Departamento de Ciências e Tecnologias da Informação

Electronic Procurement: Dealing With Supplier Adoption

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Abstract

E-procurement systems make purchasing activities more effective in terms of both time and cost. However over the past years there is evidence that some of the expected benefits have not been achieved. Among several appointed causes, supplier's adherence to such platforms has been regarded as one. The focus of this research is in supplier adoption of e-Procurement. Such a study is important in order to better address the issues actually faced by suppliers within e-Procurement. We have conducted a questionnaire-based survey to 721 Portuguese companies and performed an empirical analysis of the results. The findings from this work provide empirical evidence that the supplier perceived benefits and business partner pressures are positively related to e-Procurement adoption while some barriers like implementation costs have the opposite effect. The main critical success factors on e-Procurement adoption are also presented.

Keywords: e-Procurement, Collaboration, e-Commerce, e-Business.

Resumo

Os sistemas de e-Procurement permitem melhorias significativas no tempo e custo associados aos processos de compra. No entanto, nos últimos anos existe evidência de que alguns dos benefícios esperados não têm sido alcançados. Entre as várias causas apontadas, a falta de adesão dos fornecedores a esse tipo de plataformas foi apontada como uma. O foco desta pesquisa está na adopção dos fornecedores ao e-Procurement, mais especificamente nos factores que levam a sua adesão. Foi realizado um questionário a 721 empresas Portuguesas e os dados obtidos analisados. Os resultados deste trabalho fornecem evidências de que os benefícios percebidos pelos fornecedores e as pressões dos parceiros de negócios estão positivamente relacionados com a intenção de adopção, enquanto algumas barreiras, como custos de implementação têm o efeito oposto. Os principais factores críticos de sucesso na adesão ao e-Procurement são também apresentados.

Palavras-chave: e-Procurement, colaboração, comércio electrónico, e-Business.

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List of Abbreviators

B2B: Business to Business

CSF: Critical Success Factors

cXML: Commerce XML

ebXML: Electronic Business XML

e-MRO: Electronic Maintenance Repair and Operations

EP: Electronic Procurement

EPS: Electronic Procurement Systems

ERP: Enterprise Resource Planning

EU: European Union

ICT: Information and Communication Technologies

OBI: Open buying on the Internet

OECD: Organization for Economic Co-operation and Development

OTA: Open Travel Alliance

SCM: Supply Chain Management

SME: Small and Medium Enterprises

SOA: Service Oriented Architecture

UDDI: Universal description discovery and integration of business for the web

XML: Extensible Markup Language

1. Introduction

1.1. Background

Procurement is one of the most frequently performed business activities, since companies depend on materials and services provided by other companies. They spend a significant part of their income on the purchasing of goods and services. Suggested by its name, electronic procurement (e-Procurement) is the application of information and communication technologies (ICT) in the procurement process. It involves various forms of information and technology to automate and streamline the procurement process in business organizations (Boer *et al.*, 2002).

E-Procurement has the potential to provide cost and time reductions when ordering from suppliers, and helps to achieve a well-integrated supply chain. A survey conducted in the UK showed that the majority of companies believed that implementation of e-Procurement solutions were critical for the success of their business in the future (Stein, Hawking, 2004). Also an increasing number of public institutions identified electronic purchasing as a priority to e-Government. Many implemented or are in the process of implementing e-Procurement systems. The adoption of e-Procurement in public administration has a huge impact since governments spend large amounts in acquiring materials and services. Some of the benefits are the cost reduction in goods, services and order processing, better transparency to the suppliers and electronic commerce development (Pereira, Alturas, 2007).

Companies are approaching e-Procurement implementation with different strategies. Davila *et al.* (2003) identified two main types of companies. The first type is moving aggressively to adopt e-Procurement, frequently experimenting with various solutions. The second type adopts a more conservative strategy by selectively experimenting, typically with one technology. The latter group relies on these limited experiences to provide the capabilities to move quickly into the technology as a dominant design appears.

However users of e-Procurement technologies reported that they can acquire goods over the Internet from only 15 per cent of their supply base (Davila *et al.*, 2003). A report from EU also confirms that only 13% of EU companies are receiving orders online and 27% placing orders

online with suppliers (EC, 2005). Engaging suppliers in the process (especially smaller companies) has proven to be difficult given the level of investment required and the different needs of their customer base in terms of technologies and internal procedures.

