

---

## **Influence of firm size on the adoption of enterprise information systems: insights from Iberian firms**

---

**António Trigo\***

Polytechnic Institute of Coimbra,  
ISCAC, Quinta Agrícola – Bencanta,  
3040-316 Coimbra, Portugal  
and  
Centro ALGORITMI,  
University of Minho, Campus de Azurém,  
4800-058 Guimarães, Portugal  
Email: antonio.trigo@gmail.com  
\*Corresponding author

**João Varajão**

Department of Information Systems,  
University of Minho, Centro ALGORITMI,  
Campus de Azurém, 4800-058 Guimarães, Portugal  
Email: joao@varajao.com

**Pedro Soto-Acosta,  
Nicolás González-Gallego and  
Francisco José Molina Castillo**

Department of Management and Finance,  
University of Murcia,  
Campus de Espinardo, Universidad de Murcia,  
30100 Murcia, Spain  
Email: psoto@um.es  
Email: nicolas.gonzalvez@economistas.org  
Email: fjmolina@um.es

**Abstract:** Information technology/information systems are currently used by almost all firms worldwide to integrate and coordinate their business processes, ranging from operational to strategic support. Among the systems adopted by firms, one can find enterprise resource planning, customer relationship management, business intelligence, and many others. This paper presents a study conducted with the participation of 102 Chief Information Officers (CIO) from Iberian firms, aiming to provide a better understanding of the influence of firm size on the adoption of the main enterprise information systems (EIS) types. The findings show that firm size influences the adoption of some EIS types as, for instance, business intelligence, workflow management and collaboration and groupware systems. However, in other cases, such as the case of enterprise resource planning, it no longer happens.

**Keywords:** enterprise information systems; EIS; adoption; motivations; firm size; Europe.

**Reference** to this paper should be made as follows: Trigo, A., Varajão, J., Soto-Acosta, P., González-Gallego, N. and Molina Castillo, F.J. (2015) 'Influence of firm size on the adoption of enterprise information systems: insights from Iberian firms', *Int. J. Information Technology and Management*, Vol. 14, No. 4, pp.233–252.

**Biographical notes:** António Trigo is an Assistant Professor of Management Information Systems at ISCAC – Coimbra Business School, which is part of the Polytechnic Institute of Coimbra, Portugal, where he teaches business intelligence, management information systems, software engineering and computer programming, supervising several MSc students. His research interests include information systems management and enterprise information systems. He worked as Software Engineer and Project Manager in several companies including Portugal Telecom, Cabo Verde Telecom, Meditel, Telesp Celular and Portuguese National Institute of Statistics. He has publications in international journals, book chapters and international conferences. He serves as editorial board member for international journals and has served in several organisations and scientific committees of international conferences.

João Varajão is Professor of Information Systems and Project Management at the University of Minho. His current main research interests are in information systems management and project management. He is the author of refereed publications, authored books, edited books, as well as book chapters and communications at international conferences. He serves as Editor-in-Chief, Associate Editor and member of the editorial board for international journals and has served in numerous committees of international conferences and workshops.

Pedro Soto-Acosta is a Professor of Management in the Department of Management and Finance at the University of Murcia. His work has been published in journals such as *Behaviour & Information Technology*, *Computers in Human Behavior*, *European Journal of Information Systems*, *Enterprise Information Systems*, *European Management Journal*, *International Journal of Information Management*, *Interactive Learning Environments*, *Information Research*, *Information Systems Management*, and *Online Information Review*, among others. He is editorial board member and Associate Editor for several international journals and Chairman of various international conferences.

Nicolás González-Gallego is currently a PhD research student at the University of Murcia, Spain and he is also working as a Project Manager. He received his BA in Business Administration and his Masters degree in Business Research at the University of Murcia. His current research interest includes information systems management and e-business.

Francisco José Molina Castillo is an Associate Professor in Marketing at the University of Murcia. His main research areas are: 1) innovation and new product development; 2) electronic marketing; 3) new service development for mobile phones. He has published in well know academic journals such as *Journal of the Academy of Marketing Science*, *Journal of Product Innovation Management*, *Industrial Marketing Management*, *Technovation*, *Information & Management*, *Enterprise Information Systems*, *International Journal of Information Management*, *International Journal of Electronic Commerce*, *Electronic Markets*, *International Journal of Internet Marketing and Advertising*, among others.

---

## **1 Introduction**

Information technology/information systems (IT/IS) are widely spread by firms worldwide with the objective of achieving efficiency, competency and competitiveness (Xu, 2007; González-Gallego et al., 2014). Due to its importance, IT/IS are frequently the subject of research by practitioners and academics, who continually aim to understand the evolving aspects of such systems, including new motivations for their adoption, new challenges, new problems to solve, which in turn lead to the development of new improved solutions and products (Van Everdingen et al., 2000; Kostopoulos et al., 2004; He and Wenjie, 2006; Gonzalez-Gallego et al., 2010; Varajão et al., 2009b). Within the scope of these studies, our research aims to assess the influence of firm size on the adoption of the main enterprise information systems (EIS) types. In addition, this article also presents the results on the current implemented systems in large Iberian firms and the motivations underlying the adoption of EIS.

The paper is structured as follows. Section 2 presents the theoretical background of this study. Section 3 outlines the research questions and hypotheses. Section 4 discusses the research methodology. Section 5 analyses and discusses the obtained empirical results. Finally, Section 6 ends with some final thoughts on the study, pointing out limitations and future research work.

## **2 Theoretical background**

This section presents the theoretical background of our research based on previous studies that relate firm characteristics and the adoption of different types of EIS, as in the study conducted by He and Wenjie (2006) which states that ERP implementation will be especially challenging for Chinese enterprises due to small firm sizes. The study by Rahim et al. (2010) presents a taxonomy of motives for business intelligence (BI) systems adoption.

### *2.1 EIS types*

This study started by conducting a literature review on which EIS types firms are more concerned with in a general manner, and, based on previous studies done in North America (Kumar and Kumar, 2002; Hendricks et al., 2007; McAfee, 2002), Asia (He and Wenjie, 2006; Shin, 2006) and Europe (Van Everdingen et al., 2000; Karakostas et al., 2005; Varajão et al., 2009a), we identified that the most common EIS types adopted are, in alphabetic order: BI systems; collaboration and groupware (C&G) systems; customer relationship management (CRM) systems; enterprise resource planning (ERP) systems; supply chain management (SCM) systems; and workflow management systems (WfMS).

