

ERP ADOPTION BY PUBLIC AND PRIVATE ORGANIZATIONS – A COMPARATIVE ANALYSIS OF SUCCESSFUL IMPLEMENTATIONS

Maria do Céu Alves¹, Sergio Ivo Amaral Matos²

¹*University of Beira Interior, Management and Economics, Estrada do Sineiro, Covilha,
6200-209 Portugal*

²*University of Minho, Braga, Portugal*

E-mails: ¹mceu@ubi.pt (corresponding author); ²serg.ivomatos@gmail.com

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Abstract. The business environment has changed dramatically in the last years. The organizations are now more complex in terms of their structure and geographical dispersion. Daily, great amounts of information are produced and, to surpass these problems, organizations have invested in Enterprise Resource Planning systems (ERP). The same trends can be detected within the public sector. The interest generated by the ERP phenomenon is growing and the particularities of the public sector make specific studies necessary. Accordingly, the aim of this paper is to examine the adoption process of ERP systems by public and private organizations. Which ERP modules are mostly adopted? Which reasons legitimate ERP adoption? Using a survey research methodology, this study reveals that the need to increase the demand for real-time information, to obtain information for decision-making and the integration of applications appear as main reasons to implement an ERP system. Although the reasons given are the same for public and private organizations, the results of this study also show that the modules implemented are slightly different; the importance or dominance of each module may differ; and the deployment time is shorter in the public sector. Since comparative studies are relatively scarce, our work helps to reduce this knowledge gap.

Keywords: enterprise resource planning; ERP adoption; module; integration; opinion survey; public sector; private sector; motivation.

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1. Introduction

Nowadays no one would dispute that information technology has become one of the most important cornerstones of an enterprise's ability to successfully compete in the global market place (Yusuf *et al.* 2006). Despite the downturn in the global economy, there has been a worldwide trend of Enterprise Resource Planning (ERP) implementa-

tions resulting in key initiatives among ERP vendors, with some having established new divisions dedicated to the public-sector (Thomas, Jajodia 2004). The worldwide market for ERP solutions is expected to grow at a Compounded Annual Growth Rate (CAGR) of 4.8 percent over the next years (ARC 2006). According to a new ARC Advisory Group study “Enterprise Resource Planning Worldwide Outlook” (ARC 2006), the market was \$16.67 billion in 2005 and is forecasted to be over \$21 billion in 2010. The recent AMR Research report forecasts are higher. “We predict an 11% CAGR for the ERP market through 2011” (Jacobson *et al.* 2007), with the public sector investing heavily in ERP systems (Raymond *et al.* 2005). So, with organizations increasingly opting to implement ERP systems, there is an increasing need to understand the reasons presented to justify this option. Implementing an ERP system is a difficult task and not much research has been done in this area. Usually “the ex-post evaluation of ERP systems is necessary not only to justify the investments made in these systems, but also and above all to better manage the benefits sought by organizations from these systems” (Uwizeyemungu, Raymond 2010). In this study, an ex-post evaluation is needed to ensure that the organization under study corresponds to a successful implementation of ERP systems.

In recent years, changes in the business climate have led to significant changes in management processes of organizations. Similarly, developments in information technology and business reengineering process, have led to major strategic changes often associated with the implementation of ERP systems in organizations.

Organizations have become more complex in terms of their corporate structure and geographical dispersion due to phenomena such as the globalization of business. On a daily basis, they produce large amounts of information, resulting in different systems, which need to be addressed. As a way to overcome this problem, organizations have been integrating their systems into a single operating system. This system, which allows integrating all the information produced in an organization is called the ERP system (Shang, Seddon 2002) and affects the entire logistics chain. “An ERP implementation usually affects both suppliers and customers due to the transformation that generally occurs through the technical integration of software, hardware and processes” (Malhotra, Temponi 2010). But the main objective in an enterprise information system is to control the information within the whole enterprise, and even in the whole supply chain, in order to obtain competitive advantage” (Botta-Genoulaz *et al.* 2005).

In the public sector “Governments worldwide have increased efforts to streamline their business processes and support public services enabled by various technologies. At the core of eGovernment technology enablers are enterprise resource planning (ERP) systems” (Wagner, Antonucci 2009). ERP systems are also considered a solution to the growing information requirements within the public-sector (Spano *et al.* 2009).

The government of Portugal is exploring new and better ways of delivering its services to the Portuguese people, including alternative service delivery, public/private partnerships, and privatization. Portugal has an advanced infrastructure containing two major portals; the *Citizen's portal* and the *Enterprise's portal*. Both are considered as main

access points for interaction with the public administration (ENISA 2010). The strategic use of information technologies is playing a key role in this modernization process.

