Master's Thesis

A Multi-Dimensional Model of Enterprise Resource Planning Systems Critical Success Factors: Design and Evaluation.

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2018

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A thesis/dissertation
submitted to the Graduate School of UNIST
in partial fulfillment of the
requirements for the degree of
Master of Science

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21. 06. 2018
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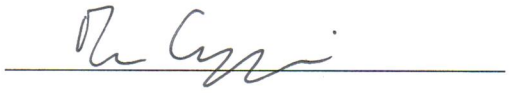
21. 06. 2018



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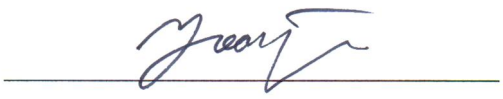

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Abstract:

This thesis studies Critical Success Factors (CSFs) of ERP (Enterprise Resource Planning) systems through an extensive literature review, and analyzes the found literature in terms of dimensionality of each paper (firm size, firm type, industry, deployment, etc.) to provide a model of corresponding CSFs for firms based upon their individual characteristics and creating a tool for practitioners and researchers alike. There is no published literature available which followed a similar approach in identification of the critical issues affecting ERP by dimensionality and there lies the originality of this study. For evaluation of this model, the researcher used two methods. First, evaluation against existing literature addressing a single particular dimension. Second, evaluation with a panel of experts in ERP implementation.

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Explanation of terms and abbreviations

ERP: Enterprise resource planning

CSFs: Critical success factors

BPO: Business process outsourcing

GIS: Gradual Implementation Strategy

OIS: Overall Implementation strategy

VS: Versus

CRM: Customer Resource Planning

BI: Business Intelligence

Ⅰ. Introduction

The implementation of enterprise resource planning systems is a widely spread. Most companies have already implementing or thinking of implementing, upgrading or changing their ERP systems. Normally, there are inherent risks to software implementation, however ERP systems are of a very delicate kind and there are very high stakes at this type of projects. This proves that managing carefully implementation is a must for companies to remain “alive”.

Critical success factors (CSFs) for ERP implementation or otherwise called key factors are those that matter the most during the implementation and that have to be addressed in order to succeeds. There is much literature available addressing case studies of how firms manage their implementation. There is much literature were surveys are made among ERP users, experts, and companies’ CIO and CEOs regarding what are the CSFs that apply. However, there is not a general consensus. Differences in rankings of importance have been found across companies, industries, nations, etc. This study aims to address these differences, by studying them and grouping them and find some trends by employing a literature review as a medium of data collection.

Chapter two of this study opens with a problem definition clarifying in detail the reason as to why this study is needed. Chapter three provides a description of the methodology followed and all the steps taken for data collection and analysis. Chapter four continues with the dimensional model developed as a result of this study and explains in detail the application/findings of each dimensionality found.

Chapter six demonstrates the use of this model by evaluating it by testing it against similar literature and exposing it to a panel of experts for feedback upon the accuracy and usefulness of the model. Chapter seven continues with the limitations found throughout this study, chapter eight discusses the conclusions reached and finally chapter nine closes this study with suggestions for future studies on this area.

II. Problem Definition

An Enterprise Resource Planning system or ERP system can be simply understood as a company-wide information system connecting all important functions of a company such as marketing, sales finance, and inventory. This type of integrated and comprehensive system has the potential to bring a series of benefits to firms such as quicker reaction to changes, reduced inventory and easier communication between business units. Naturally, implementation of ERP system or replacement of legacy systems

with ERP, became the norm across companies seeking to improve their productivity and competitiveness.

However, the implementation of an ERP system is a risky procedure that can prove to be very challenging. In doing so, companies have to deal with an investment of probably millions of dollars, a lengthy process entailing time and efforts from practically all departments who will have to collaborate together to make the implementation project a success. Firms often spend a considerable amount of time on deciding which ERP system is more appropriate, from what vendor to buy, whether or not to hire a consultant and which one and on what implementation strategy to follow.

Furthermore, the implementation of an ERP system often requires changes in the way business processes are carried out, meaning that employees will have to deal with the problems that this might bring, often frustration piles up among those employees who do not understand the reasons for the implementation or the logic behind the changes. Training is often required for all users and very frequently consultants are hired to ease the transition into the new system. These and many other aspects make the undertaking of an ERP system implementation a risky and resource demanding process.

Many scholars have tried to mitigate the risks involved in ERP system implementations by means of creating models or strategies using for instance fuzzy cognitive maps (Salmero & Lopez) fuzzy analytic network processes (Chang, Kuo, Wu, & HshiungTzengc , 2015) others have focused on the selection of an ERP software by using fuzzy analytical hierarchy processes (Ayağ & ÖzdemİR, 2007) and other techniques, while other researchers have focus on the implementation by studying up close case studies of companies that have gone through ERP implementation to pinpoint the most important aspects that are strongly related to implementation success or failure, they are called by various names: critical success factors, critical failure factors, drivers of success, key success factors or key implementation factors.

The literature shows us, that studies started to produce an average of the critical success factors of a particular dimension. Such as, scholars for instance became aware that differences in firm size will have a direct influence on what the resultants CSFs are. In other words, the nature of a firm can shift the critical success factors corresponding to it and what matters more on a small firm may have little or no significance for a large firm. A notable influx of research papers addressing CSF by firm size testifies to this phenomenon. Their findings give place to a better understanding of ERP implementation success on companies by size of the firm. (Leyh, 2016), (Ahmad & Cuenca, 2013)

Further studies focused on a different dimension: nationality of the firm. Scholars then became more interested on obtaining the average CSFs of companies within a country and obtain results by means of

surveys, or case studies across the country of interest. Such are the cases for instance India (Basu, Upadhyay, Das, & Dan, 2012) (Veena, 2013), Poland (Trąbka J., 2013) (Ziemba & Kolasa, 2015) China (Sun, Ni, & Lam, 2015) etc.

The results of these studies gave rise to a new stream of research, that aims to find and understand why were the findings not the same across different countries and if indeed they were. One more, and perhaps less unexpected discovery of this area of research produced academic literature that indicates that CSFs also are influenced by the type of industry or business a firm is in, and other have tried to related the CSFs to the economy or the culture of the country where the firm is in. (Moohebat, Asemi, & Jazi, 2010) (Shanks G. , et al., 2000) (Dezdar & Ainin, 2012)

Some studies have worked on the dimensionality of the critical success factors from an implementation strategy perspective, arguing that those companies that opt for a Gradual Implementation Strategy (GIS) work and those that opt for a more radical change as in Overall Implementation strategy (OIS) shared critical success factors up to a point but the nature of the implementation makes the stakeholders involve in every CSF different. (Zouaghi & Laghouag, 2012)

The entire literature brings one problem to practitioners and researchers alike. For practitioners, because they do not have a model that directly helps them to locate their firm among those dimensions (size, industry, country, etc.) to discern what CSFs are of importance to them and their firm during the implementation of ERP. For researchers because they could be adapting their risk forecasting models and their ERP selection models to a more customized level by understanding the target companies' dimensionality and therefore increasing the effectiveness of their models

This research inspects on the literature in an attempt to solve this problem and hopes to learn from the observations made by grouping the studies together.

III. Background and related works

Enterprise systems (ES) embody an important technology investment choice for firms and have been recognized in the practitioner and academic literature for their potential to improve business performance. (Akkermans, Bogerd, Yucesan, & van Wassenhove, 1999). ERP system implementation can bring up many benefits including financial benefits with literature showing evidence of improvements in profitability especially for early adopters of ERP systems. (Hendricks, Singhalb, & Stratman, 2007)

During an IT project many things can be competing for attention and determining priorities can be a hard task and even more so, to get all people in a team to pull in the same direction. That is precisely why CSFs have such an importance, since these essential areas of activity must have a good performance to achieve success on the project. The very idea of critical success factors was originally introduced with that name by D. Ronald Daniel in the 1960s (Daniel, 1961) and was made popular years later by John F. Rockart and Nancy S. Foster where they refine the definition into “key areas where "things must go right" for the business to flourish and for the manager's goals to be attained.” (Rockart & Forster, 1989)

Previous studies have tried to typify CSFs, by dividing them by their source: Industry CSFs, Competitive-Position or Peer CSFs, Environmental CSFs, Temporal CSFs, Management-Position CSFs or by their dimensions: Internal, external, monitoring, adapting. (Rockart & Forster, 1989)

Critical success factors have ever since been applied to all enterprise systems such as Business Intelligence (BI) where it is indicated that those organizations which address the CSFs from a business orientation approach will be more likely to achieve better results. (Yeoh & Koronios, Critical Success Factors for Business Intelligence Systems, 2010) literature has also documented BI specific critical success factors that industry partners, vendors or users have identified. (Hawking & Sellitto , 2010) and even come up with a framework of CSFs (Yeoh, Koronios, & Gao, 2009).

As for CRM systems (Customer Relationship Management Systems) strategies issues have been identified through case studies (Bull, 2003), and in general critical success factors for this type of system have been identified for the adoption phase (Hung, Hung, Tsai, & Jiang, 2010) and implementation phase where CSFs are organized organizational factors (champion, management support, resource), process factors (CRM strategy and CRM process) technological factors (complexity, compatibility, source systems, channel integration) and project factors (user participation and project team skills) (Kim, Pan, & Lee, 2002).

Critical success factors models for CRM Systems have also been developed by derivation from CSFs found in ERP systems implementation (Vinhas Da Silva & Rahimi , 2007) and even dimensionality has been addressed such as CSFs for CRM systems’ implementation in small and medium enterprises. (Wong, 2005)

Previous studies have tried to find similarities and differences across particular dimensions or have tried to get an understanding of the available literature up to that point. A similar work is that of Shaul & Tauber, were they performed a literature review of a decade, where they presented a comprehensive

taxonomy of CSFs in the area of ERP and mapped studies identifying them to different dimensions and facets of ERP system implementation. In their study they found out that the dimensions being studied regarding CSFs were based upon for instance: strategic versus technical, organization versus end user, cultural versus technological, global versus local, life cycle versus specific case and others. They however, did not provide information on what those CSFs were in each dimension, only mentioned how the found studies worked along those lines. (Shaul & Tauber, 2013)

A literature review around ERP in African countries found that effectively there are certain issues that are region related and provided recommendations as to how to avoid thus issues that can surface within the African context which once again displays the tendency of dimensionality in studies revolving around ERP implementation. (Manga Tobie , Atsa Etoundi, & Zoa, 2016)

Another similar study aims for a unified critical success factors model where the CSFs are divided along a matrix classified as been organizational (either strategic or tactical) or technological (either strategic or tactical). (Esteves-Sousa & Pastor-Collado, 2000)