A successful e-Procurement system is required to have suppliers willing and able to trade electronically. For example, a key learning from a study conducted by the Australian Government (AGIMO, 2005) was that supplier adoption is important to the overall success of an e-Procurement program. They concluded that the more suppliers in the system, the more inclined buyers will be to use it.

If suppliers are not correctly involved, then a low adoption rate can constrain users from leveraging the full associated capabilities from e-Procurement solutions. The lack of a critical mass of suppliers accessible through the organization's e-Procurement system might limit the network effects that underlie these technologies, delaying the acceptance and adoption of the solution.

1.2. **Research Focus**

An e-Procurement system may be located at the buyer side, supplier side or a third party provider. For the systems owned by the buyer side (Figure 1), typically large companies, it is their responsibility to ensure that enough suppliers are adopting the system. According to Rogers (1995) the term "adoption" is the decision to make full use of an innovation as the best course of action available, while rejection is the decision to not adopt. Thus to suppliers make full use of e-Procurement systems means that at the organizational level the supplier has decided to use the system and its users able to do it.

As represented in the figure below our research focus is in the supplier adoption of e-procurement systems. Therefore, we are not concerned with the factors that lead to the adoption of e-Procurement by Company A. The focus of this research is in the Company A relation with their suppliers after decision to go for e-Procurement. The aim is to understand the factors that lead suppliers to adopt or not e-Procurement systems located and owned by their purchasing companies.

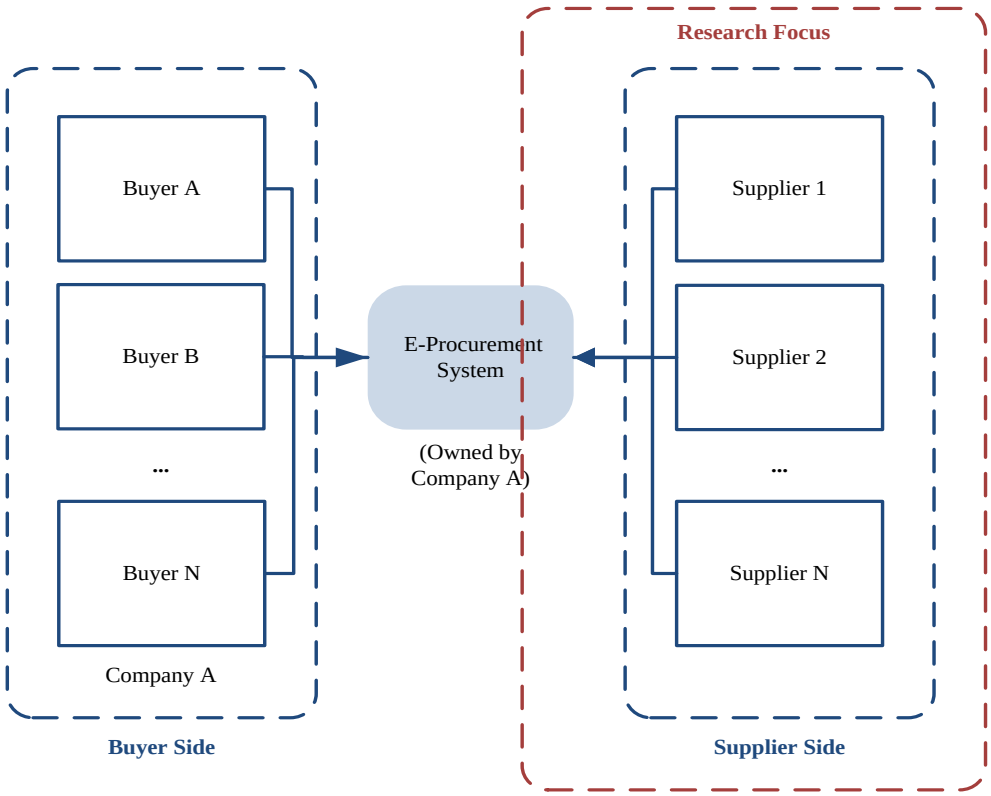

Figure 1 - Research Focus

However there is very little scientific literature on the factors that lead or not the successful adoption of e-Procurement within suppliers. The aim of this dissertation is to gain an understanding of the factors affecting the e-Procurement adoption by suppliers, with a focus on buyer centric e-Procurement systems were typically suppliers have less bargain power. In this context, the buyer plays the role of an initiator, while suppliers act as followers.

