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Impact on Organizations of changes in Information Systems: The case of two Lisbon Universities

David Alvim

Instituto Universitário de Lisboa (ISCTE-IUL)

Bráulio Alturas

Instituto Universitário de Lisboa (ISCTE-IUL)

Abstract: The acceptance of a new IS by users is not always easy, as people tend to be resistant to changes. This paper seeks to identify and evaluate the organizational impact of a IS change, having as subject of study the University Institute of Lisbon (ISCTE-IUL) and the University of Lisbon. The study was carried out based on a model that considers three perspectives: the quality of the system, the quality of information and the quality of service. For this study, interviews were conducted, and questionnaires were applied to some employees of the two universities to assess the impact of the SAP ERP implementation. The results confirm the importance of the quality of information and quality of the service provided, on learning and then on the organizational impact, through the benefits obtained and the impact on the end user.

Keywords: Portuguese Universities; Information Systems; User Satisfaction; ISCTE-IUL; University of Lisbon; SAP ERP.

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Biographical notes:

1 Introduction

Like so many other large organizations, universities also need information systems to manage their business. In Portugal, public universities always have very tight budgets, and so seek to have a fast and low cost IS (Information System).

This demand goes toward the organization's image in terms of business flow and / or internal administration, however its acceptance by users, i.e., the end user, does not always go as smoothly as possible. The impact that the new IS creates in the University differs in the acceptance by the user. However, the implementation process of the ERP systems has

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specific characteristics that require their management to be designed as a process of organizational change and not as a process of computer change.

A study conducted to gauge the extent to which accredited schools of business offered coursework in human resource information systems showed a wide range of diversity in terms of teaching methods and topics covered in the courses. The authors showed also that the technology used for human resource management, not only influences university management, but also student learning (Hoell *et al.*, 2012). A slightly older study focused on the four campuses of a large midwestern university system in the United States. The university system, which consists of four campuses, implemented SAP/R3 system to support the administrative functions. The study concluded, that for ERP implementations to be successful and not simply an automation of manual tasks, end users must be recruited for creative change, especially in public institutions (Siau and Messersmith, 2003).

It is necessary to consider that new technologies always cause changes in the social environment of organizations and it is difficult to imagine any technological innovation that could be introduced without causing any effect (Gonçalves, 1994). And for organizations to be prepared for change, it is necessary to develop flexibility and capacity to face a series of new challenges (Schein, 1980). A 2004 study concluded that if universities are to make the most of standardised software they must learn to manage a number of complicated translation processes (Pollock and Cornford, 2004).

Therefore, this study is about the impact of introducing an IS change to a University, and seeks to identify and assess the organizational impact that happens when the University decides to change the IS, thus trying to improve the Information and Communication Technologies - ICT having as objects of study the ISCTE-University Institute of Lisbon and the University of Lisbon. These two universities were chosen because they are both changing their ERP system. So, we elaborated the following research question: What is the organizational impact of an IS change on this two Portuguese Universities?

For this study, interviews were conducted and surveys were applied to some employees of ISCTE-University Institute of Lisbon and the University of Lisbon to assess the impact felt with the SAP ERP (Systeme, Anwendungen und Produkte Enterprise Resource Planning) recent implementation.

2 The impact of IS in Universities

A growing number of Higher Education Institutions worldwide have implemented or are exploring Enterprise Resource Planning (ERP) systems. The main reasons for implementing ERP in universities have to do with continuing decline in per student government funding and support, globalization and global competition, continuing growth in student numbers, changes in the nature of academic work, increasing competition between institutions, government pressure to improve operational efficiency, and generally diverse and shifting expectations of stakeholders (Rabaa'i, 2009). Universities have turned to ERP as a means of replacing existing management and administration computer systems (Pollock and Cornford, 2004)

The increased use of the IS by public and private universities has resulted in the need to evaluate its impact in several dimensions, such as, Productivity where there is a nonlinear programming model of the DEA (Data Envelopment Analysis) along with

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information on how to distribute related resources so that efficiency is maximized (Chen *et al.*, 2006); Quality of Information, in which companies invest huge amounts of money every year in the acquisition and implementation of new IT (Information Technologies) due to the need to obtain correct and accurate information in a timely manner (Cohan, 2005); Decision where it is states that investments in IT (Information Technologies) are very important decisions since it involves large expenses (Sanders and Premus, 2005); Information Security that states that unauthorized access to the IS may have negative consequences, both externally and internally within organizations (Ezingard, McFadzean and Birchall, 2005) and User satisfaction in which user satisfaction with a given IS is defined, such as the overall affective assessment that an end user has of his experience related to the IS (Chin and Lee, 2000).

Several studies have been conducted and published on the implementation of ERP systems at universities and their impact on these organizations.

