

CRITICAL SUCCESS FACTORS FOR ERP IMPLEMENTATION IN SECTOR PUBLIC: AN ANALYSIS BASED ON LITERATURE AND A REAL CASE

Research paper

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Abstract

Although there are many studies with a focus on ERP implementation in public administration, it is evident a lack of proven scientific theories and experiences in this context. However, an undeniable feature of this industry is that it is more complex, so it is important to identify factors that determine the success of the ERP implementation in this sector in order to achieve better results of the information systems projects. Thus, the objective of this research is to identify the critical factors for this kind of project, combining literature results and collected real data from the perspective of sponsors, leaders, business analysts, and users. For this, it was carried out an ad-hoc literature review, and an exploratory case study at a public institution of higher education sector that was implementing an ERP system. Interviews, observations, and documentary analysis were carried out to collect and evaluate the data. Thus, the results found allowed us to identify which critical success factors influence, as facilitators or barriers, in the implementation of ERP systems in public sector, making possible the mitigation of potential adverse impacts.

Keywords: Critical Success Factors (CSF), Enterprise Resource Planning Implementation, Public Sector.

1 Introduction

In the public sector, there are particular motivations to implement ERP differing from the private sector because most of the reasons come from the political context, and not related to performance or results. Usually, many politicians and top management members of public companies could place themselves in embarrassing situations from disclosing information that they feel may damage their careers (Uwizeyemungu and Raymond 2005; Gabryelczyk and Roztocki 2017). Existing studies compares ERP adoption in public and private sectors. Alves et al. (2012) concludes that public sector presents particular characteristic such as a different vision of value and ROI, most of the decisions are based on short term thinking, and the risk aversion are prevalent.

From the literature, the most cited motivations to adoption of ERP systems in public sector are: technological (replacing old, unintegrated systems), operational (replacing systems with those supporting a process view), strategic (decision-making improvement, Y2K compliance), and financial performance (need for efficiencies, cost reduction) (Poba-Nzaou et al. 2014; Gabryelczyk and Roztocki 2017). Thus, Sandoval-Almazán *et al.* state that there are a wide variety of ERP systems on the market, but most of them have been designed with features oriented to the private sphere. As a result, integrated systems aimed at public sectors, also called Government Resource Planning (GRP),

are still not so developed as those available to private companies. Tammel (2017) points the few existing options for GRP discourage public companies from adopting any integrated management systems and usually ordinary ERPs are adapted to the needs of these government agencies.

Thus, implementing an ERP in an organisation is often a painful experience being a complicated exercise involving technology innovation and organisational change management (Kumar et al., 2002). Adopting an ERP requires the coordination of many activities and involves/impacts most of the people in a company (Gabryelczyk and Roztocki, 2017). ERP systems implementation is also different from the traditional systems due to the large-scale changes, complexity degree, high organisational impact, need of a large number of user's participation, high cost, and the considerable risk of business impact (Grabski and Leech, 2007).

Gabryelczyk and Roztocki (2017) point that implementation of ERP systems in public administration requires both, cognitive and practical studies and, there are significant differences between private companies and government. ERP solutions successfully used in business do not apply to public administration. Due to the nature of public policy, the legal practices used in the implementation of ERP systems require verification and adjustment to their specific conditions and this the reason that most of the ERP systems are designed for private companies and do not meet specific public administration requirements.

Ziemia and Papaj (2013) consider CSFs one field where companies should be focused on primarily to achieve the most satisfying results of the ERP systems implementation. Gabryelczyk and Roztocki (2017) believes that critical success factors provides a good basis for stating what criteria should be followed during ERP systems implementation.

Although many studies with focus in ERP implementation in public administration, Gabryelczyk and Roztocki (2017) state there is a lack of proven scientific theories and experiences on the implementation of ERP systems in this context. According these authors it is an important matter is to identify factors that determine the success of the implementation of ERP systems in public administration in order to achieve the most satisfying results of the ERP projects (Ziemia and Papaj, 2013).

In this context, the motivation of this research is based on three perspectives: (i) the complexity of implementation of integrated enterprise management system in the public sector; (ii) the need for evidence considering the CSFs to support ERP implementation and; (iii) due to the particularities of the public sector, understand if the current CSFs in ERPs implementation oriented to private companies already works in the government context.