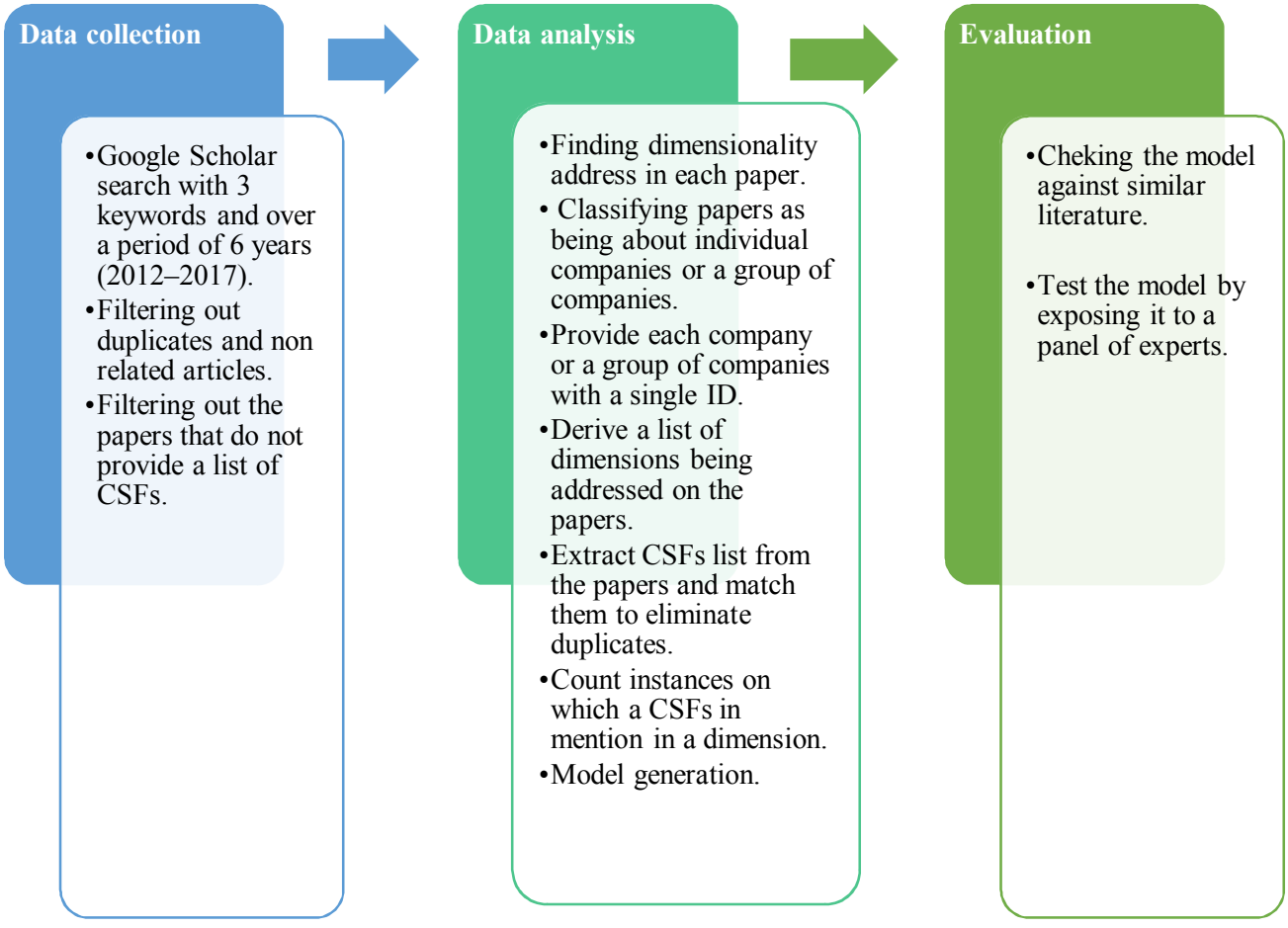
A considerable amount of research has been conducted into identification of CSFs, for ERP implementations (Holland & Light, 1999) (Sumner, 1999) and IT implementations projects as a whole (Reel, 1999) . Such factors typically include top management support, end user training and education, vendor partnership, vendor support, relations, interdepartmental collaboration, change management, communication, project team competence and composition etc. There is even a list made by managers of organizations that had recently done an ERP implementation to rank the CSFs in order of importance (Somers & Nelson, 2001)

Therefore, the need for this study, which not only identifies the dimensions but finds the related CSFs of each of them by using an extensive literature review and gaining insights on their studies. Other body of research revolves around finding the connections between the CSFs such is the work of (Akkermans & Helden, 2002)

IV. 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 between 2017-2018. It analyzes nearly 2000 articles published over a period of 6 years (2012–2017). In this study, articles from journals, book chapters, conference proceedings, and dissertations were identified, analyzed, and classified to find the information needed to answer the research problem. The following diagram depicts a flowchart with details on how this was done.

Figure 1: Research Methodology



Data collection

With the aid of Google Scholar, a comprehensive literature review of articles was performed in three rounds. The first-round specifications were: "ERP critical success factors" as keywords, with all the words, anywhere in the article and from the year 2012 to 2017. The second-round specifications were: "ERP failure factors" as keywords, with all the words, anywhere in the article and from the year 2012 to 2017. The last and third round included "ERP Project Evaluation" as keywords, with all the words, anywhere in the article and from the year 2012 to 2017. These keywords were selected based on the objectives of the present research and timeframe of six years was selected because it was considered sufficient and manageable. It was deemed sufficient to come with up to date information since ERP software and the technology related to it has been evolving over the years and it was presume necessary to cut off on older research. It was considered manageable given than a wider timeframe would have been time consuming.

Considering the entire 3 terms minus the duplicates there was a total of 1825 academic articles. This list was downsized further by excluding papers that were not related to the subject, papers that were related but did not focus on critical success factors, etc.

Selection criteria was based on whether the papers addressed a particular dimensionality such as for instance (country, company size, industries.) and if there was a list of CSFs provided with or without a ranking. The final list contained 87 articles and can be seen on Appendix 3.

Data analysis

The analysis of the resulting data was performed following these steps:

Step 1. Notes were taken for each research paper, accounting for the dimensionality addressed on each on them either implicitly or explicitly. For instance, the paper Critical Success Factors for ERP system upgrades–The Case of a German large-scale Enterprise (Leyh, 2014) upon reading it is observed that the company of the case study falls into several dimensions: Germany, energy sector, and large in size (implicit dimensions) developed country (implicit dimensions).

Step 2. Notes were taken upon whether the paper was a study on individual companies were each company is distinctively mentioned by name or alias. Or whether it was a paper based on a large number of anonymous companies of which little details is known that is the case of large survey papers with

dozens of companies. The first group is then said to have individual profiles and the second group is said to have compound profiles.

Step 3. A profile ID number is given to each individual profile and a single compound profile number is given to those companies whose information is provided as a group. Therefore, a paper with an individual profile for example: Enterprise information systems project implementation: A case study of ERP in Rolls-Royce ends up with one single ID number because a distinctive company is mentioned in the paper. On the other hand, the research paper Evaluating the Internal and External Factors Toward ERP Success: Examples from Bruneian Businesses (Seyal & Rahman, 2014) which contains the information of 45 Bruneian companies has also one single profile number because the companies are not presented individually.

Step 4. Deriving from the list of dimensions found on the research papers, those dimensions that were mentioned more often were selected: Size (large vs SMEs), deployment and development (On premise vs on the cloud) and offshore development, economic status of the firm's residence country (developed vs developing), sector (public vs private), type (manufacturing vs services) and industry (energy vs healthcare vs education).

Step 5. Extract the critical success factors that were pertinent to each profile on each paper by the exact name given by the authors. The names were then listed all together, and they were compiled or fused together if they were considered the same. The CSFs were considered to be the same one if they had very similar wording, but word collocation was different such is the case for example of: "Top management support and commitment" was deemed to be the same as "Top management commitment and support". They were considered same too if they were evidently addressing the same aspects of the implementation such are the cases of "Vanilla ERP" and "minimal customization". Those CSFs that did not match with any other CSFs in any other paper were left standing alone. Appendix 1 shows an example of how the names were matched and Appendix 2 contains the resulting CSFs.

Step 6. On this step the CSFs corresponding to each dimension were extracted and counted. On Appendix 3 the corresponding CSFs and research papers can be noted.

V. Results

The search for academic articles generated 87 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 system. Articles were excluded if they were not empirical studies published in English, with the exception of 2 academic paper written in Korean. To avoid duplication in the case of publication in two or more conference proceedings, only the article with the most findings was included, or the version that was published by an academic journal. This compilation of articles was carefully examined in light of common success factor constructs described in widely cited studies (Al-Mashari, 2003) (Holland & Light, 1999), (Somers & Nelson, 2001). This inspection yielded 63 CSFs in ERP implementations as listed in Appendix 2.

Model

The model proposed on this study uses the data collected from literature to determine the similarities or patterns of communality among them. They are mapped in a matrix on Figure 1. The following sections will cover the particulars of each dimension of the model in the same order they appeared in the figure.

The tables displayed in each dimension reflect only differences between divisions that were equal or superior to the 10%. At the end of this study, on appendix 4 the practitioner will find a manual of how to use this model to his/her convenience and according to the characteristics of the firm of interest. The manual was made by considering those factors that reported a 10% of incidence or more among the studied firms falling into a specific dimension and division. Also, those factors that only applied to individual divisions were considered. For example, those that only apply for public firms. The resultant tool for this model is indented to be a guideline.

Figure 2: Model Dimensions

Dimensions	Divisions
Economy	a. Developing countries b. Developed countries
Firm Size	a. Large b. SMEs
Sector	a. Manufacturing b. Services
Type	a. Public b. Private
Deployment and Development	a. On cloud b. On premise c. Offshore
Specifics	a. Healthcare institutions (hospitals, clinics, etc.) b. Education (Schools, universities, etc.) c. Energy (Oil, gas, nuclear energy, etc.)

Economy: Developing vs Developed countries

United Nations develops a report called World Economic Situation and Prospects (WESP) which employs statistical information about trends in various dimensions of the world economy. This report serves to group countries into categories of developed and developing countries. The composition of these groupings is intended to reflect basic economic country conditions. (United Nations, 2018). In this study the results of 2116 firms from developing countries and 940 from developed economies.

In the developing economies factors related to computer culture, IT maturity, and infrastructure take on greater importance as reflected on the high percentages for software development, testing and troubleshooting, “User training and education”, that is reflected by the nature of developing economies where ERP technology faces additional challenges in relation to economic, cultural, and basic infrastructure issues.

Additionally, “Project management” stands also tall in the list because firms with more experience on in process management are more likely to succeed with ERP. Developed countries have more

experience than developing nations in regard to ERP technology and that is how this factor shows significant difference in rankings between developed and developing nations. (Huang & Palvia, 2001)

Interestingly it seems, in the developed economies firms opt for having partnerships with vendors while in the developing economies, they have support from them mostly and partnerships are not form as often. The use of steering committees is significantly present among the developed economies but not so for the developing ones.

In general, these results seem to indicate the wide experience that developed economies do have with ERP implementation as they are early adopters of this type of systems.