1.3. **Objectives**

The following objectives have been considered of supreme importance in helping to achieve the abovementioned research focus:

- Understand the procurement role in supply chain management and how different types of goods fit for e-Procurement.
- Realize the definition of e-Procurement, their different tools, arquitectures and technologies used.
- Build empirical evidence of the impact of key factors on supplier's intention to adopt e-Procurement.
- Formulate recommendations for dealing with the main supplier issues when implementing e-Procurement.

The research questions formulated were based on the benefits, barriers and critical success factors perceived by suppliers when confronted with e-Procurement adoption. The influence of business partners was also taken in to account. The following research questions will be answered:

- What are the major perceived benefits to the adoption of e-Procurement by suppliers?
- What are the major perceived barriers to the adoption of e-Procurement by suppliers?
- What are the major perceived critical success factors to the adoption of e-Procurement by suppliers?
- What is the impact of business partner pressure on adoption of e-Procurement by suppliers?

1.4. **Methodology**

A revision of the literature was made in order to identify and analyze the factors known as contributing or not to the adoption of e-Procurement systems. Some models actually used to support IT adoption were also taken into account, in order to build an initial framework.

Questionnaire items were developed to collect quantitative data relevant to the objectives of the study, as well as descriptive information. During the month of May 2009 the questionnaire went through a pretesting process before being submitted. First, pretesting was carried out with one professor, two supplier executives and four IT consultants. The questionnaire was then refined according to the comments/suggestions made by this panel. The modifications made were mainly related to the instructions in the survey. Questions were adapted to the probable low education level of the respondents, since the target were mainly Small and Medium Enterprises (SMEs) in Portugal. A website was built to conduct the survey online. This allowed the direct entry of data by the respondents, reducing common errors in data entry through the use of standard inputs. It also provided a good control mechanism on whether companies responded or not, since a unique ID was generated by every email sent out.

The proposed framework was then validated with the help of the empirical data collected from the survey. More specifically, statistic tests of correlation and factor analysis were carried out[1], so that the empirical relationship between each factor and the intention of a supplier to join a future initiative of e-Procurement was determined. Finally, based on the empirical analysis and literature review recommendations for the supplier adoption of e-Procurement were presented.

[1] Using SPSS Version 17

[2] Classification adapted from Gunasekaran and Ngai (2008)

1.5. **Value of this Research**

This research is important for a number of reasons. First, the literature review will address the lack of empirical studies on the adoption of e-Procurement. Second while the majority of the actual literatures focus only on the buyer side of e-Procurement this research will focus on the seller side. Moreover, the identification of the benefits, barriers, CSF and business partner influence will help the research community and the business community to produce a deeper intellectual understanding on e-Procurement adoption.

1.6. **Dissertation Structure**

The dissertation is organized as follows. Chapter 2 provides the theoretical foundation for the study. In this section, literature on supply chain management (SCM), procurement, e-Commerce and e-Procurement is reviewed. Chapter 3 provides the literature foundation for the theorical framework and the hypothesis are presented. Chapter 4 contains the empirical results. A descriptive analysis of the data is presented. Correlation tests between the factors and the dependent variable are analyzed and a factorial analysis is performed. Conclusions, recommendations and future research guidelines are discussed in Chapter 5.

2. Literature Review

2.1. The Procurement Role

In this chapter procurement is presented as a process of supply chain management. The strategic role of procurement and the implications of the type of goods traded are described.

2.1.1. Definition of Supply Chain Management

In a typical supply chain, materials or products flow from up-stream to down-stream while the information flows in both directions (Figure 2). The process of managing these supply systems is called supply chain management (SCM).

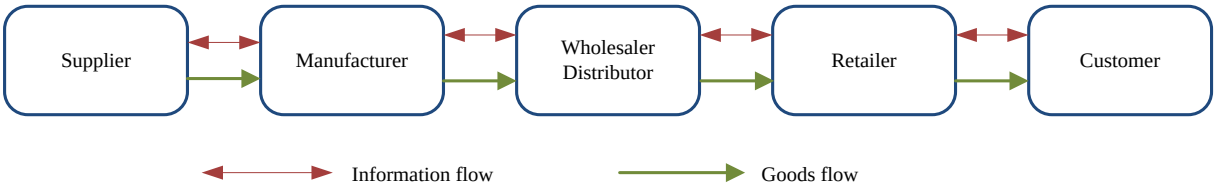

Figure 2 - Typical Supply Chain. Adapted from Xiao (2006)

According to the Council of Supply Chain Management Professionals (CSCMP, 2008), SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. It also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers.