Lee and Lee (2000) present longitudinal study based on the ERP implementation at the University of Nebraska. Based on an in-depth analysis of the early stages of this implementation, the authors identify the types of knowledge transferred during an ERP implementation and the factors affecting this transfer. The results indicated that the business processes which are incorporated in an ERP package are transferred into an organization along with the business rules inherent in the processes, and also suggested that an organization's adaptive capability concerning role and responsibility redistribution, the development of new types of required knowledge and the introduction of a different knowledge structure influence an organization's ability to internalize these standardized processes into business routines that provide a competitive advantage (Lee and Lee, 2000).

Yakovlev (2002) describes the reengineering of business practices that took place at the University of Wisconsin-Superior (UWS) when they implemented an enterprise resource planning (ERP) system. UWS learned valuable lessons about reengineering business practices while implementing People- Soft Student Administration (Yakovlev, 2002).

A research by Davison (2002) involved a case study on a Hong Kong University to learn more about culture as a factor that affects success. The author concludes that the awareness of cultural differences and preferences will certainly improve the assessment of ERP suitability and any subsequent implementation (Davison, 2002).

Siau and Messersmith (2003) present a case study on the SAP implementation at a large public university system in the midwestern United States. This case study has shown the importance of channelling all of the factors of individual, group, and organizational creativity into one cohesive unit to establish a creative outcome, such as an ERP implementation. For ERP implementations to be successful and not simply an automation of manual tasks, end users must be recruited for creative change, especially in public institutions (Siau and Messersmith, 2003).

Thus, further studies are needed in order to assess the organizational impact of implementing ERP systems in organizations and in particular in universities.

According to Gorla, Somers and Wong, the model to assess the organizational impact comes from the Quality of the system, which represents the processing quality of the system itself, the Quality of the information concerning the quality of the results of the information produced by the system and the Quality of the service which is defined as the degree of discrepancy between the consumer's expectation of the service and the perception

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of the service performance (Gorla, Somers and Wong, 2010). This model was used in previous studies, as for example another study carried out in Portugal on the implementation of ERP systems in SMEs (Martins and Alturas, 2016).

An important criterion for the success of a new IS implementation is the experience and development of the workers involved. It is expected of them the acquisition of new skills and competencies in order to reap the benefits of change.

3 Enterprise Resource Planning - ERP

3.1 The ERP System

The ERP system is defined as a modular software package, which aims to help the integrated management of the processes underlying the various departments and functional areas of the company, and this with its business partners, customers and suppliers (Carvalho, 2012). It is a business management system that integrates all facets of the business, including planning, production, sales and finance, making these areas more coordinated by sharing information with each other (Laudon and Laudon, 2009). ERP allows to meet all the specific needs of each of the different sections of an organization (sales, billing, purchasing, ware-house management, production, maintenance, costs, among others) (Beselga and Alturas, 2019).

The objective is to eliminate administrative and bureaucratic burdens and redundancy in operations through the automation of processes, allowing greater consistency of information and, in real time, develop and manage the business in an integrated manner (Carvalho, 2012).

According to Deloitte Consulting, an ERP system is a business software system package that allows you to automate and integrate most business processes, share the same database and common practices throughout the company and produce and access information in real time (Deloitte Consulting, 1998).

One of the most sought-after technological tools in the market, from different business branches, is the SAP ERP, which aims to integrate all processes. It is undeniable that the SAP ERP is a tool that offers competitive advantages to Universities, but one cannot be sure about the increase of employee productivity.

3.2 Advantages of an ERP system

According to Ross and Vitale in 1998, cited by Mesquita, there are technological, operational and strategic reasons that lead an organization to adopt an ERP system (Mesquita *et al.*, 2013).

For users to accept a technology it is important that they see advantages in its use, because users begin to see its advantages and they then begin to explore its functions, gradually reaching success. This process demonstrates that ERP users have accepted the ERP system and are putting it to extended use. The impact of ERP systems on users and

their acceptance have been recognized as key factors of ERP implementation success (Sternad and Bobek, 2013).

Addo-Tenkorang and Helo at the World Congress on Engineering and Computer Science report that ERP systems have become vital strategic tools in today's competitive business environment (Addo-Tenkorang and Helo, 2011).

ERP systems facilitate the flow of common functional and practical information across the organization, improving supply chain performance and reducing cycle times. Given the current volume of information in an organization, the use of the IS is based on speeding up access to it, optimizing the performance of the organization (Addo-Tenkorang and Helo, 2011).

Gattiker and Goodhue, 2005, quoted by Shahin Dezdar and Aininin Sulaiman, mentions that ERP information systems allow a company to better manage its business, with benefits of a better process flow, a better data analysis, higher quality data for decision making, less storage space, better coordination and better customer service (Dezdar and Sulaiman, 2009).

According to Addo-Tenkorang and Helo, the benefits of an ERP system, can be evaluated by cost reduction, return on investment, asset turnover, return on assets, perceptions by forecasts or market trends, among others. There is effectively a widespread awareness of a wide range of advantages in the use of information systems (Addo-Tenkorang and Helo, 2011).