Table 1: Developed versus Developing Economies

CSFs List	Developing	Developed	Difference
Project management	54%	97%	44%
Interdepartmental cooperation	0%	40%	40%
Use of a steering committee	0%	24%	24%
Project champion	3%	26%	23%
ERP treated as a program rather than a project	0%	23%	23%
Change management	41%	19%	22%
User training and education	53%	75%	21%
Careful package selection	36%	56%	20%
Clear goals and objectives	38%	57%	20%
Partnership with vendor	15%	33%	18%
Vendor and or consultant support	59%	43%	16%
Public sector procedures and processes	0%	15%	15%
Resources availability (financial, human and technological)	10%	25%	15%
software development, testing and troubleshooting	36%	25%	12%
End user involvement	40%	50%	10%

Firm size: Large Firms vs SMEs

This study found 30 profiles pertaining to 72 large companies worldwide and 20 profiles pertaining to 833 SMEs worldwide. Firm size is one of the most widely studies dimensions in the ERP implementation literature. The division remains between large firms and SMEs. According to the findings, there are some significant differences between them.

The differences between large firms CSFs and SMEs are many. For starters, "Legacy systems and infrastructure" has a lower ranking for smaller firms, since they usually do not have them.

Vendor support and implementation strategy score lower ranks for large firms since they tend to be more independent from vendors, very often performing in-house ERP development. Quite the contrary for SMEs who usually acquire ready-made ERP system as reflected on the biggest difference among them that is careful package selection being 63% more important for them, followed closely by software development, testing and troubleshooting.

Furthermore, SMEs heavily rely on the use of consultants, Monitoring and feedback, Vendor and or consultant support, Partnership with vendor and Implementation strategy.

The rankings are consistent with other studies comparing CSFs on the basis of firm size. (Aarabi, Mat Saman, Wong, Hossein Azadnia, & Zakuan, 2012) (Ahmad & Pinedo Cuenca, 2013).

Table 2: Large versus Small Medium Enterprises (SMEs)

CSFs list	Large Firms	Small Firms	Difference
Careful package selection	15%	79%	63%
Communication	81%	20%	60%
software development, testing and troubleshooting	4%	56%	52%
BPR and minimal customization	19%	67%	48%
Project team competence and composition	43%	90%	47%
Vendor and or consultant support	56%	100%	44%
Monitoring and feedback	7%	51%	44%
Project management	81%	42%	38%
End user involvement	21%	59%	38%
Implementation strategy	11%	40%	29%
Data accuracy, conversion	14%	40%	27%
ERP treated as a program rather than a project	0%	25%	25%
organizational culture	28%	53%	25%
Cloud-based data achieving	0%	25%	25%
Cloud based segregation of duties	0%	25%	25%
Compliance	3%	26%	23%
Use of a steering committee	6%	27%	21%
Interdepartmental cooperation	7%	27%	21%
Partnership with vendor	13%	27%	15%
User training and education	72%	59%	14%
Clear goals and objectives	43%	57%	13%
Proper reporting structure	0%	13%	13%
Legacy system and infrastructure	35%	25%	10%
Resources availability (financial, human and technological)	15%	25%	10%

Sector: Public vs Private organizations

The results of this comparison can be seen on table 7 reporting percentages for 870 private companies and 241 public firms. The differences inside this dimension have to do with context, the distinctive environment pertaining to each of them makes the difference as seen in other studies (Allen, 2002) (Holland C. P., 1999).

Very interestingly vendor and or consultant support was found in 99% of the private companies compared to 0% in the public sector. Among the very important factors for the public sector this study points to: Project management and Communication.

On the other hand, in the case of private firms the CSFs: Careful package selection, Monitoring and feedback, Partnership with vendor, Project team competence and composition, Software development, testing and troubleshooting etc. (as shown on table 7), are more important than for private firms.

This is confirmed by the literature (Hurbean, 2008) The differences among these CSFs can be explained by the bureaucratic structure that persists among the public sector, which can be beneficial for them since that provides stability, consistency and conformity with rules, but it can be very challenging when changes need to be implemented (Bannister, 2001) (Daft & Armstrong, 2012). Furthermore, the identified CSF are consistent with found weaknesses of public organizations such as “In depth knowledge due to specialization” within the functional department, Slow to respond to internal or external environment change, Slow decision-making due to hierarchy overload. (Daft & Armstrong, 2012)

Those are very important and perhaps are responding to the most important barrier found in public organizations bureaucratic culture. (Ebrahim & Irani, 2005) Public organizations have more complicated and intricated processes and that can be worsen by weak inter-departmental communication present in them in addition to the many legal and political requirements they have to deal with (Alves & Matos, 2011) These additional requirements tend to complicate business processes (Alves & Matos, 2011), (Kumar V. & Kumar, 2012)

Table 3:Private versus Public Firms

CSFs List	Public firms	Private Firms	Difference
Vendor and or consultant support	0%	99%	98%
Monitoring and feedback	0%	66%	66%
Careful package selection	6%	71%	64%
User training and education	8%	69%	61%
Data accuracy, conversion	0%	57%	57%
software development, testing and troubleshooting	0%	56%	56%
Project management	97%	42%	55%
Implementation strategy	1%	56%	55%
Change management	3%	43%	39%
Communication	62%	23%	39%
Project team competence and composition	68%	99%	31%
Interdepartmental cooperation	0%	27%	26%
Partnership with vendor	1%	27%	26%
Use of a steering committee	0%	26%	25%
ERP treated as a program rather than a project	0%	24%	24%
Resources availability (financial, human and technological)	0%	24%	24%
Compliance	0%	24%	24%
Cloud-based data achieving	0%	24%	24%
Cloud based segregation of duties	0%	24%	24%
Legacy system and infrastructure	7%	24%	17%
organizational culture	37%	51%	14%
Proper reporting structure	0%	12%	12%
Rewards, Recognition & Retention	7%	18%	11%

Type: Manufacturing and services

The results of this comparison can be seen on table 8 reporting percentages for 61 companies in manufacturing and 175 in services.

Data accuracy, conversion, change management implementation strategy, software development testing and troubleshooting, Monitoring and feedback, BPR and minimal customization, Vendor and or consultant support score higher percentages for those companies in services which can be probably because most of the available ERP software is readily made for manufacturing firms.

Careful package selection, organizational structure, legacy systems and infrastructure, Partnership with vendor, External environment. Project Champion, Interdepartmental cooperation, use of a steering committee are the most important factors for manufacturing firms again as a reflection of them having ERP for longer time in other words, that is an expected outcome because manufacturing companies are early ERP adopters which typically used complex and very customized systems. (Eclipse DXC Technology Company, 2017)

Notably, there were some CSFs that were only found among manufacturing firms with a 3% for all of the following: Cost planning and collection on cost centers, credit limits check on corporate level, closed loop for demand and supply chain planning , IS-Oil basic functionality implemented, Cost planned and collection on cost centers and for defined measures, Closed loop for asset management lifecycle, Complete finances for the whole company, Budgeting for Fiscal year for the whole company on a single, integrated basis, Centralized payment (in-house cash), Complete inventory (volumes and valuation), Closed purchasing loop (from requisition to payment), Integrated and harmonized processes (from order to cash), Closed loop order-to-cash including service station network, Well level production and revenue analysis, Supply chain partner selection. [1]

[1] Not shown on table 8 due to limited space.

Table 4: Manufacturing versus Service Oriented Firms

CSFs List	Services	Manufacturing	Difference
software development, testing and troubleshooting	89%	15%	74%
Monitoring and feedback	87%	21%	66%
Implementation strategy	90%	26%	64%
BPR and minimal customization	90%	33%	57%
Project management	3%	61%	57%
Rewards, Recognition & Retention	88%	31%	57%
Vendor and or consultant support	87%	31%	56%
Change management	93%	39%	54%
End user involvement	91%	38%	54%
organizational culture	3%	56%	52%
Data accuracy, conversion	89%	39%	49%
Careful package selection	4%	52%	48%
Communication	91%	44%	47%
Legacy system and infrastructure	5%	51%	46%
Top management support and commitment	94%	52%	42%
organization's structure	1%	34%	34%
external environment	1%	31%	31%
Project team competence and composition	92%	64%	28%
Clear goals and objectives	91%	64%	27%
Partnership with vendor	2%	30%	27%
Resources availability (financial, human and technological)	3%	30%	26%
User training and education	93%	67%	25%
Project champion	1%	26%	25%
Interdepartmental cooperation	1%	20%	19%
Use of a steering committee	1%	16%	15%

Deployment & Development

There are 5 major deployment models for ERP software: Hosted, on premise, on cloud (public or private) and hybrid. Each of them responds to different needs and has different issues. On the results there only surfaced cases of cloud deployment. As for software development, it can be done in-house, on-shore or offshore. On the results of this study there were only findings related to offshore development. Table 9 displays the findings on these two.

This study includes the CSFs mentioned for 1 academic paper covering 208 companies using cloud ERP and 2 academic papers covering 12 companies each that were using offshore development.

The list differences can be expected as for example, language is of importance offshore but not on the cloud. Scalability is a major issue offshore, because the firm needs to be sure of finding enough people to recruit.

Vendor and or consultant support is of course only found in the cloud deployment because otherwise the people in charge would be the offshoring company, therefore we have that in Offshore development there is “Offshoring Partnership” as a factor.

Factors that are unique to Offshore are: Language, Personnel Split Between Onsite/Offshore, Scalability, Choice of work to be offshore, Onsite Offshore Norms, Offshoring Partnership

Table 5:Cloud Deployment

CSF list for Cloud deployment
Top management support and commitment
Careful package selection
End user involvement
User training and education
Compliance
Project team competence and composition
Vendor and or consultant support
Cloud-based data achieving
Cloud based segregation of duties

Table 6:Offshore Development

CSF list for offshore development
Clear goals and objectives
Top management support and commitment
organizational culture
Language
Personnel Split Between Onsite/Offshore
Project management
Legacy system and infrastructure
Careful package selection
User training and education
Communication
Scalability
Project team competence and composition
Change management
Choice of work to be offshore
Onsite Offshore Norms
Offshoring Partnership

Specifics

Healthcare

ERP for healthcare was considered separated from the rest of dimensions because of the richness of literature available on that particular topic. The findings of CSF are consistent with a previous study concentrated solely on healthcare. The study identifies the CSFs for healthcare information system (HISCSFs) from 1996 to 2015. (Seed Ahmed, Ahmad, & Othman, 2016)

For this study cases around 7 healthcare institutions were found. Results can be seen below on table 11.

Table 7:Healthcare companies

HEALTHCARE
Critical Success Factors
End user involvement
Top management support and commitment
organizational culture
User training and education
Implementation strategy
Change management
Resources availability (financial, human and technological)
Rewards, Recognition & Retention
BPR and minimal customization
Clear goals and objectives
Project management
Legacy system and infrastructure
Project team competence and composition

Education

Organizations working in education such as schools and universities have been transitioning into a more "company-like" environment. Educational institutions just like private firms are faced with a need to strengthen their competitive edge and obtain more students. Students expect to receive better access to self-service transactions, and convenient access to information. Additionally, employees are demanded better performance which calls for reporting, measuring and tracking their activities. Just like that educational institutions are faced with this "forced" transition of behaving like a firm and employees can resent this mayor change in the essence of what they do, which goes beyond simple change in the information system, it goes deeper, and calls for an entire change in the culture of the organization, which could explain "change management" at the very top of the list and organizational culture among the mentioned CSFs.

