Factors for Enterprise Resource Planning Implementation Success." International Journal of Advances in Engineering & Technology 8, no. 4 (2015): 496.

[8] Bendoly, E., Bachrach, D.G., et al. (2006) 'ERP in the minds of supervisors: joint roles of task interdependence and cultural norms', International Journal of Operations & Production Management, Vol. 26, No. 5, pp.558–578.

[9] Bhatti, T. R. "Critical Success Factors for the Implementation of Enterprise Resource Planning (ERP): Empirical Validation." In The Second International Conference on Innovation in Information Technology, Vol. 110, 2005.

[10] Borman, M., & Janssen, M. (2013). Reconciling two approaches to critical success factors: The case of shared services in the public sector. International Journal of Information Management, 33, 2, 390–400.

[11] Brooks Chad. What is ERP? Business News Daily Senior Writer (2013), [online] Available at http://www.businessnewsdaily.com/5010-ERP-enterprise-resource-planning.html

[12] Bullen, Christine V., and John F. Rockart. "A Primer on Critical Success Factors," 1981.

[13] Campos Fernandes Leandro, Flávia, Mirian Picinini Méxas, and Geisa Meirelles Drumond. "Identifying Critical Success Factors for the Implementation of Enterprise Resource Planning Systems in Public Educational Institutions." Brazilian Journal of Operations & Production Management 14, no. 4 (December 8, 2017): 529. https://doi.org/10.14488/BJOPM.2017.v14.n4.a9.

[14] Candra, Sevenpri. "The Road of ERP Success: A Framework Model for Successful ERP Implementation." Binus Business Review 2, no. 2 (2011): 1118–1122.

[15] Chen, Injazz J. "Planning for ERP Systems: Analysis and Future Trend." Business Process Management Journal 7, no. 5 (December 2001): 374–86. https://doi.org/10.1108/14637150110406768.

[16] Colmenares, Leopoldo. "Critical Success Factors of Enterprise Resource Planning Systems Implementation in Venezuela." AMCIS 2004 Proceedings, 2004, 21.

[17] Dezdar, Shahin, and Sulaiman Ainin. "The Influence of Organizational Factors on Successful ERP Implementation." Management Decision 49, no. 6 (June 28, 2011): 911–26. https://doi.org/10.1108/00251741111143603.

[18] Dolmetsch, Ralph, and Institut für Wirtschaftsinformatik, eds. Accelerated SAP: 4 case studies ; Arbeitsbericht. St. Gallen, 1998.

[19] Doom, Claude, Koen Milis, Stephan Poelmans, and Eric Bloemen. "Critical Success Factors for ERP Implementations in Belgian SMEs." Journal of Enterprise Information Management 23, no. 3 (April 20, 2010): 378–406. https://doi.org/10.1108/17410391011036120.

[20] Ekman, Peter, Peter Thilenius, and Torbjörn Windahl. "Extending the ERP System: Considering the Business Relationship Portfolio." Business Process Management Journal 20, no. 3 (May 27, 2014): 480–501. https://doi.org/10.1108/BPMJ-08-2012-0085.

[21] Finney, Sherry, and Martin Corbett. "ERP Implementation: A Compilation and Analysis of Critical Success Factors." Business Process Management Journal 13, no. 3 (June 12, 2007): 329–47. https://doi.org/10.1108/14637150710752272.

[22] Françoise, Olivier, Mario Bourgault, and Robert Pellerin. "ERP Implementation through Critical Success Factors' Management." Business Process Management Journal 15, no. 3 (June 5, 2009): 371–94. https://doi.org/10.1108/14637150910960620.

[23] Fui-Hoon Nah, Fiona, Janet Lee-Shang Lau, and Jinghua Kuang. "Critical Factors for Successful Implementation of Enterprise Systems." Business Process Management Journal 7, no. 3 (August 2001): 285–96. https://doi.org/10.1108/14637150110392782.

[24] Galy, Edith, and Mary Jane Sauceda. "Post-Implementation Practices of ERP Systems and Their Relationship to Financial Performance." Information & Management 51, no. 3 (April 2014): 310–19. https://doi.org/10.1016/j.im.2014.02.002.

[25] García-Sánchez, Noé, and Luis E. Pérez-Bernal. "Determination of Critical Success Factors in Implementing an ERP System: A Field Study in Mexican Enterprises." Information Technology for Development 13, no. 3 (July 2007): 293–309. https://doi.org/10.1002/itdj.20075.

[26] Garg, Poonam. "Critical Success Factors for Enterprise Resource Planning Implementation in Indian Retail Industry: An Exploratory Study." arXiv Preprint arXiv:1006.5749, 2010.

[27] Garg, Poonam. "Critical Success Factors for Enterprise Resource Planning Implementation in Indian Retail Industry: An Exploratory Study." arXiv Preprint arXiv:1006.5749, 2010.