Therefore, the aim of this paper is to examine the motivations and key features of ERP systems implementation by Portuguese organizations. Which modules are mostly adopted? Which reasons motivate their adoption? Are patterns of ERP motivations different in Public and Private organizations? We try to understand the underlying reasons why organizations choose to convert from conventional information systems to ERP systems. To do this, in section 2 and 3, the risks and motivations for ERP implementation are studied since “as determinants of ERP adoption, motivations refer to initial reasons that led to the ERP adoption decision” (Uwizeyemungu, Raymond 2005). In Section 4 we attempt to summarize the differences between public and private organizations and section 5 presents a special focus on the integration process. The research questions are developed in section 6 and the research methodology is explained in section 7. Subsequently, in section 8, we present the result of our survey, and some conclusions are drawn in section 9.

2. Managing risks factors in ERP implementation

An ERP system is an integrated software package composed by a set of standard modules which can be adapted to the specific needs of each customer (Botta-Genoulaz, Millet 2006). An ERP package may combine inventory data with financial and human resource data, allowing organizations to manage human, material and financial resources in order to control the information within the whole organization and to obtain a competitive advantage.

ERP implementation is a complex process involving people, resources and technological changes but, also, resistance to change (Kumar *et al.* 2002), costs and risks (Aloini *et al.* 2007). Some of them are technical risks, but studies have shown that the highest risk are the people involved (Avital, Vandenbosch 2000) and their lack of training (Botta-Genoulaz, Millet 2006). In the adoption process, the cost, complexity, investment of time and staff, make a turn back after adoption very difficult (Kumar *et al.* 2002).

While many enterprises are attracted by the potential benefits expected after the implementation of ERP systems (Shang, Seddon 2002), the literature review indicated that “there are several failed cases, and companies lost not only the capital invested in ERP packages and millions paid to outside consultants but also a major portion of their business” (Yusuf *et al.* 2006). In this context, it’s important for organizations to be aware of some critical issues before implementing ERP.

A common problem encountered in adopting ERP software has been the issue of fit or alignment (Wu *et al.* 2007). This problem results from inadequacies and gaps between the functions offered by ERP and the organization’s requirements. These gaps arise from incompatibilities between the ERP functional processing capabilities, the data format, the output information content and the users’ requirements (Wu *et al.* 2007). To avoid these situations, “the implementation should be business driven and directed by business requirements” (Umble *et al.* 2003).

ERP implementation may trigger profound changes in organizations and if people are not prepared some resistance will be predictable. Some reasons for failure are poor planning or poor management, changes in business goals during the project and lack of management support (Umble *et al.* 2003). So, the ERP implementation should be planned carefully (Malhotra, Temponi 2010); with a clear understanding of strategic goals; a strong leadership, commitment, and participation by top management; a clear and well defined project management; a realignment between organizational structure and processes and ERP; a great implementation team; an extensive training (Umble *et al.* 2003).

ERP implementation projects require large investments, and after such investment it is legitimate for the enterprise to feel the need to proceed to ex-post evaluations of their investments (Uwizeyemungu, Raymond 2010).

The study of risk factors is usually linked to cases of failure (Aloini *et al.* 2007). In this study the aim is to analyze the motivations for the implementation of ERP success stories. Thus, we only examine risks that may have initially conditioned the implementation of ERP systems such as taxation requirements and government funding.

3. Reasons for ERP implementation

ERP systems, by enabling organizations to integrate all their business processes, enable a faster level of processing transactions, reporting and analysis of information, and also provide information in real time (Davenport 1998; Granlund, Malmi 2002; Hyvönen 2003; Scapens, Jazayeri 2003; Spathis, Constantinides 2004). Spathis and Constantinides (2004) reported some additional benefits of ERP systems, such as increased flexibility in generating information and the improvement of quality of reports and financial statements. Generally, the literature review quotes as reasons for the implementation of ERP systems:

- The need for organizations to remain competitive (Spathis, Constantinides 2004; Botta-Genoulaz, Millet 2006; Sayed 2006);
- The need to increase the demand for real-time information, to obtain information for decision making and the integration of applications (Umble *et al.* 2003; Spathis 2006; Ribeiro 2008).
- The need to implement a new business plan, to reduce costs and to increase sales (Spathis 2006; Ribeiro 2008).
- The need to integrate all the information scattered throughout various systems within the organization to encourage a corporate culture based on information from a single integrated system (Umble *et al.* 2003; Scapens, Jazayeri 2003).
- Or simply to seek to resemble the most modern international organizations, in terms of management, human resources and production systems (Sayed 2006).

4. ERP in public and private organizations

The experience of private-sector has been recognized by several public organizations that used this experience with implementation partners (Thomas, Jajodia 2004;

Gulledge, Sommer 2003). According to Wagner and Antonucci (2009) “as a result, the public-sector has adopted much of the generalized private-sector ERP implementation approach and tailored it to the public environment. This indicates that an understanding of public and private environment differences that affect ERP implementation are important”.