Education is being considered separately because of their uniqueness, they have a combination of unique characteristics: complexity of purpose, limited measurability of outputs, both autonomy and dependency with regard to wider society, and diffuse structures of authority and internal fragmentation. (Lockwood & Davies, 1985) very different from corporations which can have only some of these characteristics. (Pollock, 2004) For this study cases around 5 educational institutions were found. Results can be seen below on table 12.

Table 8: Education companies

EDUCATION
Top management support and commitment
Change management
Communication
Clear goals and objectives
Project management
Legacy system and infrastructure
User training and education
Project team competence and composition
BPR and minimal customization
organizational culture
Careful package selection
End user involvement
software development, testing and troubleshooting
Compliance
Partnership with vendor
Use of a steering committee

Energy

There is no literature addressing CSFs in the energy industry as a whole. However, it was very evident from the factors found in the available articles that the energy sector, here referring to companies dealing with oil, gas and nuclear energy, have very particular needs that distinguishes them from the rest of dimensions such as "well level production and revenue analysis" or "IS-oil basic functionality implemented" which are unique to this type of firms. For this study cases around 11 energy institutions were found. Results can be seen below on table 13.

Table 9:Energy companies

Type	ENERGY
Shared	Top management support and commitment
Shared	User training and education
Shared	Communication
Shared	Change management
Shared	Clear goals and objectives
Shared	Project champion
Shared	Data accuracy, conversion
Shared	Project team competence and composition
Shared	BPR and minimal customization
Shared	organizational culture
Shared	Project management
Shared	Legacy system and infrastructure
Shared	Careful package selection
Shared	Interdepartmental cooperation
Shared	End user involvement
Shared	Vendor and or consultant support
Shared	Resources availability (financial, human and technological)
Shared	Partnership with vendor
Shared	Use of a steering committee
Shared	software development, testing and troubleshooting
Shared	Monitoring and feedback
Shared	Implementation strategy
Shared	Rewards, Recognition & Retention
Shared	external environment
unique	Cost planning and collection on cost centers
unique	credit limits check on corporate level
unique	closed loop for demand and supply chain planning
unique	IS-Oil basic functionality implemented
unique	Cost planned and collection on cost centers and for defined measures
unique	Closed loop for asset management lifecycle
unique	Complete finances for the whole company.
unique	Budgeting for Fiscal year for the whole company on a single, integrated basis.
unique	Centralized payment (in-house cash).
unique	Complete inventory (volumes and valuation).

unique	Closed purchasing loop (from requisition to payment).
unique	Integrated and harmonized processes (from order to cash).
unique	Closed loop order-to-cash including service station network.
unique	Well level production and revenue analysis.

Tool for practitioner

A guideline for practitioners was developed as a result of all the analysis of the tables. The model is supposed to aid on the making of a list of CSFs that applies to the company of interest. It will guide the practitioner step by step about which CSFs to add to that list, based upon the characteristics of the firm. Every time a CSF appears to fit the list, the practitioner can give that CSF one more point. In the end, based upon how many points each CSFs has, they can be rank them in order of importance or relative interest to that particular company.

First the practitioner must locate the target company on a base dimension. The base dimension can be Healthcare, Energy, or Education. Depending upon which base dimension the firm falls into, then the corresponding CSFs seen on the tables have to be added. If the company does not relate to Healthcare, Energy, or Education then the practitioner must select among manufacturing and services. Once this is done, then the next step is selecting the type of economy that the country in which the company resides has. Then select the size of the firm between large and SMEs. The last step is to add those CSFs that are related to cloud deployment or offshore development if those apply.

It is possible for a CSF to appear more than once, in that case, a point system can apply, the more times is mentioned a CSF, the more related to the success of the implementation of a specific firm.

A more detail manual can be found in the Appendix 4.

VI. Evaluation

Several methodologies were considered for the evaluation of this model and two were selected. First, a case study following a top bottom approach has been chosen. This evaluation will look at different case studies and verify if the model actually can predict what CSFs are highlighted in each case.
The second evaluation method is a survey of experts' opinion, to verify if the model is accurate and useful.

Evaluation against similar literature:

An evaluation of the model comparing against similar literature shall provide proof of whether the model is actually applicable to real case studies.

For example, a study by Cyrus & Vaezi Nejad identified the most influential Critical Success Factors (CSFs) from each dimension of Hofstede cultural dimensions based upon Iran's scores. According to their findings Iran's highest ranked dimension: Uncertainty Avoidance, has high influence on "clear and defined goals and objectives", "organizational support" and "minimal customization". (Cyrus & Vaezi Nejad , 2011). Which is consistent with the findings of this study where members from cultures with such characteristics try to be more involved and supported during the process to cope with the uncertainty.

Another research article comparing two case studies of ERP systems implementation, one in Australia and one in China explaining the differences between the Australian and Chinese cases based upon their culture. (Shanks B. , et al., 2000) In their study only the case in Australia reported having a project champion and having "change management" as a CSFs which resonates with the idea present in my study where "change management" and "project champion" are more important in countries where there is high uncertainty avoidance, high individualism, and low power distance such as the case of Australia which is exactly the opposite to China, that scores low in individualism, has low uncertainty avoidance and high power distance.

More in detail, in that article we have a Chinese company that manufactures elevators (ElevatorCo), and an Australian company (Oilco), that refines and sells oil. According to the article the resultant CSFs for ElevatorCo are: Top management support, balanced project team, external expertise, project management, clear goals, data accuracy, education and training on the other hand, the CSFs for OilCo are: Top management support, presence of a champion, balanced project team, best people full-time, balanced project team, minimal customization and change management.

Most of it, is in accordance with our model, since according to it, a manufacturing firm in China, a developing economy, with very high-power distance and masculinity will have to pay special attention to CSFs like: Top management support, external expertise, project management, data accuracy, education and training. While a firm in Australia, a developed nation, with high individualism and masculinity will have to focus more on: Change management and the presence of a champion.

Experts opinion

An interviewed with a panel of experts of ERP systems implementation. All 3 experts have worked in different implementation projects in Costa Rica and other countries in Latin America. A description of their experience on the subject can be seen on table 13.

Table 10:Experts Panel Description

Expert 1	SAP Consultant and Project analyst for 7 years
Expert 2	ERP Implementation Consultant with more than 10 years of experience
Expert 3	Finance BPO Manager with 18 years of experience with systems analysis and implementations

Expert 1:

- Suggested to add one more dimension: the experience of the organization in Project management.
- Commented that final results of an implementation are greatly affected by the phases of Discovery and Blueprint and that the more time and resources are spent on this phase, the better the final result.

Expert 2:

- Recommended that for a smooth implementation to utilize for instance PMI to smooth differences in companies. However, I would definitely use this model to get a better idea and be prepared."

Expert 3:

- Having experience of working in a different country for an implementation in the public sector indicated that it was a completely different thing because of the political factors that increase the external variables of the implementation. Moreover, I would like to highlight the importance of the top management support. If this is not there, it is much more difficult to succeed on the project."

Moreover, all experts agreed that they will used the information from the model since they find it useful and agreed that all the dimensions covered by the model do impact the resultant CSFs and the model reflects that.

VII. Limitations

Methodological Limitations:

Despite this research reaching its objectives, there were some unavoidable circumstances that impose limitations on this study. There were some studies that even though did appear on the search for articles could not be included for distinctive reasons: First, language was an important barrier as there were papers that were written in languages different than English (Chinese, Russian, Arabic, to mention

some). Second, there was a number of papers that were not accessible for free, and such papers were excluded for further evaluation.

Model limitations:

One of the important limitations of this model was the restricted access to literature, since a small number of papers were listed on the Google Scholar search, but their link was deemed broken or the file with the research paper had been removed from the website. This limitation reduced in some degree the available number of research articles for evaluation and creation of the model. Beside the CSFs identified there may be other issues that need to be explored as well. This study can be enhanced by continuing on it on the years to come as more scholarly material is added.

VIII. Conclusion & Practical implications

The first and most important practical implication of this study is that, by identifying CSFs for different dimensions, managers are able to better prioritize and have a higher chance at implementing ERP systems with success.

Secondly ERP vendors and consultants can learn from this study to better target their products and direct their implementation efforts being better able to assess the needs of the company in question.

Third, this model can be of guidance for future academic studies on the ranking, modelling or risk assessment of CSFs in ERP implementation.

Based on the findings, several conclusions were formulated and are presented below.
First, the results of this paper can aid practitioners and academicians alike. The model presented in this study alongside the lessons learnt from it, can help practitioners with insights about how to better understand and carry on with implementation of ERP systems successfully based upon the characteristics of the target firm. More specifically, the CSFs that can aid or hamper the success of the implementation. Furthermore, this framework can assist researchers working on this topic particularly around the areas of case studies, strategy making and validation.
Second, I learnt from the model that dimensions such as firm size, economy, whether the firm is public or private or the particular sector to which it belongs, and the specifics related to the deployment and development of the ERP system can shape the CSFs that apply to that company's software implementation.

IX. Discussion

Most of the results found in this study, are a reflection of previous studies focusing on specific dimensions or can be explained logically by the characteristics and circumstances surrounding certain types of firms, such is the case of bureaucracy around public companies slowing change and decision making. However, one of them was contradictory with previous literature and could not be explained in a logic manner.

A previous study on the differences between developed and developing economies indicated that project management is of similar importance for companies from both developing and developed countries. (Mooheba, Asem, & Jazi, 2010) but that is not congruent with the results found of 54% of firms in developed countries reporting it as a CSF versus 97% in developed countries that is a 44% of difference between the two that is left unaccounted for.

For future studies it would be interesting to consider quantitative surveys across the studied dimensions in order to receive a more general result. It would be more value-achieving to combine the results of qualitative and quantitative research later on. Furthermore, this same type of study can be applied to other systems such as CRM and BI.