#### *2.1.1 Business intelligence*

BI is a generic term for applications, platforms, tools and technologies that support the process of exploitation of data and business analysis of their correlations and trends. BI applications provide businesses with the means to collect and prepare data to facilitate the generation of reports, analysis and decision-making (Power, 2007; Yeoh and Koronios, 2009). Some of the benefits of having a BI system include the ability to access data in a

common format from multiple sources, better quality information for decision making, improved ability to anticipate possible threats and opportunities, a single view of the business, discovery of new business opportunities and more sophisticated analysis and reporting (Rahim et al., 2010; Lin et al., 2009; Elbashir et al., 2008; Yeoh and Koronios, 2009).

### *2.1.2 Collaboration and groupware*

Groupware, also referred to as collaborative software, is a general term for a repertoire of information communication and technology (ICT) applications that support cooperative work between and among groups of people, even though they may not actually be together in either time or space (Pumareja and Sikkell, 2006; Halonen, 2011; Coleman, 1997). The primary motivations for the adoption of Groupware systems are (Coleman, 1997): better cost control; increased productivity; better customer service; fewer meetings; automating routine processes; extending the organisation to include both the customer and the supplier; integration of geographically disparate teams; increased competitiveness through faster time to market; better coordination globally; providing a new service that differentiates the organisation; and, leveraging professional expertise. C&G also contribute to the co-creation of new knowledge (Chou, 2011).

### *2.1.3 Customer relationship management*

CRM is a term used to describe a set of IT/IS solutions that automate customer-facing processes in marketing, sales and service functions of the business. CRM enables an organisation to be more customer focused, allowing the analysis and exploitation of customer data (Iriana and Buttle, 2006). It provides a 'single customer view' to individuals within organisations. The CRM philosophy places the customer, rather than the product or process, at the centre of the organisation in the belief that the development of a close relationship with the customer will enable the organisation to determine, fulfil and even predict the needs of the customer (Beckett-Camarata et al., 1998). The main motivations for the adoption of CRM systems are (Ryals and Knox, 2001; Elliott, 1997; Kalakota and Robinson, 2000): help identify the most profitable customers; create value for the customer; customise products and services; receive customer feedback that leads to new and improved products or services; help avoid wasting marketing money on ineffective marketing programmes; enable firms to reduce sales inventory costs through better forecasting; develop stronger customer base and increased customer loyalty and profitability; obtain faster response to customer inquiries; and obtain information that can be shared with business partners.

### *2.1.4 Enterprise resource planning*

ERP systems are commercial software packages, often transversal to the various management levels of the enterprise, that aim to fulfil almost all the IS requirements of a business (Belle et al., 2003) and to integrate the information flowing through a firm – financial and accounting information, human resource information, supply chain information, customer information, etc. (Davenport, 1998). One of the most visible

benefits of ERP systems is the replacement of legacy systems with standardised, cross-functional transaction automation, resulting in reduced cycle times, improved throughput, customer response times, and delivery speeds (Cotteleer and Bendoly, 2006; McAfee, 2002). All enterprise data is collected once during the initial transaction, stored centrally, and updated in real time. This ensures that all levels of planning are based on the same data and that the resulting plans realistically reflect the prevailing operating conditions of the firm (Hendricks et al., 2007). Taken together, the standardised firm-wide transactions and centrally stored enterprise data greatly facilitate the governance of the firm (Scott and Vessey, 2000). ERP reports provide managers with a clear view of the relative performance of the various parts of the enterprise, which can be used to identify needed improvements and take advantage of market opportunities (Hendricks et al., 2007). These visible benefits are related to the motivations of an organisation seeking to adopt an ERP system. For Oliver and Romm (2000), there are three categories of factors that determine an organisation's initial search for an ERP solution: the need to improve the performance of current operations; the need to integrate data and systems; and the need to prevent a competitive disadvantage or a business risk from becoming critical. Ross and Vitale (2000) identify six reasons generally cited by enterprises, classifying them into three categories (infrastructure, capacity, and performance) and underscore their overlapping character: the new common systems platform (infrastructure) makes it possible to acquire new capabilities (process improvement, data visibility), which in turn are supposed to allow improvements in organisational performances (cost reduction, strategic decision making, customer responsiveness). Parr (2000) takes up the same motives, but gives categories different names: technological (common platform, obsolescence of legacy systems); operational (process improvement, data visibility, operating cost reductions); and strategic (multi-site standardisation, customer responsiveness, decision-making improvement, need for efficiencies and integration, business restructuring).

#### *2.1.5 Supply chain management*

The supply chain encompasses all activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows. SCM is the integration of these activities through improved supply chain relationships, to achieve a sustainable competitive advantage (Nichols, 1999). In essence, SCM integrates supply and demand management within and across firms, allowing the collaboration and cooperation of firms across the entire supply chain as a whole in order to improve operational efficiency and market competitiveness, via the coordination of all forms of activities, information, and materials from the initial source to the end-user (Stadtler, 2000). The primary benefits of SCM systems are better operational and business planning. SCM systems use finite capacity planning algorithms that do not require iterative adjustments to the master schedule, and real-time planning capabilities that allow firms to react quickly to supply and demand changes. Increased revenue, increased productivity, operational cost savings, lower inventory, and reduced order-to-fulfilment cycle time are some of the benefits from SCM system implementations (Hendricks et al., 2007).

### 2.1.6 *Workflow management systems*

Workflow can be a sequential progression of work activities or a complex set of business processes each taking place concurrently, eventually impacting each other according to a set of rules, routes, and roles (CTG, 1997). WfMS allow organisations to define and control the various activities associated with a business process and also the opportunity to measure and analyse the execution of the process so that continuous improvements can be made. Most WfMS also integrate with other systems used by the organisation like document management systems, databases, e-mail, etc., providing a structure to a process, which employs a number of otherwise independent systems (Milutinović and Patricelli, 2002) and can be used in different enterprise functions like Internal Auditing (Almeida and Trigo, 2012). The main benefits of using WfMS include among others (CTG, 1997): less intervention to manage business processes; improved communication between employees, provided by notifications and document sharing; improved understanding of the process itself, which can lead to increased collaboration among team members and/or across teams and business units; separation of IT from workflow management, putting the business process immediately and directly under the control of the people using the system; build corporate knowledge; and, improved security and reliability. A WfMS also eases the costs of developing new enterprise applications and reduces the maintenance of standard enterprise software. From an IT point of view, two important reasons for enterprises to adopt a WfMS are (James et al., 2007): ease of software development and reduction of risk for overall system development.