However, “each sector is confronted with specific environmental constraints, the transfer of IT practices from the private to the public sector would not occur automatically” (Uwizeyemungu, Raymond 2005). According to Wagner and Antonucci (2009) an examination of public-sector ERP implementations revealed that before 2003 a majority have been on a small-scale, focusing on a few ERP modules within a department or agency. Contradictory, large-scale ERP deployments have been prevalent in the private-sector (Blick *et al.* 2000; Uwizeyemungu, Raymond 2005). “There have been few successful attempts to integrate multiple agencies of a public organization using one single ERP package” (Wagner, Antonucci 2009).

The literature comparing ERP implementations between public and private organizations indicates several differences. Culture has been identified as a major difference. Public organizations usually have some adversity to risk, high level of complexity, a complex political system and a fragmented power system which makes consistent leadership difficult (Thomas, Jajodia 2004; Wagner, Antonucci 2009). In contrast to private firms that implement information technology applications as competitive weapons, public agencies must often share their applications and competencies with other agencies (Uwizeyemungu, Raymond 2005). “In the public-sector large-scale ERP implementations tend to have increased organizational complexity combined with a large number of users across multiple ERP modules” (Wagner, Antonucci 2009). Therefore it is sometimes difficult or even impossible to adopt the commercial processes (Blick *et al.* 2000).

The complex political system and fragmented power system intensifies the challenge in obtaining top management commitment (Gulledge, Sommer 2003; Thomas, Jajodia 2004). In the public sector, top level managers, i.e. political appointees are less inclined towards the development of new information technology investments than middle managers, i.e. career managers (Uwizeyemungu, Raymond 2005).

The organizational structure of several public organizations tends to be more complex and the organizational complexity (fragmented departments) affects the ability to identify appropriate process owners (Wagner, Antonucci 2009).

Usually, ERP implementations in public organization are done by large teams. The team composition is quite different and bigger than the ones within the private sector, in order to accommodate representation from the many departments and divisions.

In public organization ERP implementation is also a complex funding process, because resources are allocated by budgetary processes rather than by market mechanisms as in the private sector (Uwizeyemungu, Raymond 2005). Consequently, budgeting and allocations are more difficult than in the private sector (Thomas, Jajodia 2004; Wagner, Antonucci 2009).

Information Technology investment planning in the public sector must often bow to political pressure and thus it is mostly oriented in the short term (Uwizeyemungu, Raymond 2005).

Finally, it is difficult to identify the “best business practices” and the “customer” for the public arena (Wagner, Antonucci 2009).

5. Integration in ERP systems

The notion of integration is central to the understanding of organizations in general as well as of contemporary phenomena such as ERP implementation (Barki, Pinsonneault 2005). “The ability of a firm to implement an ERP successfully is of significant importance; ERP is an enabler for technological integration that has evolved from basic Material Requirement Systems (MRP, MRPII) to sophisticated and multimillion-dollar systems that aim to link databases and applications in a friendly manner” (Malhotra, Temponi 2010). Past research has found even a positive relationship between integration and organizational performance (Truman 2000).

However the conceptualization of integration differs across domains. In strategy the concept is defined as “...the process of achieving unity of effort among the various subsystems in the accomplishment of the organization’s tasks...” (Lawrence, Lorsch 1967). According to Barki and Pinsonneault (2005), in the information systems field, integration may represent the extent to which different systems are interconnected and can talk to one another, namely by interfacing integration. But also, it may represent the level of integration among the internal systems, namely internal integration (Truman 2000). “ERP systems provide companies with the means of integrating their business functions into a unified and integrated business process. As companies implement more enterprise based systems throughout their organizations, the need for integration of these systems becomes even more dominant. Expanding from the functional areas of accounting, human resources, and shop floor control to an enterprise-wide system has become a format for producing full organization integration” (Ehie, Madsen 2005).

Today firms are engaging in unprecedented levels of large-scale integration due to advances in information technologies and globalization. Based on the idea that an ERP implementation could be considered a mechanism for achieving organizational integration across departments, Santamaria-Sanchez *et al.* (2010) state that although the total time spent on an ERP implementation grows with the number of modules used, modules do not require the same time to implement. In particular, value-chain modules (e.g. supplies, production and distribution processes) take more time than business-support modules (e.g. accounting, finance modules). And business-support module implementation is of relative low complexity, in terms of the cooperation and communication needed between the different areas of the organization, so the implementation time is lower than that of other more complex modules. In this context, without surprise, the literature refers that in ERP implementation the application of the modules of financial and management accounting prevails (Spathis, Constantinides 2004; Spathis 2006; Ribeiro

2008). Additionally, there are modules of costs and stock. It should be noted that the organizations that implemented ERP systems had as main concern the integration of their accounting processes (Spathis, Constantinides 2004; Spathis 2006).

