

# ***INFORMATION SYSTEMS AND TECHNOLOGY ADOPTION BY THE PORTUGUESE LARGE COMPANIES***

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## ***Abstract***

Companies use multiple solutions of information technologies and information systems to support their activities. Among the systems adopted by companies we can find Enterprise Resource Planning systems, Customer Relationship Management systems, Business Intelligence systems and many others. Such systems assure a wide spectrum of activities, ranging from operational support to the strategic support of the company.

With the purpose of identifying and characterizing which systems the large Portuguese companies have been implementing, in which systems they intend to invest in short-term and which is the current role of information technology in the organization, we developed a study with the participation of several chief information officers.

The findings of this study reveal that in Portuguese large companies the adoption of Enterprise Resource Planning systems are consolidated, while the adoption of systems like Business Intelligence, Collaboration, Workflow and Groupware will increase in the near future.

***Keywords:*** *Information Systems, Information Technology, Large Companies.*

## **1 INTRODUCTION**

The Information Technologies and Information Systems (IT/IS) play an absolutely central and crucial role in today's organizations, what is particularly evident when we are looking at large companies. As time goes by it becomes clearer that without an efficient use of IT/IS, companies cannot be competitive or generate revenue and in the great majority of the cases their own survival depends on that capacity (Varajão 2002).

Companies currently use multiple IT/IS solutions to support their activities at all management levels and few of them try to conduct their businesses without seeking to exploit the advantages of IT/IS solutions. Although the usually generalized idea that the large companies are leaders in the adoption of IT/IS solutions and use it for the support of all management levels, it is not always like that and it is of great relevance to identify which systems are currently implemented, which role the IT/IS play in the support of the diverse management levels and which systems the companies intend to develop in the near future.

With the purpose of identifying and characterizing the IT/IS adoption in large Portuguese companies, we conducted a survey which allowed us to discover diverse aspects of that reality, some of which were somewhat unexpected. In this paper, after the presentation of the scope and the research process, we present and analyze the results obtained and future trends on the adoption of IT/IS solutions.

## **RESEARCH FOCUS, DESIGN AND METHOD**

A survey was conducted to investigate several aspects of IS departments reality in large Portuguese companies. Specifically for this study, the survey aimed to determine which IT/IS solutions are adopted by them.

The general methodology involved a questionnaire that was sent to 500 Chief Information Officers (CIOs) of large Portuguese companies by gross revenue. CIOs are responsible for managing the IT department. Therefore, they should have rich information about all the aspects concerning IT/IS in their organizations.

The questionnaire was sent to the subjects in 2006 July. Three months later, after two rounds, 54 usable questionnaires were received and the data collection process was concluded. The data analysis and results presentation occurred in the next nine weeks.

### Subjects

The survey, undertaken from July to October 2006, focused on Portugal's large companies. The subjects in this study consisted of CIOs of the 500 largest Portuguese companies by gross revenue listed in the 2003 issue of Exame Magazine (Exame 2003). This particular audience was preferred because large organizations are generally leaders in technology use and application (Chang and Kirk 2000; Li et al. 2001), and need to have a well structured IT department to deal and manage the overall information system architecture. Therefore, the use of the Exame 500 companies as the target group seemed most appropriate.

#### 1.1 Questionnaire

A survey instrument was formulated (see Appendix A for selected portions) to obtain feedback from large companies in Portugal, assessing their IT/IS reality.

The structure of the questionnaire, partly based on earlier surveys conducted by CIO magazine (CIOMAG 2006), addressed several key aspects of IT departments with Likert scale, nominal scale, ordinal scale, interval scale and open-ended questions. The questionnaire was divided into several sections, each one with well defined objectives.

The proposed questionnaire was pre-tested several times to validate its content and readability and to improve some aspects of the questions. The necessary changes were made to the final questionnaire, which was delivered to all Exame 500 CIOs by post. With the questionnaire was sent a letter briefing the subjects about the scope and goals of the study, including a link to an Internet home page which allowed filling out the questionnaire online. CIOs were asked to answer by returning the questionnaire in paper support by post or to answer online.

## 1.2 Data representativeness

The survey was mailed to 500 CIOs of Exame 500 companies. The number of undelivered and return questionnaires was 11 so, that 489 total questionnaires were mailed. This mailing received 55 responses. Of these, one was rejected because many items were left blank, yielding a final usable response rate of 11%.

This response rate did not come as a surprise as it is comparable with the response rates of others studies conducted in the last few years (Sohal and Ng 1998; Chang and Kirk 2000; Enns et al. 2001; Kendall et al. 2001; Li et al. 2001; Lin and Pervan 2003). This may be due to the fact that some subjects are unwilling to respond to unsolicited survey (Li et al. 2001), simply had insufficient time (Lin and Pervan 2003) and many more companies set a policy of rejecting survey questionnaires (Li et al. 2001; Lin and Pervan 2003).