According to Mendes and Escrivão Filho it is possible to see from the reading of several works, the following advantages with the adoption of an ERP type information system (Mendes and Escrivão Filho, 2002):

- Agility in business
- Creating a Single Database
- Creation of a technological base
- Control and management
- Improved efficiency
- Acquisition of information in real time
- Integration of organizational areas
- Optimization of process documentation
- Definition of business rules
- Reduction of costs in the area of computer science
- Technological evolution
- Orientation of the organization to processes

3.3 Disadvantages of an ERP system

Addo-Tenkorang and Helo (2011) refer that the implementation of an information system as an ERP is a big project that demands a significant level of resources, commitment and changes in the whole organization, and the ERP implementation project may be the only big project that the organization has already executed. Organizations are more likely to obtain benefits in the adoption of an IS, if they have the support of top management, an adequate plan and business vision, if they invest in the reformulation of business processes,

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develop efforts in a more effective project management, and in training and user participation.

However, even if all these situations are foreseen, the risk of failure is high. Dezdar and Sulaiman (Dezdar and Sulaiman, 2009) mention that in a Standish Group report it is mentioned that the ERP implementation projects reveal a budget higher than initially expected and a duration of implementation of more than double what was expected. From the author's experience, during the adoption of an ERP information system, which took place in a company where he developed his activity, it was found that a very relevant and present difficulty is the resistance of some employees to change and the inability to understand the expected benefits. The resistance of employees is mentioned by Mendes and Escrivão Filho as a difficulty, cited in several interviews (Mendes and Escrivão Filho, 2002).

Cited in the World Congress on Engineering and Computer Science by Addo-Tenkorang and Helo, educating and training users to use an ERP is important because ERP is not easy to use, even with good information technology skills (Addo-Tenkorang and Helo, 2011).

According to Mendes and Escrivão Filho (2002), the research carried out within the scope of this study revealed the existence of several barriers and difficulties in the adoption of an ERP information system from the reading of several works.

Thus, the following main difficulties and disadvantages are considered in the adoption of an information system such as an ERP (Mendes and Escrivão Filho, 2002):

- Involvement of top management,
- Implementation and maintenance of costs,
- Need for adequate implementation planning,
- Experience of the team to manage the implementation,
- Operation of internal communication during system implementation,
- Analysis of existing processes and possible redefinition of them,
- Organizational change,
- Adaptations of the information system to the organization,
- Regular system updates,
- Resistance on the part of the users,
- Difficulties in using the system,
- Single vendor dependency (service-provider).

4 Evaluation Model

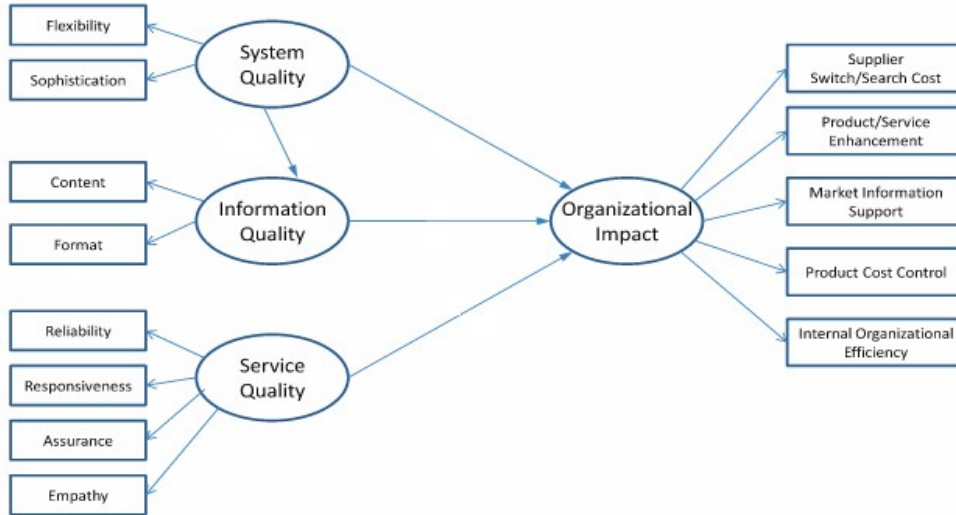
4.1 Model of Organizational Impact of Systems

The impacts of technologies are often indirectly influenced by human, organizational and environmental factors, so it is difficult and complex to measure the success of Information Systems (IS).

According to Gorla, Somers and Wong, the model to assess the organizational impact (Figure 1) comes from the Quality of the system, which represents the processing quality of the system itself, the Quality of the information concerning the quality of the results of

the information produced by the system and the Quality of the service which is defined as the degree of discrepancy between the consumer's expectation of the service and the perception of the service performance (Gorla, Somers and Wong, 2010).