6. Research purpose and questions

After a careful literature review, it appears there may be a significant missing element in the public-private research realm in that previous studies have not provided empirical evidence (Ward 2006). Little empirical research still exists when comparing and contrasting public and private sectors. Usually the data were collected with different instruments making direct comparisons between the public and private sectors difficult (Caudle *et al.* 1991) or geographically limited (Rocheleau, Wu 2002).

A few empirical studies have looked at public-sector reasons for the implementation of information systems. Based on an analysis of secondary data published in the form of “success stories” by largest ERP vendors, Uwizeyemungu and Raymond (2005) found that, in general, the public-sector organizations are driven by the same motives as those of the private-sector. However other researchers (Blick *et al.* 2000; Raymond *et al.* 2005; Rosacker, Olson 2008) have reached the opposite conclusion, pointing at significant differences between private and public organizations.

The interest generated by ERP implementation in the public sector and the particularities of this sector created the necessity of specific studies of ERP in public organizations necessary (Uwizeyemungu, Raymond 2005). And, it appears from previous studies that organizational conditions of public and private organizations are different. This suggests that the reasons to implement ERP systems may also differ. Since literature on ERP implementation on public-sector is relatively sparse, our paper helps to narrow this knowledge gap.

Consequently, in this article, an attempt has been made to address three main questions, two of them (RQ2 and RQ3) not commonly addressed in other studies of ERP implementation:

Research Question No. 1 – Why do organizations choose to adopt ERP systems?

Research Question No. 2 – Are patterns of ERP motivations different in public and private organizations?

Research Question No. 3 – Which modules are implemented?

To answer these research questions evidence will be obtained by means of a questionnaire sent to ERP adopters operating in Portugal:

7. Research methodology

Correct research methodology is a critical part of the research process, because it directly influences the results of the study (Yusuf *et al.* 2006). In this research, first hand data are obtained through a cross-sectional approach (Singh 2006) and a national survey.

The sampling frame of this research was prepared following consultation with the ERP major providers (Jacobson *et al.* 2007) in Portugal “*SAP Portugal*” who presented us a

list of successful clients, available in the SAP website (www.sap.pt). Thus, a population of 130 organizations that have successfully implemented the ERP system from SAP was defined. The data were collected through an internet-based data collection process. This survey instrument was implemented through an application available on the Website www.smartsurveyor.com. An internet-based data collection process was used. However, according to Ganassali (2008) the personalization of the contacts is a factor that affects the responses rate in web surveys; consequently the first contact was done through an e-mail with a link to the web survey. This mode of transmission was chosen since the use of online tools allows obtaining a high response rate in a short period of time (Groves *et al.* 2004) and because in certain situations, it has a very low cost (Ferreira, Sarmiento 2009).”Surveys are not necessarily cheap but, relative to strategies such as experiments and ethnography, they can produce a mountain of data in a short time for a fairly low cost. *The costs are perhaps more predictable* than is the case with other strategies” (Denscombe 2003).

To validate the questionnaire a panel of five experts was identified for participation in a pilot test. The pilot test was done with two academics, a SAP specialist and two organizations, a private organization and a public organization. They individually reviewed a preliminary version of the questionnaire which was presented to them as a web-based survey exactly as it would be deployed. After completing the pilot test an e-mail with a link to the web survey was sent to organizations that had successfully adopted SAP/ERP systems. In each organization the key informant was the accountant. Thus, in this article we only present some preliminary results of a larger research project whose aim is to study the relationship between accounting and ERP system in the post implementation phase.

As in other studies (Yusuf *et al.* 2006), in order to improve the response rate we took a set of measure. A personalized letter was sent to each respondent to explain the importance of the study and the reasons why he/she was selected for the study. The document was sent as an attachment of an electronic mail message sent to all the organizations that have successfully adopted SAP/ERP. The authors promised to give copies of the results to all respondents. All the informants were assured that their response would be kept confidential and would be shown only in an aggregated form. The questionnaire did not take more than 10 minutes to complete.

After several follow-up e-mails and phone calls, one hundred and thirty organizations were contacted, of whom 66 completed the questionnaire. We achieved a response rate of 51%. Given the length and nature of the survey, this response rate was satisfactory. The total process of data collection started in April 2008 and ended in August 2008. A database was then developed with the data gathered. These data were then analyzed with the help of the Statistical Package for Social Sciences (SPSS) for Windows.

8. Research findings

This section first presents the sample characteristics, before analyzing each research question. As stated before the sample is composed of 65 firms. Table 1 provides several characteristics of the organizations (sector activity, revenues and employees). It is clear

that the organizations come from a wide range of economic sectors, of different sizes in terms of revenues and number of employees.