In essence, supply chain management integrates supply and demand management within and across companies. The definition suggests that all of the links in the supply chain must be strong and well integrated. However the key link, the one that sets the foundation for the others, is the supply management on the input end of the chain. These procurement activities are performed between the manufacturer and the supplier (Mentzer *et al.*, 2001) and serve as input to the firm ability to produce its final goods.

2.1.2. Procurement Process

In Figure 3 a generic purchasing process is presented. Usually it involves all or part of the activities presented. In the request of supply technical features, quantity and delivery conditions are specified. Next company looks for the most adequate supplier in the market or in a restricted list. The selection of the supplier is based on the quality and the pricing of the bids received and finally the selected supplier prepares and delivers goods/services and sends the invoice.

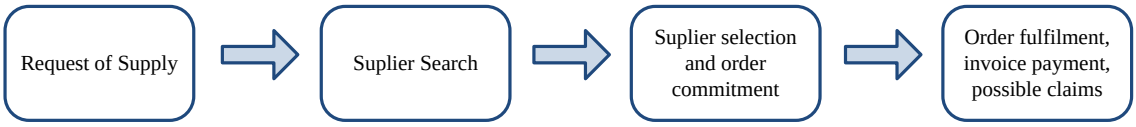

Figure 3 - The purchasing process. Adapted from Caridi *et al.* (2004)

Accordingly to Sparks and Wagner (2003) a purchasing process can range from strategic buying, transactional buying or spot buying. In the first, the main objective is to establish long-term relationship between customers and suppliers and requires a careful vendor selection and a long-term agreement on the supply management. Next, transactional buying implies repetitive purchases with the same vendor, based on yearly blanket orders or outline agreements. Finally, spot buying occurs when urgent requests come out and all the pre-qualified suppliers are not capable of fulfilling them.

Procurements is more than purchasing. Gershon (1999) defines procurement as 'the whole process of acquisition from third parties and covers goods, services and construction projects. This process spans the whole life cycle from the initial concept and definition of business needs through to the end of the useful life of an asset or end of services contract. Thus, Gershon provides a complete definition of Procurement. However, he doesn't refer anything about the strategic importance of the procurement function.

According to Croom and Giannakis (2002) the purchasing department has been acquiring a more strategic role, coupled with the term Procurement, which continuously strives for new methods of supply, trying to establish collaborative relationships with a selected list of suppliers. Procurement has become a strategic source for firms to compete, since most corporations spend between 50 to 80 percent of sales on goods and services (Cammish, Keough, 1991). Firms need to strategically acquire the materials and services that will enhance

their ability to achieve high quality levels, fast delivery and cost savings for exceeding customer requirements (Carr, Pearson, 1999). Thus, the procurement includes all the purchase cycle of a product or service and plays a strategic role, either by its high financial impact or by serving as input to all production of the company.

2.1.3. Direct and Indirect Procurement

It is common to distinguish direct procurement from indirect procurement. Procurement may differ between the acquisition of materials to incorporate in products or services and indirect goods to support and maintain company non core activities. Minahan and Degan (2001) divided procurement into three categories:

- Indirect Procurement: Includes the procurement of non-production goods and services such as office supplies, printing, advertising and casual labour.
- Direct Procurement: Includes the procurement of raw materials, parts and assemblies.
- Sourcing: Identification, evaluation, negotiation of products and supplies for both the indirect and direct supply chain.

Direct procurement is considered critical to have a good performance and leads to close relationships with suppliers. For indirect procurement price is the most important factor to ponder, and long term relationships with suppliers are not frequent. Moreover the purchasing process is harder to control, due to the high rate of "maverick" purchases (purchases carried out from single employees without using official company supply channels), which on average can amount up to 40% of the total indirect supply (Poole, Durieux, 1999). This phenomenon can reduce and delay the possibility for a company to exploit possible economies of purchase, which are normally gained for direct goods.

Companies may adopt different strategies for purchasing goods, according to the types of goods in debate. Some companies outsource indirect procurement, to improve purchasing control. According to Purdum (2007) the following factors lead to outsourcing:

- A strong corporate requirement to reduce the cost of indirect goods and services;
- Difficulties in managing large numbers of suppliers;
- Lack of visibility on indirect spend.