Figure 1 Model of Organizational Impact of Systems (Gorla, Somers and Wong, 2010)



4.2 *Organizational impact*

Organizational impacts at the organizational level can be classified into two categories: organizational impacts internal to the organization and organizational impacts external to the organization (Gorla, Somers and Wong, 2010).

The organizational impact consists of five indicators, two of which are related to internal impacts (product cost control and internal organizational efficiency) and three to external impacts (supplier switching/research costs, product and service improvements, and market information support). Product cost control is concerned with cost reduction, new product design and product marketing. Internal organizational efficiency reflects efficiency in the decision-making process, internal communication/coordination, strategic planning and profit margin. Supplier switching/search costs, reflects the ease with which it is possible to find alternative suppliers and products/services and the profitability of suppliers in bargaining power. Product and service improvements are responsible for improving the quality and availability of products/services to the customer. Market information support was defined as the information provided to the company in relation to customer needs, market trends and new markets (Gorla, Somers and Wong, 2010).

4.3 *System quality*

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According to Gorla, Somers and Wong, the quality of the system represents the processing quality of the system itself, which includes software and data components, which is a measure of the extent of a technically feasible system. The attributes for system quality are grouped into two categories: system resources from the architect's perspective (called system flexibility) and system resources from the end user's perspective (called system sophistication) (Gorla, Somers and Wong, 2010).

The flexibility category of the system takes into account two factors: the system must be designed with necessary and useful resources, that is, without unnecessary resources, and modifications to the software can be easily made by the architect.

The sophisticated category of the system denotes a user-friendly system (which is easy to use, intuitive), well documented, the response times are fast and uses modern technology that allows ease of use in systems.

4.4 Quality of information

According to Gorla, Somers and Wong, the quality of information refers to the quality of the results of the information produced by the system, which can be represented in the form of reports or on online screens. This is defined in four dimensions: accuracy, integrity, consistency and format (Gorla, Somers and Wong, 2010).

Accuracy is the agreement with an attribute about an entity in the real world, a value stored in another database, or the result of an arithmetic calculation.

Integrity must be defined with respect to a given application, and relates to the presence of all relevant information relating to the application in question.

Consistency refers to the absence of conflict between two datasets, and timeliness refers to the most current information possible.

The format is related to the presentation layer of the information to the user. The four dimensions are brought together and divided into two categories for the quality of the information: the content of the information and the format of the information. The content of the information measures the relevance of the information presented to the user in the reports, the accuracy and integrity of the information. The information format measures the style in which the information is presented to the user, if it is presented in an easy-to-understand format.

4.5 Quality of service

According to Gorla, Somers and Wong (2010), service quality is defined as the degree of discrepancy between the consumer's expectation for the service and perception of the service performance. This characteristic is measured by four indicators: reliability, responsiveness, safety and empathy (Gorla, Somers and Wong, 2010).

Reliability measures the extent of the supplier's effort to improve the information services provided to users.

Responsiveness includes parameters that measure the extent to which the provider is willing to assist users and provide a rapid service.

Security is the supplier's ability to build a relationship of trust with users.

Empathy measures the personal attention and concern provided by the supplier.

5 Methodology

5.1 Study design

As said before, we elaborated the following research question: What is the organizational impact of an IS change on Portuguese Universities?

The main goal of this study is to answer the initial question as well as to understand the advantages and disadvantages of changing the IS with the user.

In order to achieve this objective, it was necessary to define and achieve more specific objectives, including:

1. To identify the reasons that led ISCTE-IUL and the University of Lisbon to change the IS to the SAP ERP system;
2. Evaluate the new IS, from the perspective of the quality of the system, quality of information and quality of the service provided by the supplier;
3. Identify and evaluate the internal and external benefits after the change;
4. Internally identify if there has been improvement, after the change in the coordination of employees, improvements in communication and greater ease and efficiency in decision making.

In preparing this study, domains “research team and reflexivity”, “study design” and “data analysis and reporting”, were considered (Tong, Sainsbury and Craig, 2007).

Regarding the research methodology, we opted for a mixed two-stage approach, i.e., we adopted a qualitative methodology using quantitative methodology instruments, because, “as recognized by mixed methods research, both quantitative and qualitative research are important and useful. The same mixed methods were used in the study of (Siau and Messersmith, 2003). The goal of mixed methods research is not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses of both in single research studies and across studies” (Johnson and Onwuegbuzie, 2004).

The objective in any analysis is to adapt the technique to the conclusion, the statement accompanied by the proof. The questions that are asked to an investigator are always: What questions should be raised in this situation? What data can shed light on these questions? And what analytical methods can ensure data-based claims on those questions? Answering these questions is a task that necessarily involves a deep understanding of the potential and limits of a variety of quantitative and qualitative techniques” (Shaffer and Serlin, 2004).

5.2 Qualitative phase

For the qualitative analysis the interview method was chosen as the source of information, advocated by Yin as one of the most important forms of evidence collection for the case study (Yin, 2014).