Table 1. Sample Characteristics

Characteristics	Number	%
Organization type		
• Public Sector	8	12
• Private sector	57	88
• Total (N)	65	100
Private sector activity	57	100
• Industry	25	44
• Commerce	12	21
• Business Services	14	25
• Others	6	10
Sales	65	100
• < € 10 million	13	20
• € 10–49.99 million	24	37
• € 50–99.99 million	8	12
• € 100–250 million	9	14
• More than 250 million	11	17
Size	65	100
• Fewer than 50 employees	11	17
• 50–250	24	37
• 251–1000	16	25
• More than 1000 employees	14	21

As mentioned above, to identify the main reasons that motivated organizations to implement an ERP system and which modules were the most implemented in organizations surveyed, three questions were formulated. Q1 – Why do organizations choose to adopt ERP systems? Q2 – Are patterns of ERP motivations different in public and private organizations? And Q3 – Which modules are implemented?

Q1 – Why do organizations choose to adopt ERP systems?

When asked about the main reasons for implementing the ERP system, the Portuguese respondents have indicated “integration of applications” (86%), “increased demand for real-time information” (82%), “integration of information” (80%) and “information generation for decision-making” (77%) as the most popular reasons for ERP adoption.

Comparing these results with other countries (Table 2), we can see that Greek and Brazilian organizations have indicated almost the same reasons (Spathis, Constantinides 2004; Antunes, Alves 2008). Brazilian respondents have indicated that “integration of applications” (86%), “integration of information” (81%), “Information generation for decision-making” (59%) and “increased demand for real-time information” (53%), are the most popular reasons for ERP adoption. Greek respondents answered: “increased demand for real-time information” (96%), “Information generation for decision-making” (92%) and “integration of applications” (77%), as the most important reasons for ERP adoption.

Additionally, BPR as a prerequisite for a successful ERP implementation is quoted from a significant percentage of respondents (Portugal = 28%; Brazil = 34% and Greece = 54%). Also, ERP implementation as a means for cost reduction is quoted from a significant proportion of respondents (Brazil = 50%; Greece = 50% and Portugal = 26%).

The other reasons that lead organizations to implement the ERP system can be observed in Table 2.

Most of the respondents consider the ERP as an enabler of business processes and operations of the organization and also as a support for decision making at all levels of the organization. The need for organizations to remain competitive is a condition that makes them proceed with the implementation of ERP (Spathis, Constantinides 2004; Spathis 2006; Sayed 2006).

In the literature review, it was found that the organizations main reasons for implementing an ERP system are the need to increase the demand for real-time information, to obtain information for decision making and the integration of applications. Also important, the need to implement a new business plan, the need to reduce costs and the need to increase sales appear as other reasons for the implementation of ERP (Spathis, Constantinides 2004; Spathis 2006).

Table 2. Reasons for ERP implementation

Country <i>Reasons</i>	Portugal		Greece		Brazil	
	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
Integration of applications	56	86	20	77	27	84
Increased demand for real-time information	53	82	25	96	17	53
Integration of information	52	80	2	8	26	81
Information generation for decision-making	50	77	24	92	19	59
Competition	20	31	5	19	8	25
Business process re-engineering (BPR)	18	28	14	54	11	34
Costs reduction	17	26	13	50	16	50
Taxation requirements	9	14	9	35	3	9
“Year 2000” problem	6	9	1	4	-	-
Sales increase	6	9	8	31	1	3
Introduction of Euro	5	8	8	31	-	-
Applications of new business plan	5	8	7	27	4	13
Internet development	2	3	4	15	1	3
Government funding	0	0	2	8	1	3

The data collected in the survey confirm this, since it was found that the top reasons (Table 2) for the implementation of the ERP system were, in Portugal: the integration of applications; the increased demand for real-time information; the integration of information and the information generation for decision-making.

These findings corroborate the results of studies conducted in several countries in the public-sector (Kumar *et al.* 2002; Uwizeyemungu, Raymond 2005; Raymond *et al.* 2005; Singla 2008) and private-sector (Mabert *et al.* 2000; Scapens, Jazayeri 2003; Spathis 2006; Sayed 2006).

Q2 – Are patterns of ERP motivations different in public and private organizations?

Some studies provide indications of a number of significant differences between public and private organizations, which have implications for their management (Rainey *et al.* 1976; Ward 2006). When asked about the main reasons for implementing the ERP system, the private-sector respondents have indicated “integration of applications” (87%), “increased demand for real-time information” (85%), “integration of information” (84%) and “Information generation for decision-making” (80%) as the most popular reasons for ERP adoption.