## 2.2 *General motivations for EIS adoption*

From the literature revision we note that there are main motivations that lead to the adoption of the diverse EIS types:

- M1, to reduce operational costs (Elliott, 1997; Kalakota and Robinson, 2000; Ryals and Knox, 2001; Coleman, 1997; Parr, 2000; Hendricks et al., 2007; James et al., 2007)
- M2, to differentiate products or services in relation to the competitors (Rahim et al., 2010; Coleman, 1997; Elliott, 1997; Kalakota and Robinson, 2000; Ryals and Knox, 2001)
- M3, to improve the quality of products or services (Coleman, 1997; Elliott, 1997; Kalakota and Robinson, 2000; Ryals and Knox, 2001; Cotteleer and Bendoly, 2006; McAfee, 2002)
- M4, to launch new products or services before competition (Rahim et al., 2010; Elliott, 1997; Kalakota and Robinson, 2000; Ryals and Knox, 2001)
- M5, to improve business operations or processes (Hendricks et al., 2007; James et al., 2007; Parr, 2000; Cotteleer and Bendoly, 2006; McAfee, 2002)
- M6, to diversify the line of products or services (Rahim et al., 2010; Coleman, 1997; Elliott, 1997; Kalakota and Robinson, 2000; Ryals and Knox, 2001)
- M7, to identify and enter new markets (Rahim et al., 2010; Hendricks et al., 2007)

- M8, to improve customer service (Coleman, 1997; Elliott, 1997; Kalakota and Robinson, 2000; Ryals and Knox, 2001)
- M9, to reduce staff costs (Coleman, 1997)
- M10, to establish strategic partnerships (Hendricks et al., 2007)
- M11, to increase employee productivity (Coleman, 1997; CTG, 1997)
- M12, to improve communication among employees (Urbach et al., 2010; Coleman, 1997; CTG, 1997).

### **3 Research questions**

The present study assesses the adoption of EIS in firms and the underlying motivations of the adoption, aiming to answer the main research question (general hypothesis): Does firm size influence the EIS adoption? In this context, 'firm size' is measured in terms of the number of employees, annual sales and international presence, which are three common explanatory variables used in many studies of adoption behaviour (Hollenstein, 2004).

Previous studies have found that there is a relationship between the adoption of IT/IS and firm size. Generally, the size of the firm has a positive relationship with implemented IT/IS solutions, as it is the case with ERP adoption where medium-sized and large firms consider it especially important (Laukkanen et al., 2007). For instance, SCM is generally adopted by large-sized firms (Shin, 2006), and CRM systems implementation is apparently connected with the size of the firm as these information systems are more frequently used in large enterprises (Torggler, 2009).

In order to study the relation between the adoption of EIS types and firm size, the following hypotheses are proposed:

- Hypothesis H1    There is a positive association between the firm's number of employees and the EIS types implemented.
- Hypothesis H2    There is a positive association between the firm's annual sales and the EIS types implemented.
- Hypothesis H3    There is a positive association between the firm's international presence and the EIS types implemented.

Unlike the research on EIS adoption and its relation to the size of the firm, which has been the subject of intense research in the last years, the assessment of motives for adoption given the size of the firm has not. Nevertheless, some research revealed that there are motivations, such as the improvement of the innovation capabilities and business process improvement, that large firms tend to valorise more than small and medium-sized firms when implementing ERP systems (Bernroider and Koch, 2001; Laukkanen et al., 2007).

Regarding the relation between the motivations for the adoption of EIS and firm size, the following hypotheses are proposed:

Hypothesis H4 There is a positive association between the firm's number of employees and the motivations for EIS adoption.

Hypothesis H5 There is a positive association between the firm's annual sales and the motivations for EIS adoption.

Hypothesis H6 There is a positive association between the firm's international presence and the motivations for EIS adoption.

## **4 Methodology**

A cross-sectional survey was conducted to investigate several aspects of the EIS adoption in firms on the Iberian Peninsula.

### *4.1 Sample and data collection*

The subject targeted by the survey was the person responsible for IT/IS within the firm, typically the Chief Information Officer (CIO) or the IT manager. The target population consisted of the 1,000 largest firms by gross revenue in Portugal and Spain. A sample group of 500 firms in Portugal and a sample of 500 firms in Spain were used. In order to obtain a representative sample, a casual stratified sample method was used, from the INE (Portuguese National Institute of Statistics) list of the 1,000 largest national firms in Portugal (INE, 2007) and the SABI database list of the 1,000 largest firms in Spain.

Data was collected through a web-based questionnaire and respondents received a summary of the most relevant findings. The questionnaire, consisting of a set of open and close-ended questions, was pre-tested with a sample of four CIOs to validate its content and readability which can be found in Appendix.

In the first and second rounds of data collection, the number of undelivered and returned questionnaires (by e-mail) was 111 from Portuguese firms and 94 from Spanish firms. This quite significant number is perhaps due to the e-mail policies of the firms. In the third round, the invitation letter was sent by post and then the number of undelivered and returned questionnaires was respectively 44 and 23 for Portuguese and Spanish firms. In total 102 valid responses were obtained (59 responses from Portuguese firms and 43 from Spanish firms), yielding a final response rate of around 10%, which is consistent with other studies (Liu and Arnett, 2000; Enns et al., 2001; Li et al., 2001; Lin and Pervan, 2003). Chi-square distribution analyses revealed no significant differences ( $p < 0.05$ ) between our sample and the population it was drawn from in terms of number of employees or annual sales volume. Non-response bias was assessed with Armstrong and Overton's (1977) time-trend extrapolation procedure, where there were no significant differences, for any of the variables. Together, these results suggest that neither the industry bias nor non-response bias are major concerns for this study. Regarding the demographic characterisation of the respondents' CIOs, the majority of CIOs that answer the survey are male (90.2%) with a Bachelor's degree (60.8%), and in their forties. They have an average tenure within their organisation of ten years and an average tenure in their current position of eight years. Table 1 shows the demographics characteristics of the respondents' firms.