For this, the goal of this study is to identify and analyse specific critical success factors to ERP deployment in the public domain, investigating the following research question: "*what are relevant CSFs in the implementation of ERP Systems in the context of the public sector?*". Seeking to answer this question, it was carried out an ad-hoc investigation of the literature and found related works to the survey of critical success factors in the ERP implementation. Trying to narrow this search to public sector domain, the evidence found were few, so it was considered CSF from any company that implemented ERP. To complement this research, a case study in a public university which was at the beginning of the process of implementing an administrative ERP was also carried out with focus on to observe if new CSF should be considered, due the public character of the university, and comparing to known CSF already found in both sector, private and public.

After this introduction, this paper is organized in 5 sections. Section 2 presents the theoretical reference that is underlying this research. The methodology used, well its steps and structure are described in Section 3. Section 4 shows a description of the results found, both in the literature and in the case study in the field. Finally, Section 5 presents the conclusions of this work.

2 Theoretical Background

2.1 Critical Success Factors for ERP Projects

Critical Success Factors related to information systems, including ERP, were initially proposed by Rockart (1979). According to the author, critical success factors can be understood from their relationship with company's processes and the field of activity of the organization. To be considered essential, the element should have the following characteristics: (i) have attention and investment adequately regarding cost, time and effort, to ensure the excellent performance, thus providing the success of the organization; (ii) present information to check indicators that enable the control to take corrective and improvement actions; and (iii) be intimately connected to the organization's business.

ERP implementation has gained attention since the increase of reports about failure in ERP adoption in companies. An example was a study published by Scott & Vessey (2002), reporting that, according to Standish Group International, 90% of the SAP / R3 deployment projects suffer from delay. One reason for this high failure rate is the mismanagement, concerning identifying and managing implementation risks, in general, associated with critical success factors of the project. The major issues listed by were: (i) integration of all the organization's processes in the ERP; (ii) resistance of people to ERP, (iii) fear process changes and loss of power; (iv) inefficiency of training in the face of high employee turnover; (v) lack of essential skills of users; (vi) technological limitations of the ERP, (vii) problems with integration of legacy systems and; (viii) conversion and standardization of data.

Many researchers have proposed critical success factors that affect the implementation of ERP in organizations such as Holland and Light (1999); Cookie-Davies (2005); Ehie and Madson (2005); Gargeya and Davies (2005); Lam (2005); Motwani *et al.* (2005); Sun, Yazdani and Overend (2005); Plant and Willcocks (2006); Ngai, Law, & Wat (2008); Wang, Shih, Jiang, & Klein (2008); Law, Chen, & Wu (2010); Liu (2011) and Alaskari *et al.* (2012). Analysing these papers allowed us to identify essential CSFs for ERP systems implementation. They include top management support, people involvement and project management issues. Moreover, ERP systems implementation must be carried out by experienced and well-qualified project leaders. Some important aspects are related to change management, business analysis, goals, economic issues and communication.

2.2 ERP in Public Sector

Gabryelczyk and Roztocki (2017) states that opposite to business organizations, that are focused on their profitability and stakeholders' value, government agencies have the public interest in first place. Their obligations are related to meet social goals in the same time, agencies have to cope with social and political demands, which are not the regard of the private sector. To main issue of government agencies are the excess of bureaucracy in adopt policies or policy advice, which are more difficult to identify than the physical output or financial results common private sector organizations. The fundamental differences between private and government are related to occurrences in the public sector, which bear the influence upon the attainment of effective, continuous process management (Tregear and Jenkins, 2007).

Public administration processes are more complicated than private companies (Repa, 2006). Public organisations are concerned to set an organisational structure, where processes are formalised, and decision-making is slow due bureaucracy. The decision-making process is independent in each department, oriented to small and located decisions, few actions involves all the government agency. That means their own goals are unrelated to the whole government agency Gabryelczyk and Roztocki (2017). Wilson (1987) states that in public companies, the processes flow across departments slowly and it almost entirely depends on the individual effort of employees. Gabryelczyk and Roztocki (2017) point that all government actions are controlled by a significant amount of legal regulations. Those make the modification or improvement of processes a laborious task which usually starts with any changing of laws. Moreover, significant process analysis is required to identify process owners, once

recognized the process owners and determining the proper role of enterprise process office in interacting with process owners and consultants can be difficult (Blick et al., 2000).

Blick et al. (2000) state that may be impossible to adopt the commercial processes in public companies. A large-scale public sector ERP implementations require additional time to focus on the gap between the business and the essential process. This gap analysis helps determine the level of changes preferred in an ERP best practice. It is usual to find public companies that prefer to minimise these changes and extensions as much as possible implementing ERP with "as is" approach, not customising the product to their needs.