It is interesting to note that, although a paper version of the questionnaire was sent by post, unlike others studies in the past (Kendall et al. 2001), the overwhelming majority of CIOs (82%) replied electronically online.

Table 1 shows the characteristics of the respondents. The responding CIOs represent a broad coverage of industry classes, which indicates that results can be used to explain the Portuguese IT/IS adoption in large companies.

Characteristics	Respondents
Total number of employees	
<200	14
201-500	19
501-2000	16
>2000	5
Annual sales (euros)	
5 million to below 50 million	12
50 million to below 500 million	29
Greater than 500 million	8
No answer	5
International presence (number of countries)	
1	20
2	4
3-4	11
5-20	5
>20	9
No answer	5

*Table 1. Characteristics of respondents' companies.*

## 2 DATA ANALYSIS AND RESULTS

One of the questions we addressed in this study was which IT/IS systems are currently implemented in large Portuguese companies. We expected to find a high adoption of Enterprise Resource Planning systems, since its adoption is ubiquitous to large companies (Norris et al. 2000; Hossain et al. 2002; Rashid et al. 2002), on the other hand, we had high expectations concerning the adoption of systems like Business Intelligence.

To perform this study we started by searching which systems the companies are more concerned with in a general manner and, based on previous studies made in the North America (CIOMAG 2002; V. Kumar 2002; CIOMAG 2006) and Europe (Yvonne van et al. 2000; Karakostas et al. 2005), we identified the following systems: Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), Business Intelligence (BI), Collaboration and Workflow management and Groupware.

This study showed, as presented in Figure 1, that the majority of the companies have already implemented ERP systems. ERPs have been around for a long time, since the 1980's, and they are considered the standard backbone of companies' business support (Simchy-Levy et al. 2003).

This study reveals a surprisingly low adoption of CRM, Collaboration, Workflow, Groupware and BI systems, with less than 40% of the respondent companies having these kind of systems implemented. It would be expected a higher rate of adoption, closer to the ERP adoption, not only because systems like CRM are easier to implement than ERP (Hendricks et al. 2007) but also due to the fact that these systems can and should be used to improve the competitiveness and strategic positioning of the companies.

We included some open questions in the survey to verify if there was another important group of IT/IS solutions. Almost all answers obtained refer to business specific systems.

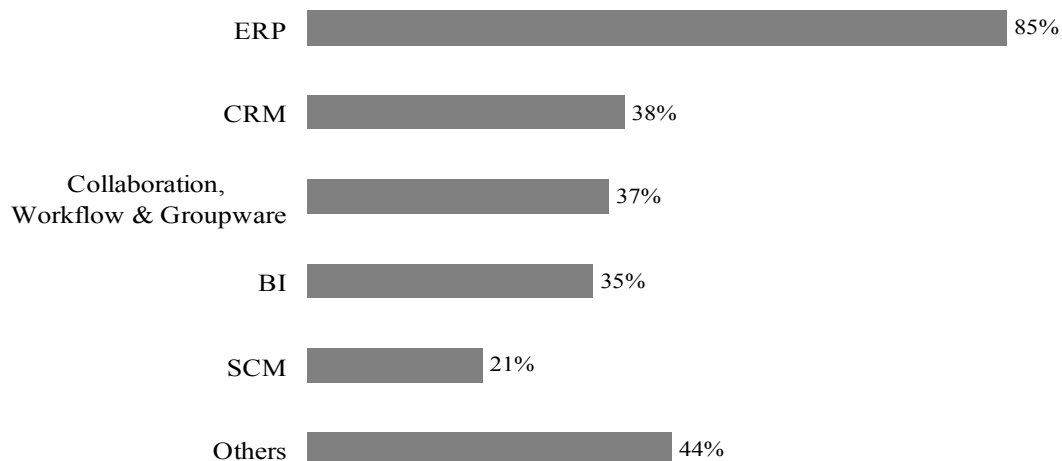
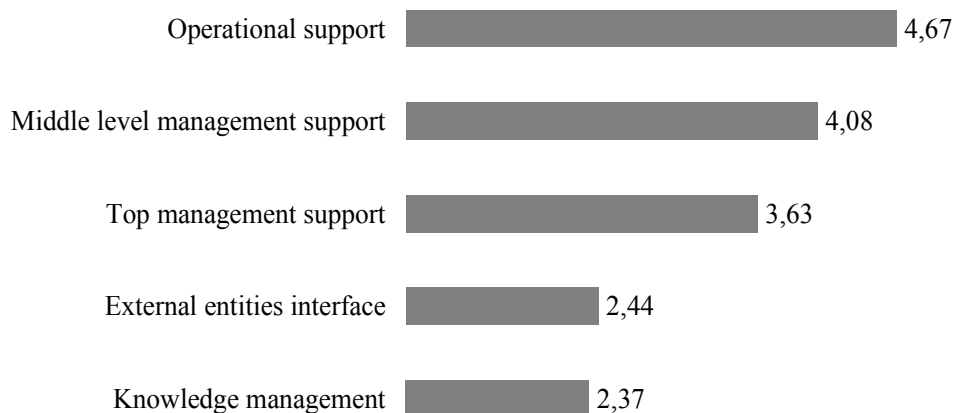


Figure 1. *Implemented systems by Portuguese large companies.*

In the survey we asked the actual role of the IT/IS in the company based on a Likert scale where 5 stands for most important and 1 the least important. Figure 2 shows the weight average of the answers obtained.