**Table 1** Demographic characteristics of respondents' firms

<i>Characteristics</i>	<i>Number</i>	<i>%</i>
<i>Country</i>		
Spain	43	42.2
Portugal	59	57.8
<i>Number of employees</i>		
Less than 500	46	53.9
501 to 2000	33	32.3
More than 2000	23	21.6
<i>Annual sales (€)</i>		
Less than 50,000,000	18	17.7
50,000,001 to 250,000,000	49	48
More than 250,000,000	28	27.5
No answer	7	6.8
<i>International presence (number of countries)</i>		
0	33	32.3
1	13	12.7
2	6	5.9
> 3–4	7	6.9
5–20	19	18.7
> 20	18	17.6
No answer	6	5.9

## 5 Data analysis and results

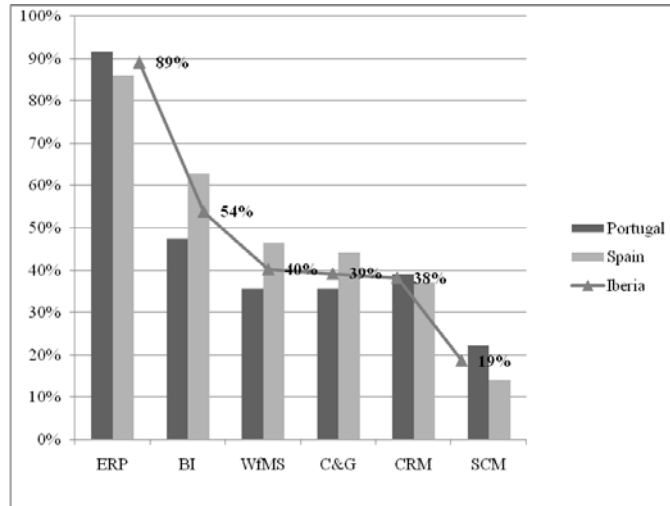
Nowadays, IT/IS have a large variety of applications within businesses and play a fundamental role both at the internal level and at linking firms with their external environment. It has become increasingly self-evident that firms cannot be competitive or profitable without IT/IS (Varajão, 2006). The great diversity of EIS types entails also a great diversity of motivations for their adoption. Nevertheless, there is a group of generally inherent motivations for EIS adoption which must be identified and grasped, in order to maximise satisfaction levels with investment initiatives in EIS (Varajão et al., 2009a).

### 5.1 EIS adoption and motivations that justify it

The respondents of the study were asked to identify which EIS their firms possessed. Figure 1 shows the respondents' answers, where we can see that the majority of firms have already implemented ERP systems. This is to be expected, considering that ERP have been around for a long time, since the 1980's, and they are considered the backbone of firms' business IT/IS (Simchy-Levy et al., 2003). This study reveals that there continues to be a surprisingly low adoption of workflow (W), C&G, and CRM systems,

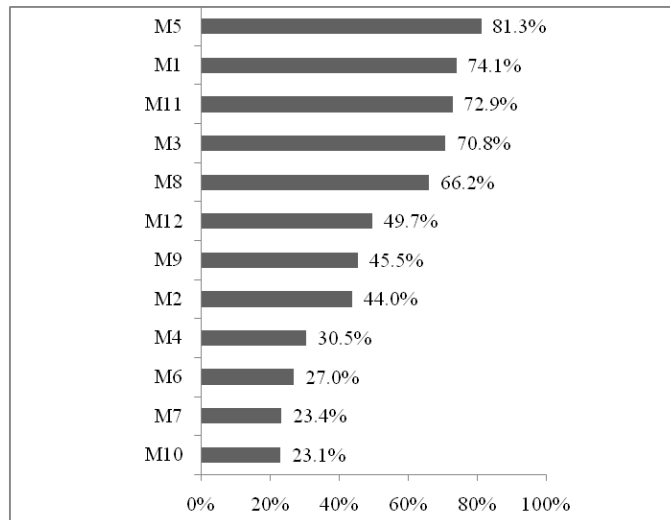
with in average less than 40% of the respondent firms having these kind of systems implemented. For CRM, for instance, a higher rate of adoption would be expected, closer to the adoption of ERP, not only because systems like CRM are generally easier to implement than ERP (Hendricks et al., 2007), but also due to the fact that these systems can and should be used to improve the competitiveness and strategic positioning of the firms (Trigo et al., 2007).

**Figure 1** Implemented EIS in Portugal (PT), Spain (SP) and Iberia (PT + SP)



It was asked of this survey’s participants to state, in order of importance (using an ordinal scale), the main motivations regarding the adoption of EIS in their firms. The ranked importance of motivational factors is presented in Figure 2.

**Figure 2** Motivations for EIS adoption



The motivation identified as being the current primary reason for IT/IS adoption in Iberian firms, highlighted at the top of the list with a weighted average of about 81%, was ‘To improve business operations or processes’. It is significant that, in contrast to the results obtained by previous studies conducted in Portugal in recent years (Varajão et al., 2009a; Trigo et al., 2007), in which the highest ranking motivations were directly linked to operational aspects of the firm, such as productivity increase or operational cost reduction, our study reveals a more strategic motivation in the top position. In the following four positions, with very similar averages, we find the motivation ‘To reduce costs’, ‘To increase the productivity of the employees’, ‘To improve the quality of products or services’ and ‘To improve customer service’. The obtained results revealed that, on the whole, the motivations identified as being the most important are not only related to operational aspects (cost reduction and productivity increase) similar to those revealed by other studies (Varajão et al., 2009a), but also with more core business aspects like improve business processes, improve quality of products and services, and customer service improvement.

### 5.2 Firm size influence on EIS adoption

One of the main objectives of this study was to assess if there was a relation between the EIS adoption and firm size (measured by, number of employees, annual sales and international presence). In order to test it, the following two propositions were defined: Proposition 1 – the adoption of EIS is related to firm size; and, Proposition 2, the motivations underlying the adoption of EIS is related to firm size. Then several hypotheses are defined and tested for each proposition. In order to test the different hypotheses, chi-square tests were used between different constructs to test the significance of the relationship. The values are statistically significant at the .05 level.

#### 5.2.1 Proposition 1 – the adoption of EIS is related to firm size

In order to evaluate the first proposition, three hypotheses were tested:

Hypothesis H1 There is a positive association between the firm’s number of employees and the EIS types implemented.

Chi-square was used to test the statistical significance of the relationship between the two variables included in this hypothesis: number of employees (see categories in Table 1) and the different types of implemented systems (yes/no answers). Table 2 shows the results obtained.