Dedrick (2008) analysed the use of e-Procurement with the type of goods purchased and the number of suppliers in the supply chain. According to Dedrick (2008) the use of e-Procurement is associated with buying from more suppliers for custom goods but from fewer suppliers for commodity goods. In an efficiently functioning transparent market, few suppliers are sufficient for commodity goods, whereas for custom goods the need for protection from opportunistic vendor leads to the use of more suppliers.

The role of procurement and the use of large information systems to conduct e-Procurement was analyzed by Hawking *et al.* (2004) and presented with the results of a survey of 38 major Australian organizations. The main results also show that direct procurement is heavily dependent upon traditional practices while indirect procurement is more likely to use "e" practices.

Thus direct goods support core activities of the company and lead to closer relations with supplier. They require more internal control and are heavily dependent on traditional practices. On the other hand, indirect goods are less critical and more likely to use e-Procurement. Their use also leads to the reduction of the number of suppliers on the supply chain.

2.2. E-commerce & E-Procurement

Advances in information systems technology have had a huge impact on the evolution of supply chain management (Lee, Whang, 2000). As a result of such technological advances e-Commerce emerges, allowing supply chain partners to work closer and share the realized returns among the partners to improve individual firm performance.

2.2.1. E-commerce

The prefix ‘e’ usually denotes something related with ICT and the Internet. According to Harris (2002) there are numerous definition of e-Commerce and e-Business, with many people treating them as synonyms. For most, e-Commerce has a more restrictive meaning and is concerned with the buying and selling of goods online. E-Business is therefore a broader concept and describes arrangements where organizations have redesigned their business structures, processes and services to take advantage of Internet capabilities (Jackson *et al.*, 2003).

There are many definition of e-Commerce, but they all imply some manner of electronic mediation for business transactions. The UK Department of Trade and Industry defined e-Commerce as the exchange of information across electronic networks, at any stage in the supply chain, whether within an organisation, between businesses, between businesses and consumers, or between the public and private sectors, whether paid or unpaid (UK Cabinet Office, 1999).

Napier *et al.* (2005) pointed out that by implementing and using e-commerce sellers can access narrow markets segments that are widely distributed while buyers can take advantage by accessing global markets with larger product availability from a variety of sellers at reduced costs (Chaudhury, Kuilboer, 2001). For SMEs e-commerce can ‘‘level the playing field’’ with big business, providing location and time independence, and ease communication (Grandon, Pearson, 2004).

However, there are some drawbacks to e-commerce. In the technological field, universal standards are missing, bandwidth for telecommunications is inadequate, the existing systems and their integration is complex or the simple access to an internet connection may not exist. Those are some of the limiting factors for the e-commerce success and expansion. On the

other hand, privacy and security questions, the increasing electronic fraud, legal demands and a low trust level by the users have also a negative impact in e-commerce development and expansion (EC, 2008).

2.2.2. Definition of Electronic Procurement

E-Procurement has shown to be a good start point of the overall e-Commerce strategy, since procurement plays a critical role between the members of the supply chain. E-Procurement can be seen as part of an automated purchasing system. It is designed to facilitate the acquisition of goods by a commercial or government organization over the Internet. Buyers may log on to the system to view supplier catalogues, and to place orders (Botto, 2003).

E- Procurement can be defined as a process which allows any designated user to requisition a product or service through a web interface, which then generates a purchase order to send to a supplier (Falk, 2005). According to the Chartered Institute of Purchasing & Supply e-Procurement is about using the Internet to operate the transactional aspects of requisitioning, authorising, ordering, receipting and payment processes for the required services or products (CIPS, 2009).

This study has determined that this definition are too narrow since they disregard several important activities: the aggregation of orders, monitoring of the supplier's performance, managing and mitigating supplier-connected risks or contract management. Thus, a better definition is that e-Procurement is provided by Gershon (1999). He considers e-Procurement as the whole process of acquisition from third parties over the internet; this process spans the whole life cycle from the initial concept and definition of business needs to the end of the useful life of an asset or end of a services contract.