2.3 Related Works

Three main related references were considered in this study.

Allen, D., Kern, T., and M. Havenhand (2002) propose four CSFs: (i) Organizational culture; (ii) Political structures; (iii) Social constructions of technological legacy; (iv) Relationship and knowledge management.

Rabaa'i (2009) concluded that there are 12 relevant CSF when implementing ERP in the high education sector: (i) Top management support; (ii) Change management; (iii) Project management; (iv) Business process; (v) Training; (vi) ERP team composition; (vii) Vision and planning; (viii) Consultant management; (ix) Communication plan; (x) ERP systems selection; (xi) ERP systems integration; (xii) Post-integration evaluation.

Finally, Gabryelczyk and Roztocki (2017) suggest eight Critical Success Factors for public bodies and are divided into four categories. The first of these is linked to the public procurement procedure and are three CSF: (i) Clear and precisely defined tender specification; (ii) realistic and chronologically arranged schedule and (iii) clear goals and objectives of the ERP system implementation. The second category is related to government processes management and there is another three CSF: (i) Frozen information requirements, (ii) Identified government processes and (iii) Government process reengineering. The third category are related to project team competences and there are five CSF: (i) project team competence on ERP systems, (ii) project team competence on public administration, (iii) use of consultants, (iv) cooperation with research centers and (v) expertise in IT. The last category is related to project management and there are eight CSF: (i) Top management support, (ii) Clear assignment of roles and responsibilities, (iii) Change management, (iv) Risk management, (v) Involvement ERP system end-users, (vi) Interdepartmental communication, (vii) Use of proven project management methodology, and (viii) Effective monitoring and control.

3 Research Method

This study was part of real-life ERP implementation in a university, and it was intended to minimise risks of the adoption considering CSFs for ERP Projects in public sector. The research walkthrough is presented on Figure 1.



Figure 1. Research Walkthrough.

In the first step, it was performed an ad-hoc literature review to identify all general CSFs associated with the implementation of ERPs. This literature review was intended to answer two questions: (i) What are relevant CSFs in the implementation of ERP Systems? And (ii) Which CSF are related to the public sector or education companies? Both questions were answered by the results presented in Section 2.3 (To Identify CSF in Literature). In the second step (To Categorize Found CSFs), the CSFs

were categorised and grouped from the most of 100 CSF found. It was necessary to group CSFs related to a larger category of CSF, like Sommers and Nelson (2001) and Ngai, Law and Wat (2008) that already grouped CSFs related in categories. It was found 20 categories as shown in Table 1, concluding the step 2. Each CSF is commented in Section 4 (Results).

With general CSFs mapped, it was possible to start the third step in a University that was at initial stages of an ERP project. This study had three objectives: (1) to provide more empirical evidence on CSF on public companies; (2) to discover if there is specific CSF in the public sector; and (3) to provide comparable results of CSF between those found in literature review and those find on this case study results. To achieve these goals it was necessary to interview with 21 professionals involved in the ERP Project from March 2015 to September 2016. The interviewees talked about general problems and good practices (CSFs) in the current ERP implantation, asking five questions:

1. Did you consider take any action before ERP implementation starts? Which actions? Why?
2. Did you investigate aspects related to ERP implementation before the project begun? Which aspects did you find? Did you analyse any of these aspects?
3. Did you take any actions to reduce ERP implementation risks before the beginning of the project? Which actions? What kind of risks did you would like to mitigate?
4. During the ERP implantation, which kind of issues did you notice? How these issues slowed down the project? How the issue was solved?
5. Did you proposed/participated of any changes in ERP implementation project? Which changes? Why change? Which changes were tried/done? What the results of these changes?

The interviews were recorded and transcribed using Speechlogger¹ tool.

In step 4 and 5, it was used thematic analysis to analyze the data, a technique for identifying, analyzing, and reporting standards (or themes) found in qualitative data (Boyatzis, 1998). To reduce the data, it was dissected the text into manageable and meaningful text segments using a coding framework. This is a common procedure in qualitative research. The Weft QDA² tool was used to categorize and code the text. After this, text segments were collected in each code (or group of related codes) and extracted the salient, common, or significant themes in the coded text segments. These texts were matched with identified CSFs previously identified and categorized (steps 1 and 2) and those that not match with any CSF category were considered new.