**Table 2** Relation between firms’ number of employees and the EIS types implemented

<i>System</i>	<i>Pearson chi-square</i>	<i>Asymp. sig. (two-sided)</i>
ERP	.221	.896
CRM	.058	.971
SCM	1.936	.380
BI	5.724	.057
C&G	4.378	.112
WfMS	7.303	.026

Table 2 shows that chi-square is statistically significant only for BI and WfMS. Therefore, the null hypothesis is rejected and the research hypothesis (H1) is accepted for these systems. This is also verifiable by observing the cross tabulation between the number of employees and the adoption of BI systems reveals that 74% of the firms with this type of system have more than 2,000 employees, showing the positive relationship between these two variables. Regarding WfMS, cross tabulation between number of employees and the adoption of WfMS shows that only 26% of firms with less than 500 employees have this type of system.

Hypothesis H2 There is a positive association between the firm's annual sales and the EIS types implemented.

Chi-square testing was used to assess the statistical significance of the relationship between the two variables included in this hypothesis: annual sales (see categories in Table 1) and the different types of implemented systems (yes/no answers). Table 3 shows the results obtained.

**Table 3** Relation between firms' annual sales and the EIS types implemented

<i>System</i>	<i>Pearson chi-square</i>	<i>Asymp. sig. (two-sided)</i>
ERP	3.245	.197
CRM	2.255	.324
SCM	2.256	.324
<i>BI</i>	<i>10.341</i>	<i>.006</i>
<i>C&amp;G</i>	<i>9.732</i>	<i>.008</i>
<i>WfMS</i>	<i>14.387</i>	<i>.001</i>

Table 3 shows that chi-square is statistically significant for BI, C&G and WfMS. Therefore, the null hypothesis is rejected and the research hypothesis (H2) is accepted for these systems. For instance, the cross tabulation between BI systems and annual sales shows that firms with BI systems have bigger annual sales volume (75% of firms with annual sales greater than 250,000,000 Euros have BI systems).

Hypothesis H3 There is a positive association between a firm's international presence and the EIS types implemented.

Chi-square was used to test the statistical significance of the relationship between the two variables included in this hypothesis: international presence (the interval variable was converted to a yes/no variable, meaning if the firm as or as not an international presence) and the different types of implemented systems (yes/no answers). Regarding this hypothesis, no positive relation between an international presence and EIS types was found.

### 5.2.2 *Proposition 2 – the motivations underlying the adoption of EIS are related to firm size*

To verify this proposition, a cluster analysis was first done to reduce the number of analysis groups, followed by chi-square tests.

**Figure 3** Dendrogram of motivations

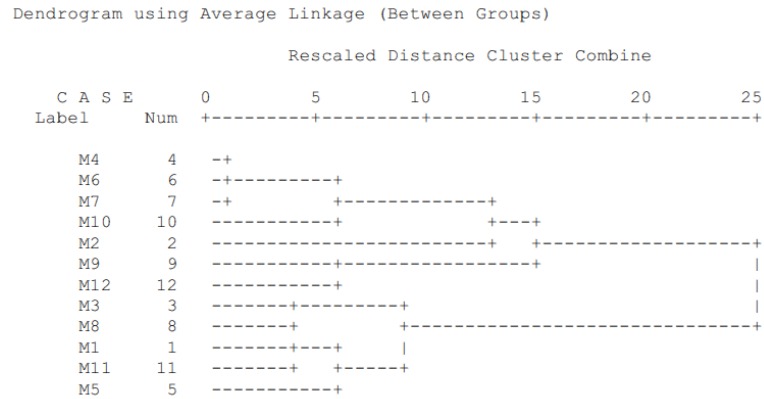


Figure 3 presents a dendrogram with the obtained results, which identifies two different groups. The first one presents the five reasons that were selected as the most important (see Figure 2), which was named ‘Top 5’ and includes the motivations M3, M8, M1, M11 and M5. The second group was named ‘non-Top 5’ and includes the remaining motivations M4, M6, M7, M10, M2, M9 and M12. After completing this analysis, we decided to create two categories for each of the motivations groups: ‘Top 5’ and ‘non-Top 5’ in order to reduce the given answers which originally had 12 values.

In order to test Proposition 2, three hypotheses were tested:

Hypothesis H4 There is a positive association between a firm’s number of employees and the motivations for EIS adoption.

Chi-square was used to test the statistical significance of the relationship between the two variables included in this hypothesis: number of employees (see categories in Table 1) and the motivations (Top 5/non-Top 5). Table 4 shows the results obtained.

**Table 4** Relation between firms’ number of employees and the motivations underlying the EIS adoption

Motivation	Pearson chi-square	Asymp. sig. (two-sided)
M1	3.148	.207
M2	.062	.969
M3	2.258	.323
M4	2.435	.296
M5	1.724	.422
M6	4.333	.115
M7	5.886	.053
M8	.460	.794
M9	6.124	.047
M10	.490	.783
M11	7.708	.021
M12	.354	.838

As one can see in Table 4, there is a remarkable relationship between the number of employees and the two motivations ‘to reduce staff costs’ and ‘to increase the productivity of the employees’. Cross tabulation between the motivation ‘to reduce staff costs’ and the number of employees reveals that this motivation has a lower impact when firms have a greater number of employees. Cross tabulation between the motivations ‘to increase the productivity of the employees’ and ‘the number of employees’ shows that this motivation gains importance in the case of firms with smaller dimension in terms of staff size. In short, it appears that a relationship exists between some motivations for the adoption of IT/IS and the firm size in terms of the number of employees.

**Hypothesis H5** There is a positive association between the firm’s annual sales and the motivations underlying the EIS adoption.

Chi-square was used to test the statistical significance of the relationship between the two variables included in this hypothesis: annual sales (see categories in Table 1) and the motivations (Top 5/non-Top 5). Table 5 shows the results obtained.

**Table 5** Relation between firm’s annual sales and the motivations underlying the EIS adoption

<i>Motivation</i>	<i>Pearson chi-square</i>	<i>Asymp. sig. (two-sided)</i>
M1	2.096	.351
M2	.749	.688
M3	6.854	.032
M4	.939	.625
M5	.524	.769
M6	8.669	.013
M7	1.871	.392
M8	.265	.876
M9	2.413	.299
M10	.392	.822
M11	2.433	.296
M12	5.426	.066

For the hypothesis H5, Table 5 shows that chi-square is statistically significant only for the motivation ‘To improve the quality of products and services’. Therefore, in regards to the hypothesis that suggests that the motivations for adoption of IT/IS is related to the annual sales of a firm, this only seems to be true for the motivation ‘To improve the quality of products or services’.