2.2.3. E-Procurement Tools

E-Procurement is viewed as an end to end solution that integrates and streamlines many procurement processes horizontally trough the organization. In Figure 4 a full e-Procurement lifecycle is presented. The author divides it in the e-Sourcing cycle and Purchase to Pay Cycle (P2P). In the e-Sourcing companies look to what the market has to offer in terms of products

or services. Strategic decisions are also performed, like contracts and important sourcing partnerships. In the purchase to pay cycle, the decision of what to buy, when and to whom has already been taken. The focus here is in the execution of the purchase order.

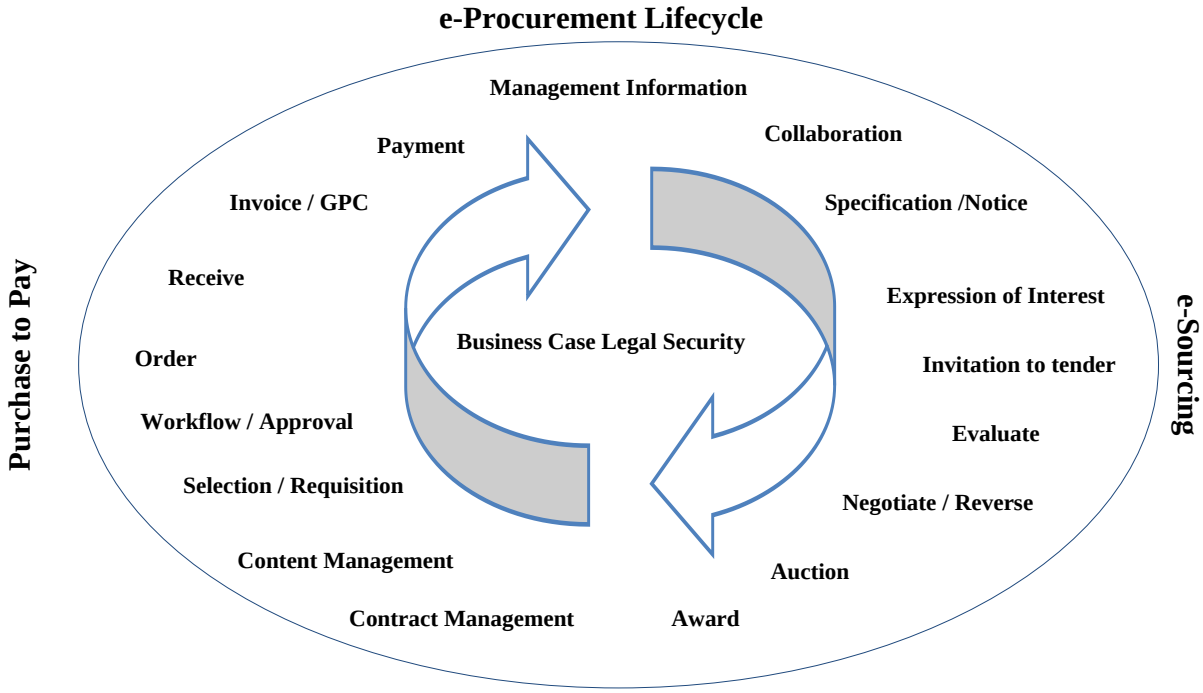

Figure 4 - e-Procurement Lifecycle. Adapted from CIPS (2009).

Such end to end solutions offer robust and rich functionality. However industry and academic analysis indicate that this ideal model is rarely achieved and e-Procurement implementations generally involve a mixture of different tools (Vaidya *et al.*, 2006). Boer *et al.* (2002) identified and described six forms of e-Procurement and related them with their life cycle, as described below:

E-MRO

Electronic Maintenance Repair and Operations (e-MRO) focus on the process of creating and approving purchasing requisitions, placing the orders and receiving the goods or services ordered using a software system based on internet technology. Further on, the software system for e-MRO is generally available for all employees to put the purchase requisitions.

Web Based ERP

It's similar to e-MRO. The difference between the two is that e-MRO deal with MRO items whereas the web-based ERP deals with products related items.

E-Sourcing

E-sourcing is the process of finding new possible suppliers using the internet in general or more specific, a B2B marketplace. Identifying new sources of supply increases the competitive forces during the tendering process. Takes place in the expression of interest phase of the procurement process.