In concordance with the currently implemented systems, IT/IS play the most important role in the support of business operations, followed closely by the support of middle level management. This study shows that in Portuguese large companies the IT/IS solutions are committed to supporting the business operations and the middle management, leaving for second plan the interface with external entities and the knowledge management.



*Figure 2. Actual role of IT/IS in large Portuguese companies.*

Another question we tried to answer with this study was to identify future intentions of companies in what concerns the implementation of new IT/IS solutions.

In Figure 3 it is possible to observe the systems that companies have currently implemented and the systems they will implement in the near future.

Practically all the companies have current IS development projects. By the end of 2007 it is expected that 90% of the companies will have ERP systems, 56% will have BI systems, 56% will have Collaboration, Workflow and Groupware systems, 54% will have CRM systems and 33% will have SCM systems. It is also important to notice the significant investment in specific systems to the business, with about 73% of the companies investing in these kind of systems.

The two types of systems showing a more significant growth are BI and Collaboration, Workflow and Groupware systems.

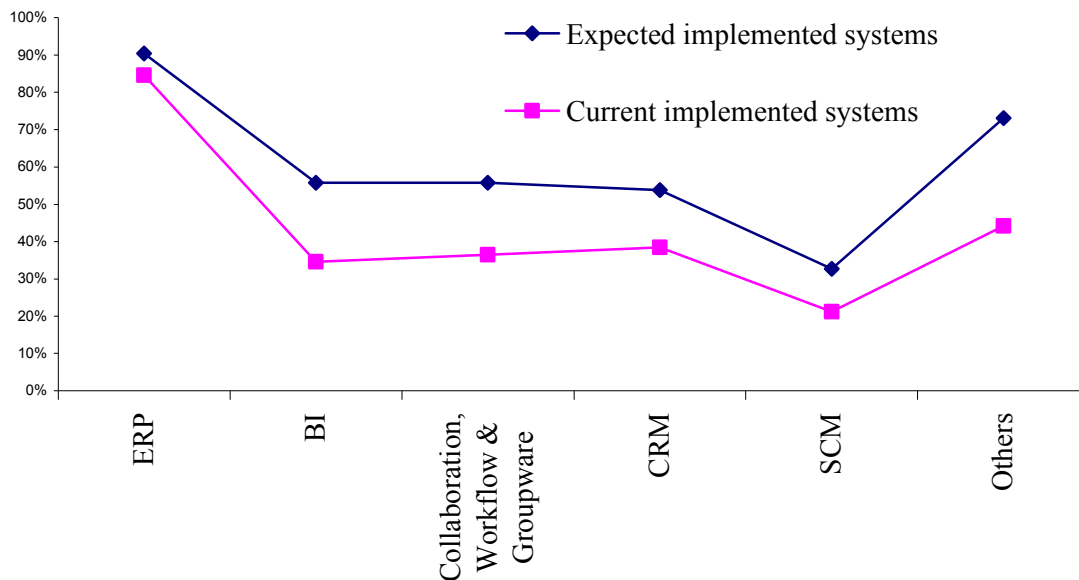


Figure 3. Current implemented systems vs. Expected implemented systems

### 3 LIMITATIONS

The primary limitation of this research, as others studies that use a similar research sample (Chang and Kirk 2000, Li et al. 2001, Lin and Pervan 2003), is that results cannot be generalized to all business. It is true that large organizations generally provide leadership in using information technology, but differences do exist between small and large business (Chang and Kirk 2000). Therefore, careful use of the results should be made, especially as to their applicability to small businesses.

### 4 CONCLUSIONS

Pressured by the market, organizations have to cope with the need to reach more ambitious goals with fewer resources in shorter periods of time. In this context, IT/IS play an extremely important role since they can have a deep impact in the businesses and in the way it is lead.

The IT/IS solutions available to companies are multiple and diverse. Within the systems that companies commonly adopt we can find ERP, CRM, BI, SCM and Collaboration, Workflow and Groupware systems.

In this paper we presented and discussed some results of a study carried out with the purpose to characterize diverse aspects of the IT/IS adoption. In Portuguese large companies the systems mainly adopted are ERP, being the IT/IS main role the operations and middle level management support. In the near future ERP adoption will consolidate as it already happens in other Europeans countries (Yvonne van et al. 2000). The

adoption of other systems like BI, Collaboration, Workflow and Groupware, which less than 40% of the companies currently have, will accelerate in the short-term.

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