**Hypothesis H6** There is a positive association between the firm’s international presence and the motivations underlying the EIS adoption.

Chi-square testing was used to examine the statistical significance of the relationship between the two variables included in this hypothesis: international presence (the interval variable was converted to a yes/no variable meaning that the firm could have an international presence or not) and the motivations (Top 5/non-Top 5). Table 6 shows the results obtained.

**Table 6** Relation between firm’s international presence and the motivations underlying the EIS adoption

<i>Motivation</i>	<i>Pearson chi-square</i>	<i>Asymp. sig. (two-sided)</i>
M1	.457	.499
M2	0	.995
M3	.906	.341
M4	1.832	.176
M5	.040	.841
M6	.043	.836
M7	.791	.374
M8	9.227	.002
M9	.943	.331
M10	3.304	.069
M11	1.905	.167
M12	.659	.417

With regard to hypothesis H6, as it is possible to verify in Table 6, there is only one relationship with statistical significance and that is the relation between the motivation ‘To improve customer service’ and the presence of international firms. Therefore, the null hypothesis is not rejected for the remaining motivations and this research hypothesis (H6) is discarded.

### 5.3 Summary

Proposition 1 stated that the EIS adoption is related to the firm size and three hypotheses were tested (1, 2 and 3). Concerning Hypotheses 1 and 2, the obtained results show that in the case of BI and WfMS there is a relation between their adoption and the size of the firm. The firms that have this kind of system generally have a greater number of employees and greater annual sales. In the case of C&G systems, there was no relation found between the firm’s number of employees and their adoption. However, these systems are more common within firms with greater annual sales. In the case of ERP, CRM and SCM systems, no relations were found between their adoption and the size of the firm. Regarding Hypothesis 3, no relation between the system adoption and the international presence of firms was found.

Proposition 2 stated that the motivations underlying the adoption of EIS are related to firm size. Three hypotheses were also tested (4, 5 and 6). In regards to Hypotheses 4 and 5, a relation between the number of employees of a firm and some motivations for their adoption was found. The motivations ‘to reduce staff costs’ and ‘to increase the employee productivity’ gain importance in firms with a small number of employees. The motivation ‘to improve the quality of products or services’ is more important in larger firms in terms of annual sales. Concerning Hypothesis 6, a relation between the motivation ‘to improve customer service’ and the international presence of firms was found. This motivation is stronger in firms that do not have an international presence.

## 6 Conclusions

Firms currently have several EIS systems to support and develop their businesses with the ERP system being one of the most ubiquitous EIS type used in the world today. In large Iberian firms, the systems mainly adopted and which are well consolidated are ERP, as it is the case of other European countries (Van Everdingen et al., 2000). Our study reveals that ERP, CRM and SCM adoption is not currently related to firm size, which is coherent with current literature on both EIS types. For example, ERP adoption, Kallunki et al. (2011) shows that firm size itself does not influence the adoption of ERP. However, there is a difference between ERP users (mature firms) and ERP implementers (young firms) which illustrates a natural development of organisational life-cycle. Concerning CRM adoption, Alshawi et al. (2011) state that firm size is not determinant for CRM adoption in Finnish firms. In regards to SCM adoption, there was also no difference on the adoption regarding firm size (Cao et al., 2013). Regarding the other EIS types present in this study, namely BI, WfMS and C&G, the findings show a positive relationship between their adoption and a firm's size, which is consistent with findings from other researchers. For instance, a study on data warehousing (DW) adoption in the USA shows that larger firms are more likely to adopt them since they have a larger customer and supplier base that can provide greater opportunities for leveraging the initial investment on DW infrastructure (Ramamurthy et al., 2008). EIS adoption does not appear to be related to the firm's international presence.

The reasons for investment are just as varied as technology. Nevertheless, there are several common and prevailing motivations which must be understood so that the process of IT/IS development can be conducted in line with the global targets of the organisations. The results of the conducted survey on large Iberian firms enabled us to identify the five most prevalent motivations for the adoption of EIS: 'To improve business operations or processes'; 'To reduce costs'; 'To increase the productivity of the employees'; 'To improve the quality of products or services'; and 'To improve customer service'. Our top rated motivation 'To improve business operations or processes' is found in studies focused on several EIS types, as it is the case of ERP adoption in Europe (Bernroider and Koch, 2001) or in Canada (Kumar and Kumar, 2002), where it appears with a score of 5.5 on a scale of 1 to 7. This top motivation is also the main motivation for the adoption of WfMS and business process management (BPM) systems (Škrinjar and Trkman, 2013).

Regarding the motivations underlying the EIS adoption, a relation was found between some motivations and the firms' characteristics, as it is the case of the motivation 'To improve the quality of products or services'. Even though the operational aspects are still very important as motivators for the adoption of EIS, our study revealed that strategic motives have gained importance.

This study gives a broader view of EIS adoption, what is not very common in IT/IS literature since most of the studies are focused on one EIS type in particular, such as ERP or CRM systems. These results are useful not only to understand more about EIS adoption and the main motivations underlying its adoption, but also to enable researchers, developers and IT vendors to focus their attention on firm size. In the future, it would be interesting to repeat this study with small and medium enterprises (SME).