¹ <https://speechlogger.appspot.com/pt/>

² <http://www.pressure.to/qda/>

ID	CSF	Authors that Consider the CSF
1	Top Management Support	(Holland and Light, 1999); (Somers and Nelson, 2001); (Cooke-Davies, 2005); (Ehie and Madsen, 2005); (Lam, 2005); (Motwani, Subramanian and Gopalakrishna, 2005); (Sun, Yazdani and Overend, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Rabaa'i, 2009); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
2	Project Team Competency	(Ehie and Madsen, 2005); (Gargeya and Brady, 2005); (Lam, 2005); (Motwani, Subramanian and Gopalakrishna, 2005); (Sun, Yazdani and Overend, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Rabaa'i, 2009); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
3	Interdepartmental cooperation and Communication	(Somers and Nelson, 2001); (Allen, Kern and Havenhand (2002); (Motwani, Subramanian and Gopalakrishna, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Rabaa'i, 2009); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
4	Clear goals and targets	(Somers and Nelson, 2001); (Plant, Willcocks, 2006); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
5	Project Management	(Somers and Nelson, 2001); (Gargeya and Brady, 2005); (Motwani, Subramanian and Gopalakrishna, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Rabaa'i, 2009); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
6	Expectations management	(Somers and Nelson, 2001); (Plant, Willcocks, 2006); (Hairul, Nasir, and Sahibuddin, 2011); (Gabryelczyk, R. and N. Roztock, 2017)
7	Presence of "Champion"	(Somers and Nelson, 2001); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012)
8	Careful solution selection	(Somers and Nelson, 2001); (Motwani, Subramanian and Gopalakrishna, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012)
9	Data analysis and conversion	(Somers and Nelson, 2001); (Ehie and Madsen, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012)
10	Education and Training in the system	(Somers and Nelson, 2001); (Gargeya and Brady, 2005); (Sun, Yazdani and Overend, 2005); (Plant, Willcocks, 2006); (Rabaa'i, 2009); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
11	Process Reengineering	(Somers and Nelson, 2001); (Ehie and Madsen, 2005); (Sun, Yazdani and Overend, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Rabaa'i, 2009); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
12	Minimum Customization	(Somers and Nelson, 2001); (Gargeya and Brady, 2005); (Plant, Willcocks, 2006); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012);
13	Change Management	(Somers and Nelson, 2001); (Motwani, Subramanian and Gopalakrishna, 2005); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Rabaa'i, 2009); (Hairul, Nasir, and Sahibuddin, 2011); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
14	Partnership with the manufacturer	(Somers and Nelson, 2001); (Plant, Willcocks, 2006); (Ngai, Law and Wat, 2008); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012);
15	Use of consultants	(Somers and Nelson, 2001); (Ehie and Madsen, 2005); (Plant, Willcocks, 2006); (Rabaa'i, 2009); (Alaskari, Ahmad, Dhafir, and Pinedo-Cuenca, 2012); (Gabryelczyk, R. and N. Roztock, 2017)
16	Frozen Requirements	(Hairul, Nasir, and Sahibuddin, 2011); (Gabryelczyk, R. and N. Roztock, 2017)
17	Appropriated Process/Methods	(Hairul, Nasir, and Sahibuddin, 2011); (Ngai, Law and Wat, 2008); (Gabryelczyk, R. and N. Roztock, 2017)
18	Organizational Characteristics	Allen, Kern and Havenhand (2002); (Ngai, Law and Wat, 2008)
19	Post Implementation Evaluation	(Rabaa'i, 2009)
20	Social Construction of Technological Legacy	Allen, Kern and Havenhand (2002);

Table 1. CSFs found in Literature.

In the last step of the research, all CSF that emerged from the interviews in case study are listed and compared with those one found in literature in order to identify which of them was not listed in previous research. These new CSFs are detailed in Section 4.

3.1 Context of Research

The public company studied, called here by UniA, has over 7000 employees, between professors and administrative employees and around 30.000 students are enrolled. The Administration is exercised by the Rectory in partnership with the University Board Council, a group formed by two other specific councils: (i) the Administration and (ii) the Teaching, Research and Extension Coordinator. Alongside these two structures is the Council of Trustees, the university's economic and financial oversight body. Each of these instances has an important role in the task of managing the institution's extensive structure so that it can offer the best services to the academic community. The Rectory coordinates

plans and supervises the activities of the institution. It is constituted by the Office of the Rector and by eight Pro-Rectories: (i) Academic, (ii) Research, (iii) Extension, (iv) human resources, (v) planning, (vi) student support, (vii) management, and (viii) communication and information technology.