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Appendix 1: Example of name matching of CSFs

Critical Success Factors from the articles	**Resultant CSF (Matched)**
Involvement of Process Owners	end user involvement
SMEs Process Owners' interaction	end user involvement
User Involvement	end user involvement
Identification of customer needs	end user involvement
Positive customer satisfaction	end user involvement
Stakeholders Management	end user involvement
User participation	end user involvement
User involvement	end user involvement
Users involvement	end user involvement
Client consultation	end user involvement
Poor user involvement	end user involvement
User satisfaction	end user involvement
involvement of end users and stakeholders	end user involvement

Appendix 2: Resulting Critical Success Factors

#	RESULTING CRITICAL SUCCESS FACTORS LIST
1	Clear goals and objectives
2	Top management support and commitment
3	Organizational culture
4	Language
5	organization's structure
6	Personnel Split Between Onsite/Offshore
7	Project management
8	Legacy system and infrastructure
9	Careful package selection
10	Interdepartmental cooperation
11	End user involvement
12	Business size
13	software development, testing and troubleshooting
14	User training and education
15	Communication
16	Compliance
17	Scalability
18	Monitoring and feedback
19	Project champion
20	Implementation strategy
21	Project team competence and composition
22	Vendor and or consultant support
23	Change management
24	Resources availability (financial, human and technological)
25	Partnership with vendor
26	Data accuracy, conversion
27	Rewards, Recognition & Retention
28	BPR and minimal customization
29	Role of government support
30	Use of a steering committee
31	external environment
32	Choice of work to be offshore
33	ERP treated as a program rather than a project
34	Identification of processes extended interface
35	Business relationship with OEM
36	Role in demand and material planning
37	Well system protection
38	Cost planning and collection on cost centers
39	credit limits check on corporate level
40	closed loop for demand and supply chain planning
41	IS-Oil basic functionality implemented
42	Cost planned and collection on cost centers and for defined measures
43	Closed loop for asset management lifecycle
44	Complete finances for the whole company.
45	Budgeting for Fiscal year for the whole company on a single, integrated basis.
46	Centralized payment (in-house cash).
47	Complete inventory (volumes and valuation).
48	Closed purchasing loop (from requisition to payment).
49	Integrated and harmonized processes (from order to cash).
50	Closed loop order-to-cash including service station network.
51	Well level production and revenue analysis.
52	Value Chain Connectivity
53	Supply chain partner selection
54	Public sector procedures and processes
55	Proper reporting structure
56	Onsite Offshore Norms
57	Offshoring Partnership
58	Cloud-based data achieving
59	Cloud based segregation of duties
60	Frozen information requirements
61	Identified government processes
62	Cooperation with research centers
63	development of requirement specification

Appendix 3: Information of the selected literature

Paper ID	Title	Profile type	Number of firms	Dimensions identified	Profile(s) ID	Citation
1	**A comparative study on the conceptual and contextual perception about CSF for ERP adoption in the SMES**	Individual	5	SMEs, India Manufacturing	1	Bharathi, S. Vijayakumar & Parikh, Shrikant. (2012). A Comparative Study on the Conceptual and Contextual Perception About CSF for ERP Adoption in the SMEs.
2	**Critical Success Factors in Enterprise Resource Planning (ERP) System Implementation: An Exploratory Study in Oman**	Compound	19	Oman	2	Shatat, Ahmad. (2015). Critical Success Factors in Enterprise Resource Planning (ERP) System Implementation: An Exploratory Study in Oman.
3	**A step-by-step performance assessment and improvement method for ERP implementation: Action case studies in Chinese companies**	Compound	3	China, medium and large firms	3	Sun, H. (n.d.). A step-by-step performance assessment and improvement method for ERP implementation: Action case studies in Chinese companies. Computers in Industry. Retrieved 2015.
4	**Implementation of fashion ERP systems in China: Case study of a fashion brand, review and future challenges**	Individual	1	manufacturing, fashion, large firm, China	4	Choi, T. (n.d.). Implementation of fashion ERP systems in China: Case study of a fashion brand, review and future challenges. International Journal of Production Economics. Retrieved 2013.
5	**An investigation of the critical success factors of IT projects in Saudi Arabian public organizations**	Compound	Unknown	Saudi Arabia,Public	5	Abdulaziz I. Almajed and Pam Mayhew (2013), "An Investigation of the Critical Success Factors of IT Projects in Saudi Arabian Public Organizations," IBIMA Business Review, Vol. 2013 (2013), Article ID 260919, DOI: 10.5171/2013.260919
6	**An approach to identify issues affecting ERP implementation in Indian SMEs**	Compound	Unknown	Indian SMEs	6	BASU, Rana et al. An approach to identify issues affecting ERP implementation in Indian SMEs. Journal of Industrial Engineering and Management, [S.l.], v. 5, n. 1, p. 133-154, june 2012. ISSN 2013-0953. Available at: <http://www.jiem.org/index.php/jiem/article/view/416/276>. Date accessed: 12 june 2018. doi:http://dx.doi.org/10.3926/jiem.416.
7	**Method of evaluating the impact of ERP implementation critical success factors – a case study in oil and gas industries**	Individual	2	Oil and gas industry, Serbia, large	7	Gordana Gajic, Stevan Stankovski, Gordana Ostojic, Zdravko Tesic & Ljubomir Miladinovic (2012) Method of evaluating the impact of ERP implementation critical success factors – a case study in oil and gas industries,Enterprise Information Systems, 8:1, 84-106, DOI: 10.1080/17517575.2012.690105
8	**Identifying critical success factors for ERP in SMEs through a case study**	Individual	1	SME, india, retails metallic food packaging	8	Bansal, V. (2013). Identifying Critical Success Factors for ERP in SMEs through a Case Study. International Journal of Future Computer and Communication, 2(5).
9	**Examining successful erp projects in middle-east and south-east asia**	Compound	Unknown	Iran, Malasya	9 and 10	Dezdar, S., & Ainin, S. (2012). Examining Successful ERP Projects in Middle-East and South-East Asia . American Journal of Scientific Research .
10	**Strategic and tactical factors for successful ERP projects: insights from an Asian country**	Compound	31	Iran, manufacturing,large, service sector, and also the mining sector	11	Shahin Dezdar, (2012) "Strategic and tactical factors for successful ERP projects: insights from an Asian country", Management Research Review, Vol. 35 Issue: 11, pp.1070-1087, https://doi.org/10.1108/01409171211276945
11	**Critical success factors for ERP implementation in a Fortis hospital: an empirical investigation**	Individual	1	Hospital, Indian, large	12	Poonam Garg, Divya Agarwal, (2014) "Critical success factors for ERP implementation in a Fortis hospital: an empirical investigation", Journal of Enterprise Information Management, Vol. 27 Issue: 4, pp.402-423, https://doi.org/10.1108/JEIM-06-2012-0027
12	**Factors influencing ERP implementation in retail sector: an empirical study from India**	Compound	Unknown	Indian , Retail	13	Poonam Garg, Atul Garg, (2014) "Factors influencing ERP implementation in retail sector: an empirical study from India", Journal of Enterprise Information Management, Vol. 27 Issue: 4, pp.424-448, https://doi.org/10.1108/JEIM-06-2012-0028
13	**Compilation of critical success factors in implementation of enterprise systems: a study on Indian organisations**	Compound	300	Indian	14	Ahmad, Naim & Haleem, Abid & Syed, Asif. (2012). Compilation of Critical Success Factors in Implementation of Enterprise Systems: A Study on Indian Organisations. Global Journal of Flexible Systems Management. 13. 217-232. 10.1007/s40171-013-0019-8.
14	**An empirical study on critical failure factors for enterprise resource planning implementation in Indian retail sector**	Compound	Unknown	Indian,retail	15	Poonam Garg, Atul Garg, (2013) "An empirical study on critical failure factors for enterprise resource planning implementation in Indian retail sector", Business Process Management Journal, Vol. 19 Issue: 3, pp.496-514, https://doi.org/10.1108/14637151311319923
15	**Key success factor analysis for e-SCM project implementation and a case study in semiconductor manufacturers**	Individual	2	Taiwan, manufaturing, semiconductor, large	16	Bang-Ning Hwang, Ta-ping Lu, (2013) "Key success factor analysis for e-SCM project implementation and a case study in semiconductor manufacturers", International Journal of Physical Distribution & Logistics Management, Vol. 43 Issue: 8, pp.657-683, https://doi.org/10.1108/IJPDLM-03-2012-0062
16	**User satisfaction as the foundation of the success following an ERP adoption: an empirical study from Latin America**	Compound	49	Latin America	17	Maldonado, M., & Sierra, V. (2013). User Satisfaction as the Foundation of the Success Following an ERP Adoption: An Empirical Study from Latin America. International Journal of Enterprise Information Systems, 9(3).
17	**A novel model to implement ERP based on dynamic capabilities: A case study of an IC design company**	Individual	1	manufacturing,Taiwan, large firm	18	Tsung-Sheng Chang, Hsin-Pin Fu, Cheng-Yuan Ku, (2015) "A novel model to implement ERP based on dynamic capabilities: A case study of an IC design company", Journal of Manufacturing Technology Management, Vol. 26 Issue: 7, pp.1053-1068, https://doi.org/10.1108/JMTM-12-2013-0185
18	**Towards the Success of ERP Systems: Case Study in Two Moroccan Companies**	Individual	2	Company Alpha Moroccan, costruction multinational,large and Company Beta is agricultural and large	19-20	Bighrissen, Brahim & Ettamiri, El Mehdi & Cherkaoui, Chihab. (2013). Towards the Success of ERP Systems: Case Study in Two Moroccan Companies. Journal of Enterprise Resource Planning Studies. 1-17. 10.5171/2012.731113.
19	**Critical Success Factors for ERP system upgrades–The Case of a German large-scale Enterprise**	Individual	1	German,large, service sector energy industry (electricity, gas, water,heat)	21	C. Leyh, "Critical success factors for ERP projects in small and medium-sized enterprises - The perspective of selected German SMEs," 2014 Federated Conference on Computer Science and Information Systems, Warsaw, 2014, pp. 1181-1190.
20	**Issues of ERP upgrade in public sectors: A case study**	Individual	1	Collier County Public Schools (CCPS) is a preK-12 educational institution, public, USA	22	Scheckenbach T., Zhao F., Allard E., Burke J., Chiwaki K., Marlow S. (2014) Issues of ERP Upgrade in Public Sectors: A Case Study. In: Kurosu M. (eds) Human-Computer Interaction. Applications and Services. HCI 2014. Lecture Notes in Computer Science, vol 8512. Springer, Cham

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Appendix 3: Information of the selected literature (cont.)