Comparing these results with public-sector respondents, we can see that public and private sectors respondents have indicated the same reasons. Public sector respondents have indicated that “integration of applications” (100%), “integration of information” (75%), “Information generation for decision-making” (75%) and “increased demand for real-time information” (75%), are the most popular reasons for ERP adoption (Table 3). We used a contingency table, the ANOVA F test and the Pearson chi-square test to analyze the association between public and private organizations. Because most of the chi-square values are not significant (we exclude only the “introduction of the euro”) we can say that we do not find significant differences between public and private organizations relatively to the reasons presented to implement ERP systems. Only the “introduction of the euro” appears as an exception.

Contradictory to the literature (Botta-Genoulaz, Millet 2006), the interest of public organizations with the Y2K problems (consequences of the new millennium on data format) is not confirmed. But, this situation is not surprising because all the public and the majority of private organizations had implemented ERP system in the year 2000 or after (Table 4).

The comparative analysis of these results shows that, in general, the public sector organizations are driven by the same motives as those of the private sector. However, there is good reason to note that certain motives can have an impact either more significant or less significant in the private sector than in the public sector. For example competition and costs are strongest arguments for the private sector organization, and taxation requirement only affects the private sector. And business process requirements’ modeling is a key element in Public organizations to deal with some differences between the public-private sectors (Blick *et al.* 2000). The results suggest that these conclusions are true but the differences are not statistically significant (Table 3).

Table 3. Reasons for ERP implementation in Portuguese public/private organizations

Reasons	Public Sector (n = 8)		Private Sector (n = 57)		F test	χ^2
	Frequency	%	Frequency	%		
Integration of applications	8	100	48	84	1.454	1.466
Increased demand for real-time information	6	75	47	82	0.252	0.259
Integration of information	6	75	46	81	0.138	0.143
Information generation for decision-making	6	75	44	77	0.018	0.019
Competition	2	3	18	32	0.138	0.143
Business process re-engineering (BPR)	3	38	15	26	0.428	0.438
Costs reduction	1	1	16	28	0.865	0.881
Taxation requirements	0	0	9	16	1.454	1.466
“Year 2000” problem	1	1	5	9	0.113	0.116
Sales increase	0	0	6	11	0.912	0.946
Introduction of Euro	3	38	2	4	13.421*	11.415*
Applications of new business plan	0	0	5	9	0.746	0.760
Internet development	0	0	2	4	0.282	0.290
Government funding	0	0	0	0	–	–

*significant at the 0.01 level

Table 4. Key Features of the implementation process

	Organizations						
	Public sector (n = 8)		Private sector (n = 57)		Total (n = 65)		
	Count	%	Count	%	Count	%	
Number of years of use of the ERP system	1	0	0	2	3.5	2	3.1
	2	0	0	6	10.5	6	9.2
	3	1	12.5	8	14.0	9	13.8
	4	1	12.5	8	14.0	9	13.8
	5	1	12.5	1	1.8	2	3.1
	6	3	37.5	6	10.5	9	13.8
	7	0	0	5	8.8	5	7.7
	8	2	25.0	5	8.8	7	10.8
	9	0	0	1	1.8	1	1.5
	10	0	0	6	10.5	6	9.2
	11	0	0	4	7.0	4	6.2
	12	0	0	2	3.5	2	3.1
	13	0	0	2	3.5	2	3.1
	14	0	0	1	1.8	1	1.5

Continued Table 4

Year of ERP implementation	1993	0	0	1	1.8	1	1.5
	1995	0	0	2	3.5	2	3.1
	1996	0	0	5	8.8	5	7.7
	1997	0	0	2	3.5	2	3.1
	1998	0	0	5	8.8	5	7.7
	1999	0	0	4	7.0	4	6.2
	2000	2	25.0	7	12.3	9	13.8
	2001	3	37.5	3	5.3	6	9.2
	2002	2	25.0	4	7.0	6	9.2
	2003	0	0	4	7.0	4	6.2
	2004	0	0	7	12.3	7	10.8
	2005	1	12.5	6	10.5	7	10.8
	2006	0	0	5	8.8	5	7.7
	2007	0	0	2	3.5	2	3.1
Time spent on ERP implementation (Months)	1	0	0	3	5.3	3	4.6
	2	0	0	3	5.3	3	4.6
	3	3	37.5	2	3.5	5	7.7
	4	1	12.5	2	3.5	3	4.6
	5	0	0	1	1.8	1	1.5
	6	1	12.5	18	31.6	19	29.2
	7	0	0	2	3.5	2	3.1
	8	0	0	3	5.3	3	4.6
	9	0	0	7	12.3	7	10.8
	10	0	0	1	1.8	1	1.5
	12	3	37.5	7	12.3	10	15.4
	15	0	0	1	1.8	1	1.5
	18	0	0	6	10.5	6	9.2
	24	0	0	1	1.8	1	1.5

Q3 – Which modules are implemented?