The university had not previously used integrated systems, only isolated and old ones. The council board decided to adopt one ERP solution, driven to education administration, called here by AERP. The full ERP consist of 20 modules and they would be implemented in UniA in a 3 years project starting in March 2015 and finishing in March 2018. The first year of the project were to build all ERP technology infrastructure and install six of the modules: System Administration, Financial Integration, Materials Catalog, Purchasing and Bidding, Price Registration and Patrimony and Assets. Three Pro-Rectories were involved: Human Resources, Management and Planning. But, in our research only the two firsts had people interviewed.

The interviewed stakeholders, a total of 21 professionals (16 of them with more than 2 years in the university and 13 of them with more than 1 year of experience in their functions), were classified into three profiles: ERP deployment managers (5 participants), process owners (8 participants) and ERP users (8 participants). These professionals were invited to answer an open questionnaire, which were carried out individually and locally at the UniA. The interviews had an average duration of 25 (twenty-five) minutes each. Among the 21 interviewed employees there were 8 ERP users, 8 Process Owner and ERP Deployment Managers. Considering their time working in university, 5 of them have less than 2 years of experience, 6 have between 2 and 5 years and 10 employees have more than 5 years experience. When considering the time in the current function, 8 of them were in the function less than 1 year, 10 employees have between 1 and 3 years in the same function, and only 3 have 3 or more years of working in the current function. Figure 2 resumes the interviewers profile.

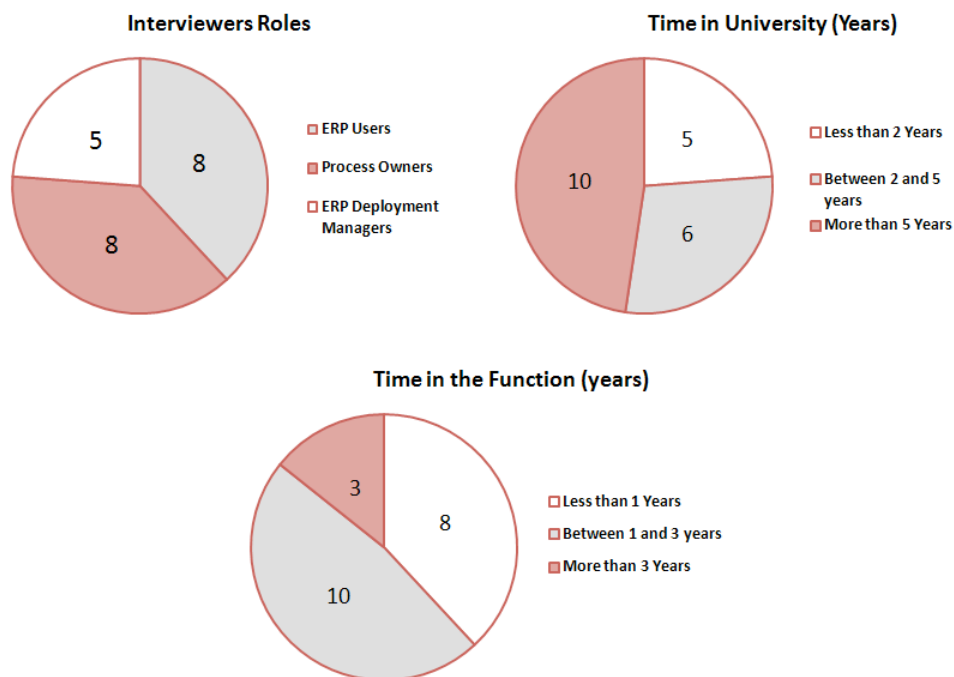


Figure 2. Interviewers Profile.

4 Results

The first two steps of this research were to find and classify CSFs in ERP implementation published in the literature. From these steps, 20 CSFs (as shown in Table 1) were point out:

[CSF01] - **Top Management Support** - Means the responsibility of the senior manager in to support the ERP implementation project and clarify the priority of the ERP to the organisation.

[CSF02] - **Project Team Competence** - Means the team of ERP implementation is well balanced, with part of the users with deep knowledge of the company's business processes and part with experience in information technology. The team is completed with the participation of external consultants.

[CSF03] - **Interdepartmental cooperation and Communication** - Means there is a cooperative relationship, strong communication and participation of the various departments of the company throughout the implementation process.

[CSF04] - **Clear Goals and Target** - Means to precisely define the objectives and goals of the project.

[CSF05] - **Project Management** - Means to manage cost, budget, deadlines, checkpoints, schedule, resources, risks, quality, critical paths and scope of ERP implementation.