## References

- Almeida, N.V.D. and Trigo, A. (2012) 'Open source workflow management systems for the internal audit process', *Proceedings of the Workshop on Open Source and Design of Communication*, ACM, Lisboa, Portugal.
- Alshawi, S., Missi, F. and Irani, Z. (2011) 'Organisational, technical and data quality factors in CRM adoption – SMEs perspective', *Industrial Marketing Management*, Vol. 40, No. 3, pp.376–383.
- Armstrong, J.S. and Overton, T.S. (1977) 'Estimating nonresponse bias in mail surveys', *Journal of Marketing Research*, Vol. 14, pp.396–402.
- Beckett-Camarata, E.J., Camarata, M.R. and Barker, R.T. (1998) 'Integrating internal and external customer relationships through relationship management: a strategic response to a changing global environment', *Journal of Business Research*, Vol. 41, No. 1, pp.71–81.
- Belle, J-P.V., Eccles, M. and Nash, J. (2003) *Discovering Information Systems*, South African Universities Press, Cape Town.
- Bernroeder, E. and Koch, S. (2001) 'ERP selection process in midsize and large organizations', *Business Process Management Journal*, Vol. 7, No. 3, pp.251–257.
- Cao, Q., Gan, Q. and Thompson, M.A. (2013) 'Organizational adoption of supply chain management system: a multi-theoretic investigation', *Decision Support Systems*, Vol. 55, No. 3, pp.720–727.
- Chou, P.B. (2011) 'A game-theoretical model for inter-organisational collaboration in information systems development', *Int. J. Inf. Technol. Manage.*, Vol. 10, Nos. 2/3/4, pp.110–123.
- Coleman, D. (1997) *Groupware: Collaborative Strategies for Corporate LANs and Intranets*, Prentice Hall, Upper Saddle River, New Jersey.
- Cotteleer, M.J. and Bendoly, E. (2006) 'Order lead-time improvement following enterprise information technology implementation: an empirical study', *MIS Quarterly*, Vol. 30, No. 3, pp.643–660.
- CTG (1997) *An Introduction to Workflow Management Systems*, Center for Technology in Government, University at Albany, New York.
- Davenport, T.H. (1998) 'Putting the enterprise into the enterprise system', *Harvard Business Review*, July–August, Vol. 76, pp.121–131.
- Elbashir, M.Z., Collier, P.A. and Davern, M.J. (2008) 'Measuring the effects of business intelligence systems: the relationship between business process and organizational performance', *International Journal of Accounting Information Systems*, Vol. 9, No. 3, pp.135–153.
- Elliott, C. (1997) 'Everything wired must converge', *Journal of Business Strategy*, Vol. 18, No. 6, pp.31–34.
- Enns, H.G., Huff, S.L. and Golden, B.R. (2001) 'How CIOs obtain peer commitment to strategic IS proposals: barriers and facilitators', *Journal of Strategic Information Systems*, Vol. 10, No. 1, pp.3–14.
- González-Gallego, N., Molina-Castillo, F.-J., Soto-Acosta, P., Varajao, J. and Trigo, A. (2014). 'Using integrated information systems in supply chain management', *Enterprise Information Systems*, pp.1–23.
- Gonzalez-Gallego, N., Soto-Acosta, P., Molina-Castillo, F.J., Trigo, A. and Varajao, J. (2010) 'El papel de las TIC en el rendimiento de las cadenas de suministro: el caso de las grandes empresas de España y Portugal Universia', *Business Review*, Vol. 28, No. 4, pp.102–114.
- Halonen, R. (2011) 'Removing obstacles when implementing inter-organisational information systems', *Int. J. Inf. Technol. Manage.*, Vol. 10, Nos. 2/3/4, pp.192–207.
- He, X.J. and Wenjie, W. (2006) 'Factors affecting adoption of ERP in China', *Computational Intelligence for Modelling, Control and Automation 2006 and International Conference on Intelligent Agents, Web Technologies and Internet Commerce, International Conference on*, 28 November–1 December, pp.156–156.

- Hendricks, K.B., Singhal, V.R. and Stratman, J.K. (2007) 'The impact of enterprise systems on corporate performance: a study of ERP, SCM, and CRM system implementations', *Journal of Operations Management*, Vol. 25, No. 1, pp.65–82.
- Hollenstein, H. (2004) 'Determinants of the adoption of information and communication technologies (ICT): an empirical analysis based on firm-level data for the Swiss business sector', *Structural Change and Economic Dynamics*, Vol. 15, No. 3, pp.315–342.
- INE (2007) *Lista das 1000 maiores empresas portuguesas*, Ficheiro de Unidades Estatísticas – FUE – Base Belém, Instituto Nacional de Estatística.
- Iriana, R. and Buttle, F. (2006) 'Strategic, operational, and analytical customer relationship management', *Journal of Relationship Marketing*, Vol. 5, No. 4, pp.23–42.
- James, C., Joonsoo, B., Qinyi, W., Ling, L., Calton, P. and William, B.R. (2007) 'Workflow management for enterprise transformation', *Inf. Knowl. Syst. Manag.*, Vol. 6, Nos. 1–2, pp.61–80.
- Kalakota, R. and Robinson, M. (2000) 'Customer relationship management: integrating processes to build relationships', in Kalakota, R. and Robinson, M. (Eds.): *E-Business 2.0: Roadmap for Success*, Addison Wesley Publishing Company.
- Kallunki, J-P., Laitinen, E.K. and Silvola, H. (2011) 'Impact of enterprise resource planning systems on management control systems and firm performance', *International Journal of Accounting Information Systems*, Vol. 12, No. 1, pp.20–39.
- Karakostas, B., Kardaras, D. and Papathanassiou, E. (2005) 'The state of CRM adoption by the financial services in the UK: an empirical investigation', *Information & Management*, Vol. 42, No. 6, pp.853–863.
- Kostopoulos, K.C., Brachos, D.A. and Prastacos, G.P. (2004) 'Determining factors of ERP adoption: an indicative study in the Greek market', *Engineering Management Conference, 2004: Proceedings, 2004 IEEE International*, 18–21 October, Vol. 1, pp.287–291.
- Kumar, V. and Kumar, B.M.U. (2002) 'Enterprise resource planning systems adoption process: a survey of Canadian organizations', *International Journal of Production Research*, Vol. 40, No. 3, pp.509–523.
- Laukkanen, S., Sarpola, S. and Hallikainen, P. (2007) 'Enterprise size matters: objectives and constraints of ERP adoption', *Journal of Enterprise Information Management*, Vol. 20, No. 3, pp.319–334.
- Li, E.Y., McLeod, R. and Rogers, J.C. (2001) 'Marketing information systems in Fortune 500 companies: a longitudinal analysis of 1980, 1990, and 2000', *Information & Management*, April, Vol. 38, No. 5, pp.307–322.
- Lin, C. and Pervan, G. (2003) 'The practice of IS/IT benefits management in large Australian organizations', *Information & Management*, October, Vol. 41, No. 1, pp.13–24.
- Lin, Y-H., Tsai, K-M., Shiang, W-J., Kuo, T-C. and Tsai, C-H. (2009) 'Research on using ANP to establish a performance assessment model for business intelligence systems', *Expert Systems with Applications*, March, Vol. 36, No. 2, Part 2, pp.4135–4146.
- Liu, C. and Arnett, K.P. (2000) 'Exploring the factors associated with web site success in the context of electronic commerce', *Information & Management*, October, Vol. 38, No. 1, pp.23–33.
- McAfee, A. (2002) 'The impact of enterprise information technology adoption on operational performance: an empirical investigation', *Production and Operations Management*, March, Vol. 11, No. 1, pp.33–53.
- Milutinović, V. and Patricelli, F. (2002) *E-Business and E-Challenges: Emerging Communication*, IOS Press, Amsterdam, The Netherlands.
- Nichols, R.B.H.A.E.L. (1999) *Introduction to Supply Chain Management*, Prentice Hall Press, Upper Saddle River, New Jersey.
- Oliver, D. and Romm, C. (2000) 'ERP systems: the route to adoption', *6th Americas Conference on Information Systems Association for Information Systems (AMCIS)*, Long Beach, USA, pp.1039–1044.