In fact, in the organizations surveyed it was found that most of the modules implemented were: the Financial Accounting module (94%); the Materials Management module (83%) and the Controlling module (80%). These results corroborate those from other studies (Spathis, Constantinides 2004; Botta-Genoulaz, Millet 2006; Spathis 2006; Ribeiro 2008), according to which in the organizations that have implemented ERP, the financial and management accounting module are dominating. Thus we can conclude that Portuguese organizations that implemented ERP systems began by implementing the modules of accounting, which shows an initial concern to integrate their accounting processes. This is true for private and public organization but, also, for manufacturing and service companies. According to Botta-Genoulaz and Millet (2006), “service com-

panies have often implemented an ERP solution in order to replace old legacy systems in the administration, finance and material management departments”.

However, private organizations have implemented, on average, more modules than public organizations (6/5). Public organizations have implemented between 3–7 modules while private organizations modules vary between 1 and 9 modules (Table 5). A t test was used to compare one variable (modules implementation) between two groups (public and private organizations). The differences between public and private organizations are small but statistically significant (Table 6).

Table 5. Implementation of modules in public and private organizations

Modules implementation in Public/private organizations					
		Organizations			Total
		public	private		
How many ERP modules have been implemented?	1	Count	0	1	1
		%	0	1.8%	1.5%
	2	Count	0	2	2
		%	0	3.5%	3.1%
	3	Count	2	3	5
		%	25.0%	5.3%	7.7%
	4	Count	2	6	8
		%	25.0%	10.5%	12.3%
	5	Count	1	7	8
		%	12.5%	12.3%	12.3%
	6	Count	2	13	15
		%	25.0%	22.8%	23.1%
	7	Count	1	13	14
		%	12.5%	22.8%	21.5%
	8	Count	0	3	3
		%	0	5.3%	4.6%
	9	Count	0	9	9
		%	0	15.8%	13.8%
Total (N)		8	57	65	

Table 6. T test regarding the utilization of ERP system by public/private organizations

Statement	N	Organizations	Mean	t	Sig.
No. of modules implemented	8	Public	4.75	1.830	0.072*
	57	Private	6.09		
Years of use of the ERP system	8	Public	5.75	0.482	0.632
	57	Private	6.37		
Time spent on ERP implementation	8	Public	6.9	0.801	0.426
	57	Private	8.4		

*significant at the 0.1 level

Given the characteristics of public sector organizations it is not surprising that there is less use of some modules, namely Sales and Distribution, Production Planning, Logistics and Quality Control (Fig. 1). And, we can not forget that the system was originally designed for the private sector organization; consequently, sometimes public organizations need to modify the software to meet their requirements (Blick *et al.* 2000; Kumar *et al.* 2002).

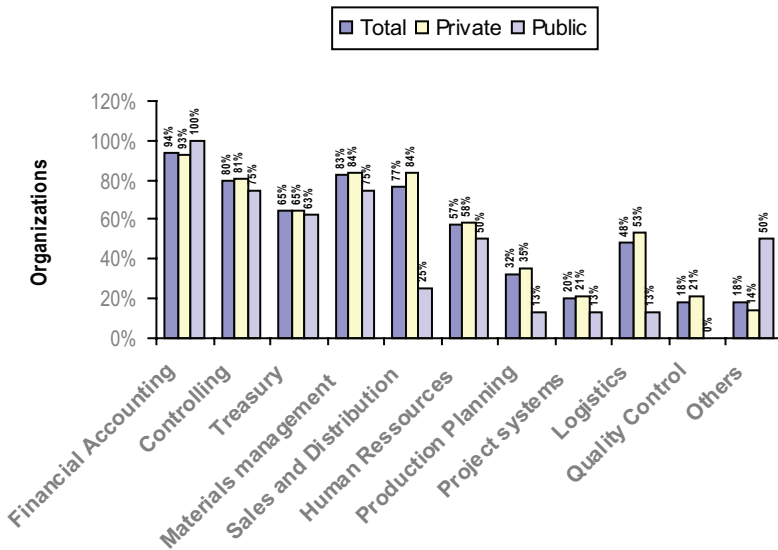


Fig. 1. ERP Modules implemented in Portuguese public/private organizations

The public sector respondents have been using ERP systems for over 3 years and less than 9 years. In the private sector the majority of respondents have been using ERP systems for more than 5 years (Table 4). However, the differences between private and public organizations are not statistically significant (Table 6).

In the public sector the ERP system was implemented in 2000, 2001, 2002 or 2005. In the private sector the years 2000, 2004 and 2005 were the most frequent answer. All public sector organizations and most private sector organizations have implemented ERP after 2000. The change of millennium (Year 2000 problem) installed some fear of looming disasters and accelerated the sales and acceptance of ERP. But, in this study, public organizations interest with Y2K problems is not confirmed because all the organizations studied had implemented ERP system in the year 2000 or after (Table 4).