[CSF06] - **Expectations Management** - Means to manage the expectations of project team members and the stakeholders of the organization.

[CSF07] - **Presence of Champion** - Means that the company should have a project leader (champion), a top business executive with the responsibility to set goals, solve issues, validate changes, and with capable of taking decisions about the ERP implementation process.

[CSF08] - **Careful solution selection**- Means that proper selection of the ERP and new technology architecture should be properly evaluated and estimated to not compromise performance.

[CSF09] - **Data analysis and conversion** - Means that the Company needs to know data that must be included or omitted in the system. Also, the company should consider interfaces with other internal or external systems.

[CSF10] - **Education and Training in the system** - Means that the team project is properly trained in tools, software and methodologies that will be used during ERP implementation. Training of the end users in the new business processes and ERP system is also part of this CSF.

[CSF11] - **Process Reengineering** - Means that the company should map its current business processes, identifying possible improvement and creating a new process when necessary.

[CSF12] - **Minimum Customization** - Means that company analysed the ERP to maximise the use of configurable functionalities and minimise the use of customisations, seeking when possible to adapt the business process of the organisation to the software.

[CSF13] - **Change Management** - Means that changes can occur in teams, processes, organisational structure impacting the ERP implementation. Manage these changes can minimise risks of failure.

[CSF14] - **Partnership with the manufacturer** - Means to maintain a relationship to maximise the use of the manufacturer's system and tools, fix ERP bugs and constantly update through the release of new versions.

[CSF15] - **Use of consultants** - Means to use an external team of consultants experienced in ERP implementations to assist the organisation.

[CSF16] - **Frozen Requirements** - Means that the requirements need a minimum degree of stability to enable efficient ERP implementation.

[CSF17] - **Appropriated Process/Methods** - Means that established methods in the industry are being used in ERP implementation avoiding ad-hoc processes that can bring more problems to the project.

[CSF18] - **Organizational Characteristics** - Means that particular characteristics of the companies, or their ecosystem, are reflected in the ERP and in this way must be evaluated before starting the implementation.

[CSF19] - **Post Implementation Evaluations** - Means that the implementation of the ERP should be evaluated later to verify the effectiveness of the action.

[CSF20] - **Social Construction of Technological Legacy** - Means that stakeholders should understand the ERP function in the organization and how it helps in their activities. It goes beyond the

technical and business domain referring to the actual integration of the ERP in the context of the organization.

The CSF20 is the only one related exclusively to public organisations while all the others are found in general initiatives of ERP implementation.

Considering the case study in public sector, 16 CSFs were reported after the analysis of interviews and data compilation, in which two of them are new (Bureaucracy and Change Government), as showed in Figure 3.

CSFs observed in the case study	
Top Management Support	Project Team Competency
Clear goals and targets	Project Management
Presence of "Champion"	Careful solution selection
Education and Training in the system	Process Reengineering
Interdepartmental cooperation and Communication	Bureaucracy*
Expectations management	Change Government*
Data analysis and conversion	Organizational Characteristics
Social Construction of Technological Legacy	Partnership with the manufacturer

Figure 3. CSFs found in case study.

Bureaucracy (1) was pointed out as the major "issues source" in the ERP implementation in this sector. Endless meetings to make decisions, a lot of authorisations to move forward, wait for specific dates to solve certain problems, uncountable delays and impossibilities to change resource (money) allocations were cited by 20, from 21 interviewers. The bureaucracy was the major cause of schedule deviations, and motivator for re-planning actions. One of the process owners related: *"we spent more effort trying to bypass bureaucratic situations than performing process reengineering"*. None of the interviewers cited "change management" in their answers, besides most of them considered "changes", but bureaucracy impacted everyone that cited changes during the ERP implementation project. Some actions were proposed to minimize the impact of bureaucracy in the projects:

- Intensify communication between sectors, departments and academic centers;
- Preliminary planning of the project about all necessary acquisitions to reduce the execution time of the activities;
- Make people aware of laws and regulations necessary for the institution;
- Involve Information Technology personnel in project planning to ensure that all technological resources are sufficient to the project.

Change government (2) was relevant in the ERP implementation project because, at the beginning of the process, a new Rector and Board Council were elected and the project suffered some changes that impacted the job in both pro-rectory studied. Processes governed by law were not impacted, but other processes suffered changes that required re-establish goals, re-planning and a new financial strategy. Recommendations to reduce risks were related:

- Determine project milestones during each government management to reduce the impact of management change;
- Have project leaders with well-defined roles and responsibilities in the project since managerial positions are often modified after change government.