[28] Ghosh, Saumyendu. "Global Implementation of ERP Software-Critical Success Factors on Upgrading Technical Infrastructure." In Engineering Management Conference, 2003. IEMC'03. Managing Technologically Driven Organizations: The Human Side of Innovation and Change, 320–324. IEEE, 2003.

[29] Gupta, Atul. "Enterprise Resource Planning: The Emerging Organizational Value Systems." Industrial Management & Data Systems 100, no. 3 (2000): 114–118.

[30] Hailu, Alemayehu, and Syed Rahman. "Evaluation of Key Success Factors Influencing ERP Implementation Success," 88–91. IEEE, 2012. https://doi.org/10.1109/SERVICES.2012.74.

[31] Hasibuan, Zainal Arifin, and Gede Rasben Dantes. "Priority of Key Success Factors (KSFS) on Enterprise Resource Planning (ERP) System Implementation Life Cycle." Journal of Enterprise Resource Planning Studies 2012 (2012): 1.

[32] Hong, Kyung-Kwon, and Young-Gul Kim. "The Critical Success Factors for ERP Implementation: An Organizational Fit Perspective." Information & Management 40, no. 1 (2002): 25–40.

[33] Hossain, L., & Shakir, M. (2001). SIF for understanding the ERP selection in New Zealand. Journal of Decision Systems-Special Issue on ERP and their Impact on Decision Making, 10.

[34] Huang, Zhenyu. "A Compilation Research of ERP Implementation Critical Success Factors." Issues in Information Systems 11, no. 1 (2010): 507–512.

[35] Hwa Chung, Sock, and Charles A. Snyder. "ERP Adoption: A Technological Evolution Approach." International Journal of Agile Management Systems 2, no. 1 (April 2000): 24–32. https://doi.org/10.1108/14654650010312570.

[36] Johnston, S. ERP: Payoffs and Pitfalls. HBS Working Knowledge. (2002): 14-21.

[37] Karolak, Dale Walter. Software Engineering Risk Management: Finding Your Path through the Jungle. Version 1.0. Los Alamitos, Calif: IEEE Computer Society, 1998.

[38] Kemppainen, I., 2004. Change management perspectives in an ERP implementation. In: Leino, T., T. Saarinen and S. Klein (Eds.), Proceeding of the 12th European Conference on Information Systems. Turku, Finland.

[39] Kronbichler, Stephan A., Herwig Ostermann, and Roland Staudinger. "A Review of Critical Success Factors for ERP-Projects." The Open Information Systems Journal 3, no. 1 (2009).

[40] Laudon, J., & Laudon, K. (1998). Management information systems: new approaches to organization and technology (5th ed.). Macmillan PublishingCo. Ltd.

[41] Leyh, Christian, and Pauline Sander. "Critical Success Factors for ERP System Implementation Projects: An Update of Literature Reviews." In Enterprise Systems. Strategic, Organizational, and Technological Dimensions, edited by Darshana Sedera, Norbert Gronau, and Mary Sumner, 198:45–67. Cham: Springer International Publishing, 2015. https://doi.org/10.1007/978-3-319-17587-4_3.

[42] M. Beheshti, Hooshang, Bruce K. Blaylock, Dale A. Henderson, and James G. Lollar. "Selection and Critical Success Factors in Successful ERP Implementation." Competitiveness Review 24, no. 4 (August 12, 2014): 357–75. https://doi.org/10.1108/CR-10-2013-0082.

[43] Maditinos, Dimitrios, Dimitrios Chatzoudes, and Charalampos Tsairidis. "Factors Affecting ERP System Implementation Effectiveness." Journal of Enterprise Information Management 25, no. 1 (December 30, 2011): 60–78. https://doi.org/10.1108/17410391211192161.

[44] Majid Aarabi, Muhamad Zameri Mat Saman, Kuan Yew Wong, Amir Hossein Azadnia, and Norhayati Zakuan -. "A Comparative Study on Critical Success Factors (CSFs) of ERP Systems Implementation among SMEs and Large Firms in Developing Countries." International Journal of Advancements in Computing Technology 4, no. 9 (May 31, 2012): 226–39. https://doi.org/10.4156/ijact.vol4.issue9.27.

[45] Matende, Samwel, and Patrick Ogao. "Enterprise Resource Planning (ERP) System Implementation: A Case for User Participation." Procedia Technology 9 (2013): 518–26. https://doi.org/10.1016/j.protcy.2013.12.058.

[46] Mohammad Reza Moohebat, MIT. Asefeh Asemi, and PhD Mohammad Davarpanah Jazi. "A Comparative Study of Critical Success Factors (CSFs) in Implementation of ERP in Developed and Developing Countries." International Journal of Advancements in Computing Technology 2, no. 5 (December 31, 2010): 99–110. https://doi.org/10.4156/ijact.vol2.issue5.11.

[47] Møller, Charles. "ERP II: A Conceptual Framework for Next-generation Enterprise Systems?" Edited by Marinos Themistocleous. Journal of Enterprise Information Management 18, no. 4 (August 2005): 483–97. https://doi.org/10.1108/17410390510609626.