The time spent on ERP implementation varies (Table 4). Most frequent delays in the public sector were three months (38%), 6 months (13%) and 12 months (38%). In the private sector, the amplitude of variation increases and time spent in ERP implementation varies between one month and two years. Most frequent delays in the private sector were six months (32%), 9 months (12%), 12 months (12%), and 18 months (11%).

In short, most respondents (52.2%) took six months or less to implement the ERP. However the differences between private and public organizations are not statistically significant (Table 6).

According to Santamaria-Sanchez *et al.* (2010) the total time spent on ERP implementations grows with the number of modules used and all the modules do not require the same time to be implemented. In this study, the correlation between the number of modules implemented and the time spent on ERP implementation is statistically significant (Table 7). However, the association between modules implementation and time spent is statistically significant for the private sector but not for the public sector (Table 8).

Table 7. Time spent on ERP implementation and modules implemented

		Time spent on ERP implementation	Nr. modules implemented
Time spent on ERP implementation	Pearson Correlation	1	.253*
	Sig. (2-tailed)		.042
	N	65	65
Nr. of modules implemented	Pearson Correlation	.253*	1
	Sig. (2-tailed)	.042	
	N	65	65

* Correlation is significant at the 0.05 level (2-tailed).

Table 8. Modules implemented / Time spent by private and public organizations

Activity sector		Value	df	Asymp. Sig. (2-sided)
Private	Pearson Chi-Square	125.791	104	.072*
	Likelihood Ratio	81.010	104	.954
	Linear-by-Linear Association	2.848	1	.091
	Nr of Valid Cases	57		
Public	Pearson Chi-Square	16.000	12	.191
	Likelihood Ratio	14.543	12	.267
	Linear-by-Linear Association	1.071	1	.301
	Nr of Valid Cases	8		
Total	Pearson Chi-Square	117.289	104	.176
	Likelihood Ratio	84.159	104	.923
	Linear-by-Linear Association	4.097	1	.043
	Nr of Valid Cases	65		

* Significant at the 0.1 level.

9. Conclusions and recommendations

In the present article, we have examined initial motives in the adoption of ERP systems. The main reasons that lead a public/private organization to implement an ERP system were analyzed, and we asked about the most implemented modules with the ERP system. The results suggest as the main motivators for the implementation of ERP system: the search for systems integration, the increasing demand for real-time information, the demand for integration of information systems, the need to generate information for decision-making and the increase of competitiveness in markets. These results are similar to the literature review. Moreover, it was found that in the surveyed organizations the most implemented modules of the ERP system are Financial Accounting, materials management and Controlling. Thus, the data collected indicate that the organizations that have implemented ERP systems began to implement the modules of accounting. These results show a concern by the respondent organizations to integrate their processes, starting with the area of accounting.

The results also show a statistically significant correlation between the number of modules implemented and the time spent in the implementation of the ERP system.

Our study presents some limitations. First, the research was based on Portuguese organizations and thus its results might not be generalizable to other countries. So, there is an opportunity for replicating this study across different countries. Secondly, many of the studies reviewed are based on questionnaires, whenever there are limitations associated with traditional application of these instruments. Questionnaire methods present certain validity threats. This study, also, presents a low response rate which may skew the findings. We studied a very small number of public sector companies (eight). However, the response rate was high as only one public organization did not want to participate in the study.

The research contribution of this study emanates from its basic research aim, that is, we didn't find evidence to suggest that the reasons for implementing ERP are different. Yet, although the reasons for implementing ERP are the same, some evidence seems to indicate that, given the specific features of the public sector, the modules implemented are slightly different. The importance or dominance of each module may differ. A smaller number of modules are implemented and the differences between private and public organizations are statistically significant. On average, the deployment time is shorter in public organizations.

We conclude then that there are differences between public and private sector regarding the implementation of ERP.

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Maria do Céu ALVES is Assistant Professor at the Business and Economics Department, University of Beira Interior, Portugal. She teaches Advanced Management Accounting at graduate and post graduate courses and currently guides 6 Ph.D. students. She holds a Ph.D. in Management from University of Beira Interior. Maria is member of the editorial board of *Portuguese Journal of Accounting and Management*, *International Business Research*, *International Journal of Economics and Finance*, *International Journal of Business and Management*. She is reviewer of the *International Journal of Business Administration*, *International Journal of Financial Research*. Her research interests include accounting information systems; ERP systems and new costing systems; management accounting roles and decision making. She is author of several publication including book chapters and articles. She has published in several national and international journals and conference proceedings.

Sergio Ivo Amaral MATOS is Certified Accountant and consultant in a Portuguese company. Sergio holds a master degree in accounting at University of Minho and he has published in several conference proceedings such as AMIS 2010 – Accounting and Management Information System and ECIME 2010 – European Conference on Information Management and Evaluation.