The data were collected through the application of four semi-structured interviews, and the interviewees' role are as follows:

- 1) The vice-rector of ISCTE-IUL between 2009 and 2018. It was during this period that the need to modernize one of the ISCTE-IUL Information Systems was identified.
- 2) The Administrator of ISCTE-IUL at the date of the implementation of SAP.

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3) The vice-rector in the area of Information Technologies at the University of Lisbon.

4) The Coordinator of the Center for Information Systems Management at the University of Lisbon.

All respondents played a leading role in the SAP acquisition / implementation phase in their institutions. For the presentation of the data, we considered it pertinent to structure them in three dimensions that respect the three phases of the ERP implementation process, namely, the decision and selection, implementation and use of the ERP.

The questions asked are mostly open-ended, where we intend to analyse certain behaviours, attitudes and motivations and the opinion of those involved in the implementation processes. The answers obtained served to design the questionnaire to be applied in the quantitative phase, because although the model by Gorla, Somers and Wong (2010) was applied before to study the implementation of ERPs (e.g. Martins and Alturas, 2016), the need to adapt was felt, due to the particularities of the organizations under study.

5.3 Quantitative phase

For the quantitative analysis, a more rationalist approach is sought, using a closed response questionnaire as an instrument for data collection in order to obtain quantifiable data. According to Fortin "the quantitative research method is a systematic process of collecting observable and quantifiable data. It is based on the observation of objective facts, events and phenomena that exist independently of the researcher. Objectivity, prediction, control and generalization are inherent characteristics of this approach." (Fortin, 2009). It was available via a link from the Google Forms platform from July 5, 2019 until the end of August 2019.

The questions were constructed based on the indicators defined in the baseline model, taking care to be objective, clear and precise, and with a language that is accessible and easy to understand for the target respondents. For this purpose, the interviews carried out in the previous phase were very useful. The questionnaire had closed-ended questions, in a 5-point Likert scale anchored by 1 (I completely disagree) to 5 (I completely agree) (see Appendix).

We selected the sample using information-oriented selection, searching for the maximum variation cases, that according to Flyvbjerg (2006) classification, search for obtain information about the significance of various circumstances for case process and outcome (Flyvbjerg, 2006).

The distribution of the questionnaires was made via e-mail to the employees of ISCTE-IUL and the University of Lisbon, from which we obtained a total of 104 replies. All respondents were part of the university staff and they all needed to work with the new system. The questionnaire was applied in the production phase of the system, but had also questions about the implementation phase.

6 Presentation and analysis of the results

6.1 Data analysis

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The population in which our study is inserted are all managers or main actors of the project in the qualitative analysis and all employees of the areas of Human Resources, Finance, Logistics / Procurement, Projects, Informatics and Office of quality in the quantitative analysis.

These are the business areas present in each study organization with the exception of the Quality Office, which is only present in the ISCTE-IUL. The SAP has been present in these areas since its inception and one personal interview was conducted, while the remaining 3 interviews were sent an e-mail.

For the employees were sent the questionnaire via e-mail.

There are currently 65 employees working with the SAP ERP at ISCTE-IUL, who received 30 replies to the questionnaire, while the University of Lisbon received 74 replies with 277 employees.

From these, responses were not excluded due to inconsistencies, thus obtaining an effective sample of 104.

After the characterization of the sample, we proceeded to the analysis of the results of the questionnaire aimed at assessing the organizational impact based on the influence of the quality of the system, quality of information and quality of service. In order to be viable, the study carried out an analysis of the main components (PCA) to reduce the number of variables. As an assumption, we assumed that the Likert-type scale used, between 1 and 5, corresponds to close intervals and with equal gaps.

From the data analysis, it was possible to conclude what the users' perception, which constituted the sample, was about system quality, information quality and service quality. For this purpose, the average responses of users from both universities were calculated. Since a 5-point Likert scale was used, considering positive as an average above or equal to 2.5 and negative below 2.5.

As can be seen in Table 1, users from both universities agree on the components of the system quality, with the exception of "Integration of all data, processes and information" in which ISCTE-IUL users consider negative and users of the University of Lisbon consider positive. About "Easy to learn, suitable and fast to process" in both universities it was considered positive, while on "Intuitive system in terms of usability" in both universities it was considered negative.

Table 1 Results of users' perception of System Quality

	ISCTE-IUL	University of Lisbon
Easy to learn, suitable and fast to process	Positive	Positive
Integration of all data, processes and information	Negative	Positive
Intuitive system in terms of usability	Negative	Negative

About the users' perception of information quality, as can be seen in Table 2, users from both universities agree on the components of the information quality, with the exception of "Information provides easy understanding" in which ISCTE-IUL users consider positive

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and users of the University of Lisbon consider negative. About “Content inserted in the system is accurate and useful for decision making” and “The extracted information looks good and has a good format” in both universities it was considered positive.