21	**ERP in Project-Driven Organizations: A Case-Study from IT Industry in Poland**	Individual	1	Poland,large, services	23	Trąbka J., Soja P. (2013) ERP in Project-Driven Organizations: A Case-Study from IT Industry in Poland. In: Wrycza S. (eds) Information Systems: Development, Learning, Security. SIGSAND/PLAIS 2013. Lecture Notes in Business Information Processing, vol 161. Springer, Berlin, Heidelberg
22	**The impact on ERP implementation by leadership and organisational culture: a case analysis**	Individual	1	USA,large,services, healthcare	24	Bourrie, D. M., Sankar, C. S., & McDaniel, B. (2012). The impact on ERP implementation by leadership and organisational culture: a case analysis. International Journal of Information Systems and Change Management, 6(2).
23	**Critical success factors of enterprise resource planning implementation in construction: Case of Turkey**	Compound	Unknown	Turkey, Construction	25	Ozorhon, Beliz & Cinar, Emrah. (2015). Critical Success Factors of Enterprise Resource Planning Implementation in Construction: Case of Turkey. Journal of Management in Engineering. 31. 04015014. 10.1061/(ASCE)ME.1943-5479.0000370.
24	**Impact of ERP Implementation at Malaysian SMEs: Analysis of Five Dimensions Benefit**	Compound	84	SME,Malaysia	26	Mirbagheri, F.A., & Khajavi, G. (2013). Impact of Erp Implementation at Malaysian Smes: Analysis of Five Dimensions Benefit.
25	**Learning from a failed ERP implementation: The case of a large South African organization**	Individual	1	Large, South African	27	Ramburn, Anjali & Seymour, Lisa & Gopaul, Avinaash. (2013). Learning From a Failed ERP implementation: The Case of a Large South African Organization. Proceedings of the 4th International Conference on IS Management and Evaluation: ICIME 2013. 215.
26	**Examining health information systems success factors in Uganda's Healthcare System**	Compound	Unknown	SMEs in Healthcare, Uganda, Public and Private	28	Namakula, S., & Kituyi, G. M. (2014). Examining(Health(Information(Systems(Success(Factors(in(Uganda's(Healthcare(System. The Journal of Global Heatlhcare Systems, 4(1).
27	**ERP Implementation in a Developing World Context: a Case Study of the Waha Oil Company, Libya**	Individual	1	Large, Libya,Oil.	29	Akeel, Hosian and Wynn, Martin G (2015) ERP Implementation in a Developing World Context: a Case Study of the Waha Oil Company, Libya. eKnow 2015 7th International Conference on Information, Process and Knowledge Management. pp. 126-131. ISSN 2308-4375
28	**Application Integration: Enterprise Resource Planning (ERP) Systems in the Hospitality Industry. A Case Study in Portugal**	Individual	1	Hospital, Portugal	30	Paula Serdeira Azevedo, Carlos Azevedo, Mário Romão,Application Integration: Enterprise Resource Planning (ERP) Systems in the Hospitality Industry. A case study in Portugal,Procedia Technology,Volume 16,2014,Pages 52-58,
29	**Reexamining critical success factors for enterprise system adoption in transition economies: Learning from Polish adopters**	Compound	144	Poland	31	Piotr Soja (2015) Reexamining Critical Success Factors for Enterprise System Adoption in Transition Economies: Learning from Polish Adopters, Information Technology for Development, 22:2, 279-305,
30	**Implementing ERP in a Challenging Environment: The Case of a Palestinian Telecom Company**	Individual	1	Palestinian,emerging state,services,large	32	Anaya, Luay & Olsen, Dag. (2014). Implementing ERP in a Challenging Environment: The Case of a Palestinian Telecom Company. Proceedings of the 8th European Conference on Information Management and Evaluation, ECIME 2014.
31	**Risk factors framework for information systems projects in public organizations-insight from Poland**	Compound	144	Public, Poland	33	E. Ziemba and I. Kolasa, "Risk factors framework for information systems projects in public organizations - insight from Poland," 2015 Federated Conference on Computer Science and Information Systems (FedCSIS), Lodz, 2015, pp. 1575-1583.
32	**An exploration study to find important factors influencing on enterprise resource planning**	Individual	1	Iran,large,automaker(manufacturing)	34	Azad, Naser & Shadmanfard, Atieh & Foad Zarifi, Seyed. (2013). An exploration study to find important factors influencing on enterprise resource planning. Management Science Letters. 3. 2405-2410. 10.5267/j.msl.2013.08.027.
33	**Success factors of ERP implementation in SMEs in Malaysia**	Compound	107	SMEs,Malasya	35	Mirbagheri, F.A. (2012). Success Factors of Erp Implementation in Smes in Malaysia.
34	**Critical success factors for offshoring of enterprise resource planning (ERP) implementations**	Compound	12	Companies in Switzerland offshoring ERP in India, Fortune 500 companies,large	36	R. Chauhan, A. M. Sherry and V. Bhat, "Critical success factors for Offshoring of Enterprise Resource Planning (ERP) implementations — US experience," 2011 International Conference on Recent Trends in Information Technology (ICRTIT), Chennai, Tamil Nadu, 2011, pp. 1308-1312.
35	**Relevance of ERP Implementation and Critical Success Factors in SMEs of Developing Countries**	Compound	10	SMEs,Iran	37	Aarabi, M., Ghafoorian, H., & Saman, M. Z. (2014). Relevance of ERP Implementation and Critical Success Factors in SMEs of Developing Countries. International Journal of Scientific & Engineering Research, 5(9).
36	**Analysis of success factors in the Implementation of ERP system in Research Institute.**	Individual	1	Indonesia,National Nuclear Energy Agency in Indonesia, or BATAN	38	Budi, Indra & Rafur, H. (2017). Analysis of success factors in the implementation of ERP system in research institute. Journal of Theoretical and Applied Information Technology. 95. 2830-2839.
37	**Compliance, network, security and the people related factors in cloud ERP implementation**	Compound	208*	SMEs India , Cloud ERP	39	Gupta, S., & Misra, S.C. (2016). Compliance, network, security and the people related factors in cloud ERP implementation. Int. J. Communication Systems, 29, 1395-1419.
38	**ERP solutions between success and failure**	Individual	2	Companiy A:Airline North America and Europe based, Company B (IT Equipment & Software Integrator, Romania) both large firms	40-41	Stanciu, V & Tinca, A. (2013). ERP solutions between success and failure. Accounting and Management Information Systems. 12. 626-649.
39	**Factors affecting the ERP implementation in Indian retail sector: A structural equation modelling approach**	Compound	Unknown	Indian, retail (services)	42	Poonam Garg, Ajay Chauhan, (2015) "Factors affecting the ERP implementation in Indian retail sector: A structural equation modelling approach", Benchmarking: An International Journal, Vol. 22 Issue: 7, pp.1315-1340,
40	**Implementation critical success factors (CSFs) for ERP: Do they contribute to implementation success and post-implementation performance?**	Compound	217	Australian, all sizes	43	Jiwat Ram, David Corkindale, Ming-Lu Wu,Implementation critical success factors (CSFs) for ERP: Do they contribute to implementation success and post-implementation performance?,International Journal of Production Economics,Volume 144, Issue 1,2013,Pages 157-174,

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Appendix 3: Information of the selected literature (cont.)

41	**Critical Success Factors of Enterprise Resource Planning Systems Implementation Success in China**	Compound	138	Chinese	44	Zhang, Liang & Lee, Matthew & Zhang, Zhe & Banerjee, Probir. (2003). Critical Success Factors of Enterprise Resource Planning Systems Implementation Success in China. Proceedings of the 36Th Hawaii International Conference on System Sciences (HICSS 2003). 236. 10.1109/HICSS.2003.1174613.
42	**Critical Success Factors for ERP Systems Implementation in Public Administration**	Compound		Public, Poland	45	Ziemba, Ewa. (2013). Critical Success Factors for ERP Systems Implementation in Public Administration. Interdisciplinary Journal of Information, Knowledge, and Management. 8. 1-19.
43	**Critical issues across the ERP life cycle in small-and-medium-sized enterprises: Experiences from a multiple case study**	Individual	5	SMES, most probably norwegian	46	Eli Hustad, Dag H. Olsen,Critical Issues Across the ERP Life Cycle in Small-and-Medium- Sized Enterprises: Experiences from a Multiple Case Study,Procedia Technology,Volume 9,2013,Pages 179-188
44	**Success Factors for Enterprise Systems in the Higher Education Sector: A Case Study**	Individual	1	Australian University	47	Rabaa'i, Ahmad. (2018). Success Factors for Enterprise Systems in the Higher Education Sector: A Case Study.
45	**CRITICAL SUCCESS AND FAILURE FACTORS OF ERP IMPLEMENTATIONS: TWO CASES FROM KINGDOM OF SAUDI ARABIA**	Individual	2	Both large 1. Airforce Saudi 2. Arabia-Saudi Telecom Company, is a Saudi Arabia-based telecommunications company (services)	49-50	Aldammas, A & Al-Mudimigh, A.S.. (2011). Critical success and failure factors of ERP implementations: Two cases from kingdom of Saudi Arabia. Journal of Theoretical and Applied Information Technology. 28. 73-82.
46	**An Empirical Investigation of IT Project Success in Developing Countries**	Compound	72	Saudi Arabian public organizations	51	A. I. Almajed and P. Mayhew, "An empirical investigation of IT project success in developing countries," 2014 Science and Information Conference, London, 2014, pp. 984-990.
47	**Challenges of Enterprise Resource Planning implementation in Iran large organizations**	Individual	1	Iran, large, called Isfahan Telecommunication	52	Mohammadreza Babaei, Zahra Gholami, Soudabeh Altafi,Challenges of Enterprise Resource Planning implementation in Iran large organizations,Information Systems,Volume 54,2015,Pages 15-27
48	**Critical factors for successful ERP implementation: Exploratory findings from four case studies**	Individual	4	Sweden, all large Company A manufacturing,Company B manufacturing Company C global energy company company D is primarily a supplier of wiring harnesses for the automotive industry. It was formed from a joint venture between 2 Japanese companies. The company has 28 facilities in the United States, Mexico and Canada.	53-56	Jaideep Motwani, Ram Subramanian, Pradeep Gopalakrishna,Critical factors for successful ERP implementation: Exploratory findings from four case studies,Computers in Industry,Volume 56, Issue 6,2005,Pages 529-544
49	**CRITICAL SUCCESS FACTORS FOR ENTERPRISE RESOURCE PLANNING IMPLEMENTATION SUCCESS**	Individual	1	Cihan University is an educational institution in Erbil, capital of the autonomous Kurdistan Region of Iraq, Private.	57	AL-SABAAWI, Mohmed. (2015). CRITICAL SUCCESS FACTORS FOR ENTERPRISE RESOURCE PLANNING IMPLEMENTATION SUCCESS. International Journal of Advances in Engineering & Technology. 8. 496-506. 10.7323/ijaet.
50	**Critical success factors for ERP implementation in SMEs**	Compound	8	8 SMES of the North-East of UK	58	
51	**CSFS OF ERP IMPLEMENTATIONS IN BELGIAN SMES: A MULTIPLE CASE STUDY**	Individual	4	Belgian small-to-medium sized enterprises (SMEs) F-Co is a manufacturer. M-Co is manufacturer and has services O-Co manufacturer, W-Co	59-62	Claude Doom, Koen Milis, Stephan Poelmans, Eric Bloemen, (2010) "Critical success factors for ERP implementations in Belgian SMEs", Journal of Enterprise Information Management, Vol. 23 Issue: 3, pp.378-406, https://doi.org/10.1108/17410391011036120
52	**Critical Success Factors Plays a Vital Role in ERP Implementation in Developing Countries:**	Compound	60	Companies representing various industries in Pakistan.	63	Ahmed, Naeem & A, A & Sarim, Muhammad. (2017). Critical Success Factors Plays a Vital Role in ERP Implementation in Developing
53	**Critical success factors for implementing ERP: the case of a Chinese electronics manufacturer**	Individual	1	ElectronicCo large manufacurer in China	64	Woo, Hong. (2007). Critical success factors for implementing ERP: The case of a Chinese electronics manufacturer. Journal of Manufacturing
54	**Critical Success Factors in ERP Implementation in Finland**	Compound	84	Finn	65	Yingjie, J., & Tallberg, A. (2005). Critical Success Factors in ERP Implementation in Finland.
55	**Critical Success Factors in International ERP Implementations: A Case Research Approach**	Individual	2	Both large firms: Company A division of a holding company located in the Caribbean Company B is U.S. division of a leading global supplier of energy solutions headquartered in the UK.	66-67	Robert Plant & Leslie Willcocks (2016) Critical Success Factors in International ERP Implementations: A Case Research Approach, Journal of Computer Information Systems, 47:3, 60-70, DOI: 10.1080/08874417.2007.11645967
56	**Critical Success Factors in Romanian SME's ERP implementation**	Compound	Unknown	SMES Romania	68	Dorobat, Iuliana, Critical Success Factors in Romanian SME's ERP implementation (May 25, 2006). Proceedings of the 3rd International Workshop IE&SI, pp. 308-315, Timisoara, Romania, 2006. Available at SSRN: https://ssrn.com/abstract=1288619
57	**Differences in Critical Success Factors in ERP Systems Implementation in Australia and China: A Cultural Analysis**	Individual	2	both large firms: Elevatorco, elevator company in China and Oilco, a refiner and marketer of a broad range of petroleum products in Australia	69-70	Shanks, G.; Parr, A.; Hu, B.; Corbitt, B.; Thanasankit, T.; and Seddon, P., "Differences in Critical Success Factors in ERP Systems Implementation in Australia and China: A Cultural Analysis" (2000). ECIS 2000 Proceedings. 53.
58	**Enterprise information systems project implementation: A case study of ERP in Rolls-Royce**	Individual	1	Rolls Royce, Large firm, UK, manufacturing	71	Yahaya Yusuf, A Gunasekaran, Mark S Abthorpe,Enterprise information systems project implementation:: A case study of ERP in Rolls-Royce,International Journal of Production Economics,Volume 87, Issue 3,2004,Pages 251-266
59	**A COMPARATIVE STUDY OF CRITICAL SUCCESS FACTORS FOR ERP SYSTEM IMPLEMENTATION IN CHINA AND FINLAND**	Individual	5	Company A chinese manufacturing medicine, public and large. Company B is Chinese private SME manufacturing machinery and electronics Company C is a Finish-invested Chinese company in Beijing working on Global engieering and technology (paper,rocks,minerals and Energy) Company D Power plants, is finn and global and large. Company E Finn large escalator and elevator company	72-76	Moohebat, Mohammadreza & Asemi, Asefeh & Davarpanah Jazi, Mohammad. (2010). A Comparative Study of Critical Success Factors (CSFs) in Implementation of ERP in Developed and Developing Countries. International Journal of Advancement in Computing Technology. 2. 99-110. 10.4156/ijact.vol2.issue5.11.
60	**ERP Implementation at King Saud University**	Individual	1	King Saud University, Saudi Arabia	77	Sulaiman A. AL-Hudhaif, D. (2012). ERP Implementation at King Saud University. Global Journal Of Management And Business Research, 12(5). Retrieved