Most of the interviewers highlighted the importance of the **presence of the champion (3)**. In a public company, few people feel compelled to support all the change culture brought by an ERP, and the person that leads this process is very valued, maybe more than in a private company. In this case study, the leadership was distributed among the process owners. Each department had its ERP project

responsible, and most of them lead the ERP initiative, supporting and encouraging their colleagues. There is no recommendations about this CSF.

Interviewers also point out **expectations managing (4)** as a crucial activity in ERP implementation. The first ERP modules involved 200 employees, most of them from warehouses and all of them with expectations, managers, and external control organisms, demanding many activities in same time. Moreover, the top management of university also presented their expectations, and in fact, only part of it could be delivered in the short term. The most difficult task is to manage the expectations that will not be attended or those that "emerge" during the project. Some initiatives in order to reduce risks related to this factor:

- Keep the goals visible and clear to all stakeholders;
- Every time that expectations to change, inform this to the stakeholders;
- Conciliate goals and expectations should be done as soon as possible.

As commented, **clear goals and target (5)** was closely related to expectations management. In fact, most of the interviewers that cited any goal, it was related to expectation. But another part of the people, put goals and targets as a compass to follow when any scope changes happened. Some modules extension was narrowed or simplified to attend the most urgent demands, and these goals and targets helped the team to decide what were the priorities. The only recommendation here is:

- Keep the goals visible and clear to all stakeholders.

Project team competence (6) was referred to its initial size (small) and experienced in university business since it consists of users with deep knowledge of business processes, with access to the various levels of the organisation structure, as well as champions with experience in information technology and project management expertise. To minimize the risks related to this CSF, it is possible to highlight:

- Keep the project team always multidisciplinary;
- Enable the skills development to update the knowledge of the members and to guarantee the execution of the project efficiently and effectively.

Interviewers also cited **project management (7)** as an important aspect of ERP implementation. The curiosity about project management is that CSF always was related to others, such as bureaucracy, change government, expectation management, clear goals and target, and project team. There is no specific recommendation about this CSF.

Organization characteristics (8) present a similar behaviour to project management CSF, there is no mention of this CSF isolated, only linked to another CSF. Apparently, the organisational structure of the university did not impact, significantly, considering the interviewer's perceptions. There is no recommendation about this CSF.

Top management support (9) presented an intriguing scenario which was the "lack" of attention of these managerial. It was reported that top managers were present in the project in the initial stages. After the first weeks, the project champions took the leadership of the projects, and themselves supported the project teams. This situation only changed with the creation of one management committee, responding to the whole organisation and defining priorities and reaffirming the need to implement the ERP. To reduce problems in this context two actions are recommended:

- Define the roles and responsibilities of each project stakeholders together the sponsors;
- Conduct a critical review of the project to verify that what has been defined is being met.

A lot of effort was planned to **Education and Training (10)** of employees in ERP. The first training initiative was slowed down because most of the employees involved had problems with basic informatics skills. Some employees were relocated to units affected by ERP and the training schedule re-started again.

Process reengineering (11) was cited mostly by the process owners and ERP deployment managers as a requirement to be successful in the implementation project. Processes were changed in all units affected by ERP, and the reengineering was required, on a small or large scale, in all units. Another point observed is that there was no documentation about business processes (AS-IS or TO-BE). All the processes are in the head of the people involved. From this CFS, it is indicated:

- Document processes, beginning with critical processes and adding value to the organization;
- Create a team or department focused on process, because the business processes are “alive” and in constant changings.

In **interdepartmental cooperation and communication (12)** there was one issue about this CSF related to training of the system. It was observed that people from the same department are not aware of the project, others didn't have any information about the progress of the project and, moreover, communication between departments was very scarce. Some found evidences:

"... I just found out in training. The communication I think is ideal for conducting the appropriate information system. "(I02)"

"To be honest, there is no total integration between sectors" (I07)

"I think that lacked more communication with those involved..."(I08)

This lack of communication brings problems to ERP implementation, and this is one of the reasons for the first wave training failed. Some recommendations:

- Create a strategy to motivate people to follow the progress of the project through the site;
- Use newsletter or teaser, which can be sent by e-mail to all employees of the organisation;
- Conduct periodic workshops to present the results of the projects, the problems faced and the new challenges.