Table 2 Results of users' perception of Information Quality

	ISCTE-IUL	University of Lisbon
Content inserted in the system is accurate and useful for decision making	Positive	Positive
The extracted information looks good and has a good format	Positive	Positive
Information provides easy understanding	Positive	Negative

Finally, about the users' perception of service quality, as can be seen in Table 3, users had different perceptions. While at ISCTE-IUL the service provided by the supplier was completely negative, at the University of Lisbon they consider positive “Supplier Trust and Security” and “Empathy with the supplier” and only consider negative “Supplier responsiveness”. These results demonstrate that, although both universities had the same supplier, the experience was different, which is explained by the fact that the two universities have different organizational problems, with the experience of implementation at ISCTE-IUL seeming to have gone much worse, in the opinion of the users of the sample collected.

Table 3 Results of users' perception of Service Quality

	ISCTE-IUL	University of Lisbon
Supplier Trust and Security	Negative	Positive
Supplier responsiveness	Negative	Negative
Empathy with the supplier	Negative	Positive

After the preliminary analysis of the data, a Principal Component Analysis was performed using all items evaluated with a Likert scale of the questionnaire. The components obtained resulted in new variables.

The following variables were identified, confirming the respective reliability with the Cronbach Alpha test: Benefits (10 items with Cronbach Alpha 0.938), Quality_service_provided (8 items with Cronbach Alpha 0.915), Ease_Learning (5 items with Cronbach Alpha 0.785), Impact_End_User (3 items with Cronbach Alpha 0.794), Data_Presentation (3 items with Cronbach Alpha 0.705) and Quality_Information (2 items with Cronbach Alpha 0.798).

It should be noted that while the items originated by the questions related to the Quality of Information and Quality of the Service Provided, have remained in the same component, the items originated by the questions related to the quality of the system have been separated into three components: Benefits, Ease of Learning and Data Presentation.

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Once the variables were identified, we conducted a correlational analysis in order to measure the intensity of the association between them (Table 4). Among the variables, we found that the Benefits are strongly correlated with Ease_Learning (0.690**) and Data_Presentation (0.680**).

Table 4 Pearson Correlations between the variables

		Benefits	Quality service provided	Ease of Learning	Impact End User	Data Presentation	Quality Information
Benefits	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	104					
Quality service provided	Pearson Correlation	,209*	1				
	Sig. (2-tailed)	0,033					
	N	104	104				
Ease of Learning	Pearson Correlation	,690**	,386**	1			
	Sig. (2-tailed)	0	0				
	N	104	104	104			
Impact End User	Pearson Correlation	0,147	,279**	,248*	1		
	Sig. (2-tailed)	0,137	0,004	0,011			
	N	104	104	104	104		
Data Presentation	Pearson Correlation	,680**	,284**	,586**	0,13	1	
	Sig. (2-tailed)	0	0,004	0	0,189		
	N	104	104	104	104	104	
Quality Information	Pearson Correlation	,359**	,391**	,378**	0,041	,402**	1
	Sig. (2-tailed)	0	0	0	0,683	0	
	N	104	104	104	104	104	104

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

**. Correlation is significant at the 0.01 level (2 tailed).

Quality_service_provided correlates with Quality_Information (0.391**) and Ease_Learning (0.386**).

Ease_Learning strongly correlates with Benefits (0.690**).

As for the Impact_End_User correlates with the Quality_Service_Provided (0.279**), while the Presentation_Data correlates strongly with the Benefits (0.680**).

Finally, we have the Quality_Information that correlates with Quality_service_provided (0.391**).

This means that the factors that have the most impact on the end user were Quality of the Service Provided and Ease of Learning.

6.2 *Results discussion*

The importance of the quality of the system, quality of information and quality of the service provided was verified on the impact of introducing an IS change to an organization. The correlational analysis confirms the importance of the quality of information and quality of the service provided, on learning and then on the organizational impact, through the benefits obtained and the impact on the end user, confirming the work of Gorla, Somers and Wong (2010).

The individual impact was also analysed, in the implementation phase, in the start-up in production and in the support provided. Findings obtained confirmed the work of Lee and Lee (2000) and Siau and Messersmith (2003), by indicating a strong impact of the system change, on the work of the end user.

The individual impact is defined by productivity, by the way the new Information System improves the functions of employees in the study organizations per unit of time. According to our results, most employees agree that the system helps to save time and that it increases their productivity.

In the implementation phase, the impact on the end user is defined by the participation or involvement that the user had throughout the implementation project. According to ISCTE-IUL officials, most disagree with the fact that the benefits of the new information system have been presented, that they were aware of the steps involved and that they were consulted and were able to contribute. In turn, we conclude that most of the employees of the University of Lisbon do not agree or disagree with the fact that the benefits of the new information system have been presented, and that they were aware of the steps involved but agree with the fact that they were consulted and were able to contribute throughout the implementation project.