- Parr, A.N. (2000) 'A taxonomy of ERP implementation approaches', *33rd Hawaii International Conference on System Sciences*, p.10, IEEE.
- Power, D.J. (2007) 'A brief history of decision support systems', *DSSResources.COM* [online] <http://dssresources.com/history/dsshistory.html> (accessed 19 October 2013).
- Pumareja, D.T. and Sikkel, K. (2006) 'Getting used with groupware: a first class experience', *The Journal of Human-Centred Systems*, Vol. 20, No. 1, pp.189–201.
- Rahim, M.M., Shanks, G. and Jagielska, I. (2010) 'The role of organizational motivations in information systems implementation', *PACIS 2010 Proceedings*.
- Ramamurthy, K., Sen, A. and Sinha, A.P. (2008) 'An empirical investigation of the key determinants of data warehouse adoption', *Decision Support Systems*, March, Vol. 44, No. 4, pp.817–841.
- Ross, J.W. and Vitale, M.R. (2000) 'The ERP revolution: surviving versus thriving', *Information Systems Frontiers*, August, Vol. 2, No. 2, pp.233–241.
- Ryals, L. and Knox, S. (2001) 'Cross-functional issues in the implementation of relationship marketing through customer relationship management', *European Management Journal*, Vol. 19, pp.534–542.
- Scott, J.E. and Vessey, I. (2000) 'Implementing enterprise resource planning systems: the role of learning from failure', *Information Systems Frontiers*, August, Vol. 2, No. 2, pp.213–232.
- Shin, I. (2006) 'Adoption of enterprise application software and firm performance', *Small Business Economics*, April, Vol. 26, No. 3, pp.241–256.
- Simchy-Levy, D., Kaminsky, P. and Simchy-Levy, E. (2003) *Designing & Managing The Supply Chain – Concepts, Strategies & Case Studies*, McGraw-Hill, New York.
- Škrinjar, R. and Trkman, P. (2013) 'Increasing process orientation with business process management: critical practices', *International Journal of Information Management*, February, Vol. 33, No. 1, pp.48–60.
- Stadtler, H. (2000) 'Supply chain management – an overview', in Kilger, C. (Ed.): *Supply Chain Management and Advanced Planning: Concepts, Models, Software and Case Studies*, Springer-Verlag, Germany.
- Torggler, M. (2009) 'The functionality and usage of CRM systems', *International Journal of Human and Social Sciences*, Vol. 4, No. 3, pp.164–172.
- Trigo, A., Varajão, J., Figueiredo, N. and Barroso, J. (2007) 'Information systems and technology adoption by the Portuguese large companies', *European and Mediterranean Conference on Information Systems (EMCIS)*, Valence, Spain, 23–26 June, pp.1–7.
- Urbach, N., Smolnik, S. and Riempp, G. (2010) 'An empirical investigation of employee portal success', *The Journal of Strategic Information Systems*, Vol. 19, No. 3, pp.184–206.
- Van Everdingen, Y., Van Hilleegersberg, J. and Waarts, E. (2000) 'Enterprise resource planning: ERP adoption by European midsize companies', *Communications of the ACM*, April, Vol. 43, No. 4.
- Varajão, J. (2006) 'Gestão da função de sistemas de informação', *Dirigir - Revista para chefias e quadros*, IEFP.
- Varajão, J., Trigo, A. and Barroso, J. (2009a) 'Motivations and trends for IT/IS adoption: insights from Portuguese companies', *International Journal of Enterprise Information Systems (IJEIS)*, Vol. 5, No. 4, pp.34–52, 19pp.
- Varajão, J., Trigo, A., Figueiredo, N., Barroso, J. and Bulas-Cruz, J. (2009b) 'Information systems services outsourcing reality in large Portuguese organisations', *Int. J. Bus. Inf. Syst.*, November 2008, Vol. 4, No. 1, pp.125–142.
- Xu, L.D. (2007) *Frontiers in Enterprise Integration*, Taylor & Francis, Inc., Bristol, PA, USA.
- Yeoh, W. and Koronios, A. (2009) 'Critical success factors for business intelligence systems', *Journal of Computer Information Systems*, Vol. 50, No. 3, pp.22–32.

## Appendix

- 1 Firm characterisation
  - a Number of employees (please choose only one of the following):
    - 1 1 to 500
    - 2 501 to 2,000
    - 3 More than 2,000
    - 4 Do not know/do not answer
  - b Business volume (please choose only one of the following):
    - 1 Less than 50,000,000 Euros
    - 2 50,000,001 to 250,000,000 Euros
    - 3 More than 250,000,000 Euros
    - 4 Do not know/Do not answer
  - c International presence (number of countries excluding your own)? \_\_\_\_\_
- 2 Firm characterisation in terms of IT/IS solutions:
  - a Implemented systems in firm (please choose all that apply):
    - Enterprise resource planning (ERP)
    - Customer relationship management (CRM)
    - Supply chain management (SCM)
    - Business Intelligence (BI)
    - Collaboration and groupware
    - Workflow
    - Business specific
    - Other: \_\_\_\_\_
  - b What are the main motivations behind IT/IS adoption? Please order them by importance (number each box in order of preference from 1 to 12):
    - To reduce operational costs
    - To differentiate products or services in relation to the competitors
    - To improve the quality of products or services
    - To launch new products or services before competition
    - To improve business operations or processes
    - To diversify the line of products or services
    - To identify and to occupy new markets
    - To improve customer service
    - To reduce staff costs
    - To establish strategic partnerships
    - To increase the productivity of the employees
    - To improve the communication between the employees
    - Other: \_\_\_\_\_