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Appendix 3: Information of the selected literature (cont.)

61	**A study on the critical success factors affecting the implementation of ERP systems in Korea Companies**	Compound	Unknown	Korean companies	78	Park, J. H., & Choi, D. W. (2003). A study on the critical success factors affecting the implementation of ERP systems in Korea Companies . 지역발전연구/Regional Development Studies, 3(1).
62	**Enterprise system implementation issues: learning from field study in Poland**	Compound	68	Poland	79	P. Soja (2008) Enterprise system implementation issues: learning from field study in Poland, Enterprise Information Systems, 3:2, 173-200, DOI: 10.1080/17517570802398216
63	**Erp Implementation Failure: A Case Study**	Individual	1	Large soft drink maker and botler possibly american (from authors and company foundation date)	80	Traci Barker & Mark N. Frolick (2003) Erp Implementation Failure: A Case Study, Information Systems Management, 20:4, 43-49, DOI: 10.1201/1078/43647.20.4.20030901/77292.7
64	**ERP Implementation Success Factors in Saudi Arabia**	Compound	74	Companies of varying sizes, activities, ownership and from different regions of Saudi Arabia	81	Sajed M. Abukhader (2014) ERP implementation in the private hospitals of Saudi Arabia, International Journal of Healthcare Management, 8:2, 77-88, DOI: 10.1179/2047971914Y.0000000092
65	**ERP Project Implementation: Evidence from the Oil and Gas Sector**	Individual	1	Large oild and gas (I think a turkish company call botas)	82	Mishra, A., & Mishra, D. (2011). ERP Project Implementation: Evidence from the Oil and Gas Sector.
66	**Evaluating the Internal and External Factors Toward ERP Success: Examples from Bruncian Businesses**	Compound	45	Bruneian companies	83	Seyal, Afzaal. (2014). Evaluating the Internal and External Factors Toward ERP Success: Examples from Bruneian Businesses. International Journal of Enterprise Information Systems. 10. 73-95. 10.4018/ijeis.2014100105.
67	**Evaluating enterprise resource planning (ERP) post implementation problems in Egypt: findings from case studies of governmental, multinational and private Egyptian organizations**	Compound	3	Government, multinational and private Egyptian organizations	84	El Sayed, May, Hubbard, Nick J. and Tipi, Nicoleta S. (2013) Evaluating enterprise resource planning (ERP) post implementation problems in Egypt: Findings from case studies of governmental, multinational and private Egyptian organisations. In: LRN Annual Conference and PhD Workshop 2013, 4th-6th September
68	**Examining Successful ERP Projects in Middle-East and South-East Asia**	Compound	384	Iran	85	Dezdar, Shahin & Sulaiman, Ainin. (2012). Examining Successful ERP Projects in Middle-East and South-East Asia. International Journal of Scientific Research. 13-25.
69	**Exploring the Critical Success Factors (CSF) and Limitations of Enterprise Resource Planning (ERP) Systems: The Case of Egyptian Hotels**	Compound	151	Five-star hotels distributed around 18 areas in Egypt	86	Mohamed, L. M. (2015). Exploring the Critical Success Factors (CSF) and Limitations of Enterprise Resource Planning (ERP) Systems: The Case of Egyptian Hotels. Journal of Hospitality and Management Tourism, 6(3).
70	**Technical and organisational aspects in enterprise resource planning systems implementation: lessons from a Spanish public hospital**	Individual	1	Spanish Public Hospital	87	Tomas Escobar-Rodriguez, Bernabe Escobar-Pérez & Pedro Monge-Lozano (2012) Technical and organisational aspects in enterprise resource planning systems implementation: lessons from a Spanish public hospital,Enterprise Information Systems, 8:5, 533-
71	**The biggest critical failure factors in ERP implementation**	Individual	5	All American and Large Nike, Inc., FoxMeyer Drugs,Hewlett Packard, University of Massachussets,New York City	88-92	Peci, Matus & Važan, Pavel. (2014). The Biggest Critical Failure Factors in ERP Implementation. Applied Mechanics and Materials. 519-520. 1476-1480. 10.4028/www.scientific.net/AMM.519-520.1476.
72	**Offshoring ERP Implementations: Critical Success Factors in Swiss Perspective**	Compound	12	Offshoring in India (from Switzerland)	93	Chauhan, Rajneesh & Dwivedi, Ph.D., Rajeev & Sherry, Arun. (2012). Offshoring ERP implementations: Critical success factors in Swiss perspective. 18th Americas Conference on Information Systems 2012, AMCIS 2012. 1. 464-471.
73	**How Consultant Participation Lead to ERP Implementation Satisfaction: A study Upon the Iranian Industries**	Compound	49	Iranian	94	Soltani, S., Elkhani, N., & Bakri, A. (2013). How Consultant Participation Lead to ERP Implementation Satisfaction: A study Upon the Iranian Industries.
74	**How to successfully apply critical success factors in healthcare information systems development ? A story from the field**	Individual	1	Swedish,healthcare.	95	Aggestam, Lena and van, Laere Joeri, "HOW TO SUCCESSFULLY APPLY CRITICAL SUCCESS FACTORS IN HEALTHCARE INFORMATION SYSTEMS DEVELOPMENT ? A STORY FROM THE FIELD" (2012). ECIS 2012 Proceedings. Paper 220. http://aisel.aisnet.org/ecis2012/220
75	**Factors Determining the Enterprise Resource Planning Project-Success in Small and Medium Enterprises: Evidence from Indian Cases**	Compound	52	SMEs, India.	96	Samuel, R.D., & Kumar, S. (2014). Factors Determining the Enterprise Resource Planning Project-Success in Small and Medium Enterprises: Evidence from Indian Cases.
76	**The Analysis of CSFs in stages of ERP Implementation – Case Study in small and medium – sized (SME) companies in Croatia**	Compound	212	SMES in Croatia	97	M. Nikitović and V. Strahonja, "The analysis of CSFs in stages of ERP implementation — Case study in small and medium-sized (SME) companies in Croatia," 2016 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija, 2016, pp. 1494-1499.
77	**Identification and classification of ERP critical failure factors in Iranian industries**	Compound	13	Iran ,government and manufaturing	98	Amin Amid, Morteza Moalagh, Ahad Zare Ravasan,Identification and classification of ERP critical failure factors in Iranian industries,Information Systems,Volume 37, Issue 3,2012,Pages 227-237
78	**Investigating the success of ERP systems: Case studies in three Taiwanese high-tech industries**	Individual	3	Three large high-tech firms in Taiwan: UMC Manufacturing semi conductors. Compal manufactures notebook computers, televisions, etc. and Powerchip Semiconductor Corp	99-101	Shih-Wen Chien, Shu-Ming Tsaur,Investigating the success of ERP systems: Case studies in three Taiwanese high-tech industries,Computers in Industry,Volume 58, Issues 8–9,2007,Pages 783-793
79	**SUCCESS FACTORS FOR ERP IMPLEMENTATION IN LARGE ORGANIZATIONS: THE CASE OF EGYPT**	Compound	27	Large, egypt, 48.1% of the responses are from manufacturing organizations, 37% are from organizations that deliver services, 7.4% are from banking field and the rest are from trading and other activity organizations.	102	Abdelghaffar, Hany. (2012). Success Factors for ERP Implementation in Large Organizations: The Case of Egypt. Electronic Journal of Information Systems in Developing Countries. 52. 10.1002/j.1681-4835.2012.tb00369.x.
80	**Successful implementation of ERP systems in small businesses: a case study in Korea**	Individual	1	Korean, SME Jinyang Oil Seal Co., Ltd. is a professional oil seal manufacturer for automobiles and electronic equipment in Korea	103	Lee, C.K., Lee, HH. & Kang, M. Serv Bus (2008) 2: 275. https://doi.org/10.1007/s11628-008-0045-3

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Appendix 3: Information of the selected literature (cont.)