The start-up in production phase of the new information system in production is defined by the preparation of the end user for the start of their tasks in the new information system. According to our results, the majority of ISCTE-IUL's employees agree that they felt properly qualified to start their duties in the new information system, while most of the employees of the University of Lisbon disagree, so they did not feel prepared for the start of tasks in the new information system.

The impact of the support provided is defined by the support provided by the support teams (Consulting and Key-users) to end users in the development, start-up and after-start phases. When analysing the responses, we concluded that the majority of ISCTE-IUL employees who participated in our study, agree that all doubts they had at the beginning, that is, during the start-up phase of production, were promptly clarified. However, they do not agree or disagree about communicating the changes that occurred during the development of the project. We also concluded that the majority of the employees of the University of Lisbon only agree with the fact that they have all doubts resolved or clarified within the stipulated response time, disagreeing with the clarification of doubts that occurred in the start-up phase of production and also with the communication about the changes that occurred during the development of the project.

7 Conclusions

7.1 Main conclusions

In an ERP implementation it is important that Universities study the situation in which they find themselves in so that it can be verified if the investment makes sense or not.

When we refer to the implementation of an ERP system, we must take into account 3 perspectives, since these variables have impacts on the organization.

1. Quality of the system - Given that we are talking about an information system, the quality of the system must be taken into consideration.

2. Information quality - For the system to fully perform its functions, all the organization's data must be present.

3. Quality of service provided by the supplier - Since the implementation of a system of this nature are services provided by other companies, the quality of service must be taken into account.

As proposed by Gorla, Somers and Wong in the model "organizational impact of system quality, information quality and service quality", where they define metrics that allowed us to identify and evaluate the advantages and disadvantages of implementing SAP ERP in ISCTE-IUL and the University of Lisbon.

We can say that the objectives we set ourselves have been achieved:

Objective 1 - Both in ISCTE-IUL and in the University of Lisbon, there was a need to acquire an IS that would allow having all the relevant information for the organization in a single space, that would be easily and quickly accessible and that, simultaneously, would be adapted to the specific existing needs of the organization or that could arise during its use.

The cost of updating existing information systems before the change was also a factor that motivated the acquisition of another system.

While in ISCTE-IUL there was a "security" for the change to SAP ERP and since other institutions would have made the same change, the references were positive and had been informed that there were several consultants capable of responding. In the case of the University of Lisbon there was an international public tender in which the jury decided in favour of SAP ERP as one of the essential requirements, the implementation of a non-proprietary system that would allow the coexistence of autonomously developed code without dependence on a single partner and the fact that it is multi-vendor.

Objective 2 - With regard to the quality of the system, in the opinion of ISCTE-IUL employees, the SAP ERP system is easy to learn, adequate and fast to process but not all ISCTE-IUL data, processes and information are integrated, and it is not an intuitive system in terms of usability while, in the opinion of the University of Lisbon employees, the SAP ERP system is easy to learn, adequate and fast to process and all the data, processes and information of the University of Lisbon are integrated but it is not an intuitive system in terms of usability. In relation to the quality of the information, in the opinion of ISCTE-IUL employees, the content inserted in the system is precise and useful for decision making as well as the format provides an easy interpretation and understanding from a good appearance and a good format. While, in the opinion of the University of Lisbon staff, the

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content inserted in the system is accurate and useful for making good-looking decisions, the information extracted from the system is not easy to understand. With regard to the quality of service provided by the supplier in the opinion of ISCTE-IUL employees, there is no trust in the supplier, in the answers given to problem solving and in turn makes the security and empathy with the supplier not the most desired. On the other hand, in the opinion of the employees of the University of Lisbon there is trust, empathy and security in the supplier but the capacity to respond is not the most desired.

Objective 3 - Both at ISCTE-IUL and at the University of Lisbon, employees felt that SAP ERP helped to save time in the tasks performed and also increased productivity.

SAP ERP helps decision making and has improved the daily lives of employees, giving them time for other tasks. A few months after the implementation date, it is possible to point out the benefits brought by SAP ERP and is considered superior to the system previously used.

Objective 4 - In the opinion of ISCTE-IUL employees, the benefits of SAP ERP were not presented to them, they were not aware of the stages involved throughout the project and they were not consulted and could not contribute.

However, according to the interviewees, there was a great deal of involvement, stressing that support was fundamental. In the opinion of the University of Lisbon employees, they were consulted and were able to contribute throughout the implementation project, which confirms what was said by the interviewees when they said that the role of human resources was essential, both in design and planning and also in implementation, validation and use. However, as previously mentioned, the SAP ERP system helps in the decision-making process on both ISCTE-IUL and the University of Lisbon.

7.2 Contributions, limitations and future work

The main contribution of this study is to show that there are factors that should be taken into consideration, by universities, in the process of implementing SAP ERP systems, since it assesses the impact of changing IS in Portuguese universities and can be important for those who do research in IS management area.