[48] Moon, Young B. "Enterprise Resource Planning (ERP): A Review of the Literature." International Journal of Management and Enterprise Development 4, no. 3 (2007): 235–264.

[49] Motiwalla, L.F. and Thompson, J. (2009). Enterprise Systems for Management, Pearson Education, Inc., Upper Saddle River, New Jersey

[50] Motwani, Jaideep, Ram Subramanian, and Pradeep Gopalakrishna. "Critical Factors for Successful ERP Implementation: Exploratory Findings from Four Case Studies." Computers in Industry 56, no. 6 (August 2005): 529–44. https://doi.org/10.1016/j.compind.2005.02.005.

[52] Nah, Fiona Fui-Hoon, and Santiago Delgado. "Critical Success Factors for Enterprise Resource Planning Implementation and Upgrade." Journal of Computer Information Systems 46, no. 5 (2006): 99–113.

[54] Ngai, E.W.T., C.C.H. Law, and F.K.T. Wat. "Examining the Critical Success Factors in the Adoption of Enterprise Resource Planning." Computers in Industry 59, no. 6 (August 2008): 548–64. https://doi.org/10.1016/j.compind.2007.12.001.

[55] Olson, D. L., and F. Zhao. "CIOs' Perspectives of Critical Success Factors in ERP Upgrade Projects." Enterprise Information Systems 1, no. 1 (February 2007): 129–38. https://doi.org/10.1080/17517570601088364.
[56] Orlicky, J.A. Material Requirements Planning, McGraw-Hill (1975), New York.
[57] Osman, M. R., Rosnah Mohd Yusuff, S. H. Tang, and Seyed Mohammadbagher Jafari. "ERP Systems Implementation in Malaysia: The Importance of Critical Success Factors," 2006.
[58] Pan, Shan L., and Jae-Nam Lee. "Using E-CRM for a Unified View of the Customer." Communications of the ACM 46, no. 4 (2003): 95–99.
[59] Plant, Robert, and Leslie Willcocks. "Critical Success Factors in International ERP Implementations: A Case Research Approach." Journal of Computer Information Systems 47, no. 3 (2007): 60–70.
[60] Purna Sudhakar, Goparaju. "A Model of Critical Success Factors for Software Projects." Journal of Enterprise Information Management 25, no. 6 (October 12, 2012): 537–58. https://doi.org/10.1108/17410391211272829.
[61] Ram, Jiwat, and David Corkindale. "How 'critical' Are the Critical Success Factors (CSFs)?: Examining the Role of CSFs for ERP." Business Process Management Journal 20, no. 1 (January 28, 2014): 151–74. https://doi.org/10.1108/BPMJ-11-2012-0127.
[62] Rosario, J.G (2000), 'On the leading edge: critical success factors in ERP implementation projects', BusinessWorld.
[63] Saade, Raafat George, and Harshjot Nijher. "Critical Success Factors in Enterprise Resource Planning Implementation: A Review of Case Studies." Journal of Enterprise Information Management 29, no. 1 (February 8, 2016): 72–96. https://doi.org/10.1108/JEIM-03-2014-0028.
[64] SARAVANAN, R., and C. SUNDAR. "ANALYSIS OF ERP IMPLEMENTATIONS," n.d.
[65] Schniederjans, Dara, and Surya Yadav. "Successful ERP Implementation: An Integrative Model." Business Process Management Journal 19, no. 2 (April 12, 2013): 364–98. https://doi.org/10.1108/14637151311308358.
[66] Seddon PB, Shanks G and Willcocks LP (2003) Introduction: ERP – the quiet revolution? In Second-Wave Enterprise Resource Planning Systems: Implementing for Effectiveness, pp 1–16, Cambridge University Press, Cambridge, UK.
[67] Shatat, Ahmad Saleh. "Critical Success Factors in Enterprise Resource Planning (ERP) System Implementation: An Exploratory Study in Oman." Electronic Journal of Information Systems Evaluation 18, no. 1 (2015): 36–45.
[68] Soja, Piotra. Success factors in ERP implementations: lessons from practice. Journal of Enterprise Information Management.19(4) (2006). 418-433
[69] Tarhini, Ali, Hussain Ammar, Takwa Tarhini, and Ra 'ed Masa'deh. "Analysis of the Critical Success Factors for Enterprise Resource Planning Implementation from Stakeholders' Perspective: A Systematic Review." International Business Research 8, no. 4 (March 25, 2015). https://doi.org/10.5539/ibr.v8n4p25.
[70] Yanhong, Zhang. "ERP Implementation Process Analysis Based on the Key Success Factors," 25–27. IEEE, 2009. https://doi.org/10.1109/IFITA.2009.426.
[71] Zouine, Abdesamad, and Pierre Fenies. "The Critical Success Factors of the ERP System Project: A Meta-Analysis Methodology." Journal of Applied Business Research 30, no. 5 (2014): 1407.

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