81	**Critical Success Factors for ERP Projects in Small and Medium-sized Enterprises – The Perspective of Selected German SMEs**	Compound	9	Nine small and medium- sized enterprises located in Germany, 8 of them manufaturing one services.	104	C. Leyh, "Critical success factors for ERP projects in small and medium-sized enterprises - The perspective of selected German SMEs," 2014 Federated Conference on Computer Science and Information Systems, Warsaw, 2014, pp. 1181-1190.
82	**CRITICAL SUCCESS FACTORS OF GLOBAL ENTERPRISE RESOURCE PLANNING PROGRAMMES: AN EMPIRICAL MODEL BASED ON EXPERT INTERVIEWS**	Compound	13	Large organizations with a global ERP programme.	105	Seidel, Gunter and Back, Andrea, "CRITICAL SUCCESS FACTORS OF GLOBAL ENTERPRISE RESOURCE PLANNING PROGRAMMES: AN EMPIRICAL MODEL BASED ON EXPERT INTERVIEWS" (2011). ECIS 2011 Proceedings. 12.
83	**Determination of Critical Success Factors in Implementing an ERP System: A Field Study in Mexican Enterprises**	Compound	48	Medium and large enterprises in Mexico	106	Garcıa-Sanchez, N. (n.d.). Determination of Critical Success Factors in Implementing an ERP System: A Field Study in Mexican Enterprises. InformationTechnologyforDevelopment,Vol.13(3)293–309(2007) 2007 WileyPeriodicals,Inc. Published Online in Wiley InterScience. Retrieved 2007
84	**Success of ERP Systems in Chile: An Empirical Study**	Compound	72	Large Chile	107	Ramírez, P., & Garcia, R.C. (2005). Success of ERP Systems in Chile: An Empirical Study.
85	**Korean Organization ERP system Implementation CSFs: A delphi study**	Compound	16	All sizes, Korea	108	Real Kim, Yeong. (2012). Korean Organization ERP System Implementation CSFs: A Delphi Study. Journal of the Korea Industrial Information Systems Research. 17. 159-166. 10.9723/jksiis.2012.17.7.159.
86	**A Qualitative Study of the Critical Success Factors of ERP System - A Case Study Approach**	Individual	1	A Government owned electric supply company in Pakistan	109	Ijaz, A., & Malik, R. (n.d.). A Qualitative Study of the Critical Success Factors of ERP System - A Case Study Approach. Proceedings of the 2014 International Conference on Industrial Engineering and Operations Management Bali, Indonesia, January 7 – 9, 2014. Retrieved 2014.
87	**An Approach to Identify Failure Factors of Enterprise Application Implementation in Indian Micro Enterprises**	Compound	85	Indian Micro, Small and Medium scale Enterprises (MSMEs).	110	Basu, R., & Biswas, D. (n.d.). An Approach to Identify Failure Factors of Enterprise Application Implementation in Indian Micro Enterprises. International Journal of Managing Value and Supply Chains (IJMVSC) Vol. 4, No. 1, March 2013. Retrieved 2013.

Appendix 4: Manual on how to use the model: Tool for practitioner

This model is supposed to aid on the making of a list of CSFs that applies to your company of interest. It will guide you step by step about which CSFs to add to that list, based upon the characteristics of your firm. Every time a CSF appears to fit your list, you can give that CSF one more point. In the end, based upon how many points each CSFs has, you can rank them in order of importance, with the CSF with the highest number or points being the most important and the one with least number of points being the least important.

For using this model, you must locate your target company on a base dimension. The base dimension can be Healthcare, Energy, or Education. Depending upon which base dimension the firm falls into, add the corresponding CSFs as seen on the tables below. If none of these applies to the company of interest. Then, select among manufacturing and services.

HEALTHCARE
Critical Success Factors
End user involvement
Top management support and commitment
organizational culture
User training and education
Implementation strategy
Change management
Resources availability (financial, human and technological)
Rewards, Recognition & Retention
BPR and minimal customization
Clear goals and objectives
Project management
Legacy system and infrastructure
Project team competence and composition

EDUCATION
Critical Success Factors
Top management support and commitment
Change management
Communication
Clear goals and objectives
Project management
Legacy system and infrastructure
User training and education
Project team competence and composition
BPR and minimal customization
organizational culture
Careful package selection
End user involvement
software development, testing and troubleshooting
Compliance
Partnership with vendor
Use of a steering committee

ENERGY
Critical Success Factors
Top management support and commitment
User training and education
Communication
Change management
Clear goals and objectives
Project champion
Data accuracy, conversion
Project team competence and composition
BPR and minimal customization
organizational culture
Project management
Legacy system and infrastructure
Careful package selection
Interdepartmental cooperation
End user involvement
Vendor and or consultant support
Resources availability (financial, human and technological)
Partnership with vendor
Use of a steering committee
software development, testing and troubleshooting
Monitoring and feedback
Implementation strategy
Rewards, Recognition & Retention
external environment
Cost planning and collection on cost centers
credit limits check on corporate level
closed loop for demand and supply chain planning
IS-Oil basic functionality implemented
Cost planned and collection on cost centers and for defined measures
Closed loop for asset management lifecycle
Complete finances for the whole company.
Budgeting for Fiscal year for the whole company on a single, integrated basis.
Centralized payment (in-house cash).
Complete inventory (volumes and valuation).
Closed purchasing loop (from requisition to payment).
Integrated and harmonized processes (from order to cash).
Closed loop order-to-cash including service station network.
Well level production and revenue analysis.

Services:

- software development, testing and troubleshooting
- Monitoring and feedback
- Implementation strategy
- BPR and minimal customization
- Rewards, Recognition & Retention
- Vendor and or consultant support
- Change management
- End user involvement
- Data accuracy, conversion
- Communication
- Top management support and commitment
- Project team competence and composition
- Clear goals and objectives
- User training and education

Manufacturing:

- Software development, testing and troubleshooting
- Monitoring and feedback
- Implementation strategy
- BPR and minimal customization
- Project management
- Rewards, Recognition & Retention
- Vendor and or consultant support
- Change management
- End user involvement
- Organizational culture
- Data accuracy, conversion
- Careful package selection
- Communication
- Legacy system and infrastructure
- Top management support and commitment
- Organization's structure
- External environment
- Project team competence and composition
- Clear goals and objectives
- Partnership with vendor
- Resources availability (financial, human and technological)
- User training and education
- Project champion
- Interdepartmental cooperation
- Use of a steering committee

Next: Locate the country where the company in located among developed or developing nation. If it is an economy in transition, select developed.

If your company is located in a developing country add:

- Project management
- Legacy system and infrastructure
- Compliance
- Change management
- User training and education
- Careful package selection
- Clear goals and objectives
- Partnership with vendor
- Vendor and or consultant support
- Resources availability (financial, human and technological)
- Value Chain Connectivity
- Rewards, Recognition & Retention
- software development, testing and troubleshooting
- End user involvement
- Cloud-based data achieving
- Cloud based segregation of duties
- Top management support and commitment
- Data accuracy, conversion
- Implementation strategy
- BPR and minimal customization
- Project team competence and composition
- Communication
- organizational culture
- Monitoring and feedback

If your company is located in a developed country then add:

- Project management
- Interdepartmental cooperation
- Use of a steering committee
- Project champion
- ERP treated as a program rather than a project
- Change management
- User training and education
- Careful package selection
- Clear goals and objectives
- Partnership with vendor
- Vendor and or consultant support
- Public sector procedures and processes
- Resources availability (financial, human and technological)
- software development, testing and troubleshooting
- End user involvement
- Top management support and commitment
- Data accuracy, conversion
- Implementation strategy
- BPR and minimal customization
- Project team competence and composition
- Communication
- organizational culture
- Monitoring and feedback

Next: Locate size dimension.

If firm is large then add:

- Careful package selection
- Communication
- BPR and minimal customization
- Project team competence and composition
- Vendor and or consultant support
- Project management
- End user involvement
- Implementation strategy
- Data accuracy, conversion
- organizational culture
- Partnership with vendor
- User training and education
- Clear goals and objectives
- Legacy system and infrastructure
- Resources availability (financial, human and technological)
- Top management support and commitment
- Change management
- Project champion

If it is an SME add:

- Careful package selection
- Communication
- software development, testing and troubleshooting
- BPR and minimal customization
- Project team competence and composition
- Vendor and or consultant support
- Monitoring and feedback
- Project management
- End user involvement
- Implementation strategy
- Data accuracy, conversion
- ERP treated as a program rather than a project
- organizational culture
- Compliance
- Use of a steering committee
- Interdepartmental cooperation
- Partnership with vendor
- User training and education
- Clear goals and objectives
- Proper reporting structure
- Legacy system and infrastructure
- Resources availability (financial, human and technological)
- Rewards, Recognition & Retention
- Top management support and commitment
- Change management

Next, locate your firm between public or private.

If your firm is public add:

- Project management
- Communication
- Project team competence and composition
- Organizational culture
- End user involvement
- Top management support and commitment
- BPR and minimal customization
- Clear goals and objectives
- Public sector procedures and processes
- Frozen information requirements,
- Identified government processes,
- Cooperation with research centers

If your company is private add:

- Vendor and or consultant support
- Monitoring and feedback
- Careful package selection
- User training and education
- Data accuracy, conversion
- software development, testing and troubleshooting
- Project management
- Implementation strategy
- Change management
- Communication
- Project team competence and composition
- Interdepartmental cooperation
- Partnership with vendor
- Use of a steering committee
- ERP treated as a program rather than a project
- Resources availability (financial, human and technological)
- Compliance
- Legacy system and infrastructure
- organizational culture
- Proper reporting structure
- Rewards, Recognition & Retention
- End user involvement
- Top management support and commitment
- BPR and minimal customization
- Clear goals and objectives

Last, we will add to the list we have, the unique CSFs that are there for Cloud deployment or Offshore development if they apply.

CSF list for Cloud deployment
Top management support and commitment
Careful package selection
End user involvement
User training and education
Compliance
Project team competence and composition
Vendor and or consultant support
Cloud-based data achieving
Cloud based segregation of duties

CSF list for offshore development
Clear goals and objectives
Top management support and commitment
organizational culture
Language
Personnel Split Between Onsite/Offshore
Project management
Legacy system and infrastructure
Careful package selection
User training and education
Communication
Scalability
Project team competence and composition
Change management
Choice of work to be offshore
Onsite Offshore Norms
Offshoring Partnership

Acknowledgements

I would like to express my sincere gratitude to my supervisor Associate Professor Dr. Marco Comuzzi for his efforts, generous guidance, patience, encouragement and time throughout the whole dissertation project. His kindness and professionalism, had taught me not only to be a better researcher but a better person.

Special thanks to Prof. Byoung Ki Seo, my advisor during my bachelor's degree who always had supporting words. Prof. Robert Mitchell for giving me the opportunity to come to UNIST, Prof. Woo, Prof. Victoria Kim, Prof. Yoonhyuk Jung, Prof. Bradley Tatar, and Minseok Song, Prof. Henri Christiaans, Prof. Lu Zhang, Young Choon Kim, Junyoup Lee, Sang-Tai Choi, who taught me inside and outside the classrooms. I would like to extend my deepest appreciation to all the staff in Management Engineering.

Special thanks to my closest friends and colleagues in UNIST: Hannan Jamal Mohamed, Cerien Vaidya, Elham Fartash, Donggi Lee, Jong Hyeon Ko, Rabey Husini, Minh Canh, Sanghyuk Park, Erdenekhuu Unurjargal.

Finally, I would like to express my deepest gratitude to my parents: Cecilia Santamaria Mirker and Fernando Lopez Villarreal, my older siblings Delia and Martin, my beloved husband Moeen Mirhosseini, and extended family for their emotional and moral support throughout my academic career and also for their love, patience, encouragement and prayers.