A study was carried out on the impact of an IS change on Portuguese Universities and was evaluated based on a model that considers three perspectives, the quality of the system, the quality of information and the quality of service.

At the business level, this study leaves its contribution through the results of this research and the subjects covered in the theoretical foundation so that there is a source of knowledge that helps an eventual process of implementing SAP ERP in the company.

Due to the low availability of ISCTE-IUL and Universidade de Lisboa employees, we are facing a small number of respondents and, therefore, the size of the effective sample is relatively small, 104 valid responses, which may not significantly represent the impact of changing a IS in Portuguese Universities.

Since it is a case study and because it was carried out in only two unique university institutions, the research has as a limitation the difficulty in generalizing its results to other universities. On the other hand, the fact that the study was carried out in these institutions for the first time, does not allow comparisons with other moments in time.

The lack of studies on IS impacts on Portuguese university institutions has also become a limitation and lastly, although the Organizational Impact of Systems model was used to

assess the Organizational Impact of system quality, information quality and quality of the service, there are many other models that could have been used such as the TAM - Technology Acceptance Model (Davis, 1989) or even the MISS - Model of Information Systems Success (DeLone and McLean, 1992). The use of only one model means that other variables that could also be relevant for the study of this problem have not been considered.

For future investigations that may arise as a result of this, it is suggested that further studies be carried out on SAP ERP implementations in which models other than the one described in this dissertation are used.

It is also suggested that further studies be carried out on SAP ERP implementations in private universities so that there is a comparison with this study.

In future investigations it would also be interesting to collect implementation information from other ERPs in order to understand how similar the results would be.

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Appendix

SAP ERP: The Case of ISCTE-IUL and the University of Lisbon

PRESENTATION

This study aims to understand what impact the change to SAP ERP had on ISCTE-IUL and the University of Lisbon.

The response time to the questionnaire takes between 15 to 20 minutes.

The results obtained will be protected and kept anonymous. No information will be published that will allow an identification of the respondents to this questionnaire.

Thank you very much for your cooperation.

NOTE ON PRIVACY

This questionnaire is anonymous.

The saved record of your answers to the questionnaire does not contain any identifying information about you.

***Required**

0. Informed consent *

If you agree with the following statement and wish to participate in the study, select "I agree" If not, select "I do not agree": "I have read and understand the explanation given about the questionnaire in the research and agree to respond voluntarily to this questionnaire."

Mark only one oval.

I agree

I don't agree

1. Age * _____

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2. Literary qualifications*

Mark only one oval.

- 9th year
- 12th year
- Degree
- Master or PhD

3. Department where you work *

Mark only one oval.

- Human Resources
- Financial Logistics
- Projects Computing
- Quality office
- Other

4. Do you work at ISCTE-IUL or at the University of Lisbon? *

Mark only one oval.

- ISCTE-IUL
- University of Lisbon

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5. Quality of the system

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
He learned how to use SAP with ease					
The SAP implemented is suitable for the organization where you perform daily functions					
The system integrates all data, processes and information in your organization					
The system is easy and intuitive					
The processing time between input and output is short (for example, extraction from a report or legal map)					

6. Quality of information

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
The content of the information that the system makes available, either in on-screen consultations or in printed paper information, is accurate					
The information presented/extracted from the system is useful for decision making					
The information presented/extracted from the system looks good and has a good format					
The information presented/extracted from the system is easy to understand					

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7. Quality of service provided

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
The supplier shows interest in solving problems					
The supplier provides the services in the contracted time					
The supplier provides a fast service					
The supplier is available to respond to requests					
Users are treated with courtesy/patience by the supplier					
The supplier has the knowledge to do his job					
The supplier has convenient times to provide the service					
The supplier understands the specific needs of users					

8. Impact on the work process

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
SAP helps me save time					
SAP increases my productivity					

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9. Impact on the end user

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
When your University chose to acquire SAP, it was presented to me in an understandable way as well as its benefits					
During the implementation project I was aware of all the steps involved					
Also, at the implementation stage, I was consulted and was able to contribute					

10. I felt properly fit, so I felt prepared for the beginning of my tasks in the System. *

- I completely disagree
- I disagree
- I neither agree nor disagree
- I agree
- I completely agree

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11. Impact on support provided

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
All the doubts I had at the beginning were cleared up promptly, leaving me safe to perform my functions in the system					
At this time I have my doubts resolved or clarified within the stipulated response time					
Communication about the changes that occurred during the development of the project was made in a clear and objective way					

12. Impact on daily work

	I completely disagree	I disagree	I neither agree nor disagree	I agree	I completely agree
SAP has perfected my daily life and eliminate activities/routines giving me time for other activities					
Over the months after implementation, you can point out the benefits brought by SAP					
Today, I consider myself autonomous for a correct use of SAP					
I evaluate the new system as being superior to the previous one					
SAP helps me make decisions and contributes to quality in the final decision					