About **Careful solution selection (13)**, few interviewers cited that government law about public acquisitions of IT products obligated technology people to consider only the solutions without restrictions. The analysis of technological aspects of ERP was properly done, and the solution is selected after an evaluation. In the study case, the business aspects were more clear since the selected system was developed by another public education institution and used by others educational institutions. To minimize risks related to this CSF it was recommended:

- Perform an analysis of adherence to the processes of the organisation with the existing processes in the ERP, to verify which system best meets the needs of the institution, before the acquisition of the system.

Considering **Data analysis and conversion (14)**, the only migration was of the existing data in the legacies systems and performed to warehouse. At the time of the validation of the data migration by the key users, some inconsistencies were detected, which were reported to the project manager and consequently to the deployment consultancy. This can be reinforced in the following evidences:

"A problem with the old records at the time of importing the records was with the wrong information, so when they imported it, it imported with error, then it had to redo the import of such data". (I04)

"For now the problems are few, but in the initial deployment present a data migration problem because the data was not compatible in the same AERP (our ERP) format."(I10)

This FCS can ruin the project if the organisation does not know the data that needs to be included or omitted in the system. To reduce the risks it is indicated:

- Perform the entire process of data migration in an approval environment of approval, and avoiding to damage the integrity of the data in the official environment;
- Validate the needs to be performed by several key users and simulate the system routines that impact or are impacted by such migrated information.

Partnership with Manufacturer (15) was crucial to this project since the university did not hired any external consultant. All information about the products came from the manufacturer that made

available guides and the Wiki product. Telephone calls and video-conference sessions were provided to clear doubts and issues in the ERP installation and implementation. There is no recommendation to this CSF.

Social Construction of Technological Legacy (16) was cited by the ERP users and was related to the perceived value of the system. Few members were afraid if in a long term the ERP would be disabled. There is no recommendation for this factor.

This case study brings a lot of evidence about issues and good practices on ERP implementation. Even that project is still running the idea is to continue gathering experience to improve the next stages of ERP implementation. These 16 CSFs comprehends most of the lessons learning of this first year of project, and provided much more knowledge about some CSFs, others almost not affect the project, but the main reason to share these knowledge is to bring the evidences of a real case, and to propose these two new CSFs related to public sectors.

5 Conclusions

According the literature, ERP implementation in public organizations is different from private sector. These differences are also reflected in the CSFs, even when the CSF is the same for any project, for example, “team competency”, because “hiring” people in public sector is quite bureaucratic. There are CSF that is specific in public context, such as bureaucracy and social construction of technological legacy. In fact the whole context tends to be more complicated and slow than regular ERP implementation. The CSFs and recommendations listed here were suggested in order to help public companies to being more efficient and waste less energy with public specificities.

5.1 Limitations and Treats to Validity

This study has some limitations, which exist in any research project. Considering the literature review, the decision about perform an ad-hoc search may cause a loss of relevant papers that could be rich to the whole research. Additionally, qualitative findings are highly based on context, and case-dependent. To avoid bias, it was adopted well-established research methods and developed an early familiarity with the organisations culture through preliminary visits. Although the limited size of the sampling of informants (21 respondents), usually a particularity of the qualitative research, it was selected diverse participants as possible from each unit, considering similarities, dissimilarities, redundancies, and varieties to acquire greater knowledge of the wider group.

5.2 Future Works

As future research, some works can be considered:

- Conduct new investigations in others public sector institutions to compare the results, validate the CSF found, evaluate the degree of relevance of these CSFs, and identify new critical success factors in the adherence of ERP business processes;
- Design a research similar to the present study, changing the analysis unit to a people-centered analysis, with focus on the stakeholders in the ERP deployment process (managers, analysts, key users, end users, etc.) in order to verify what are the impacts on human and behavioral aspects during the implementation of integrated management systems;
- Develop a guideline with best practices and CSFs to help public companies to adopt ERPs.

5.3 Implications on Academy and Industry

ERP implementation is a complex topic and seems to be little studied when considering public companies. In this context, this study contributed to the field by providing a synthesis of the state of the art of CSFs for ERP implementation in public companies, through a broad literature review. It also provided results from a case study on CSF in one public university.

The shown results suggest that CSFs of ERP implementation in public contexts are different from the general view since some of these CSFs are more evident in public companies that suffer from bureaucracy and social questions. It also can be noticed the importance of the context to establish a cause-effect relationship between the public context and the CSFs perceived in the practical case. It is important to emphasize the need for research with the focus on the better description of the public context to support the CSF analysis of ERP implementation in light of theoretical models. Finally, it was proposed some recommendations that come from lessons learned. Public context seems to need more empirical evidences than the private contexts and, therefore, can be better explored in future studies.

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