E-Tendering

E-tendering is the process of sending RFX (Request for exchange) to suppliers and receiving the responses using the Internet. Sometimes the analysis and comparison of responses is also supported by the solution (Boer *et al.*, 2002). The data concerning e-tendering is focused on the product or service. Here, it is also possible to have an initial screening process where a selected number of suppliers qualify for the negotiation phase. This process phase does not include closing of the contract. Takes place in the invitation to tender phase of the procurement process.

E-Reverse auctioning

E-reverse auctions enables the purchasing company to buy goods and services from the supplier that has the lowest price or combination of lowest price and other conditions as well via internet technology. The auction is most often traded in real-time and ends in a closing bid between the buyer and the supplier. Takes place in the negotiation phase of the procurement process.

E-Informing

E-informing is a part of e-Procurement that does not involve transactions or call offs but instead it handles gathering and disseminating of purchasing related information. E-informing is hard to link to one single phase in the procurement process. It can take place anywhere in the procurement process.

Knudsen (2003) presents a framework for assessing the alignment between corporate strategy, procurement strategy and purchasing tools. The framework is used for assessing the strategic origin of the e-Procurement tools presented above by Boer *et al. (2002)*. The results indicate that e-Procurement tools are fully viable for creating monopoly rents, moderately viable for creating ricardian rents and only somewhat viable for creating entrepreneurial rents. This indicates the importance of e-Procurement tools in the successful application of e-Procurement.

As previously described, the term e-Procurement embraces the use of internet technologies to manage parts or the totality of the procurement process. The combination of different technologies, origin unique e-Procurement systems requiring that managers take into account the particularities of the environment in which they operate but also the nature of their suppliers.

2.3. **E-Procurement Systems**

Different solutions have been adopted to migrate from a transactional and offline purchasing function to a more strategic view. According Koorn *et al.* (2001) there are three types of e-Procurement systems: buyer e-Procurement systems, seller e-Procurement systems and online intermediaries. Kim and Shunky (2004) and also consider e-Procurement systems as various internet B2B commerce systems, which are located at the supplier, third party or the buyer, with the following categorization:

- Supplier-centric e-Procurement systems;
- Neutral e-marketplaces;
- End-to-end electronic document/message exchange systems.
- Buyer-centric e-Procurement systems:

2.3.1. Supplier-centric e-Procurement systems

In the supplier-centric e-Procurement systems (Figure 5) sellers create their own Internet sites that allow any number of buyers to browse and purchase their products online and in real-time. The responsibility for creating and maintaining the electronic catalogs lies with the sellers. In many ways, this model is a method for selling rather than purchasing, except if these storefront or shopping mall portals provide significant opportunity for buyers to purchase goods online from all over the world (Neef, 2001).

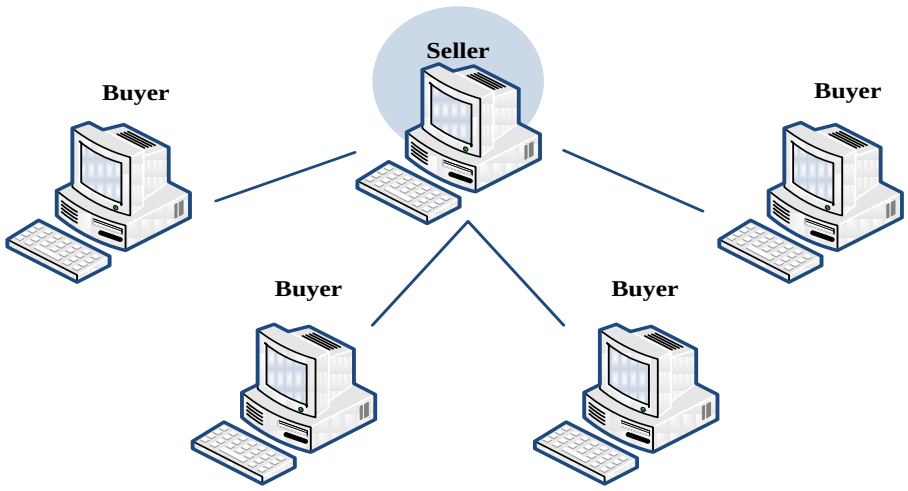

Figure 5 - Supplier centric e-Procurement systems

2.3.2. Neutral e-Marketplaces

Neutral electronic marketplaces allow collaboration and data sharing within or across industries. They are attractive to both the buy and sell-side organizations for different reasons. For the buyer they provide demand aggregation, enable quick and easy supplier comparisons, and allow activity reporting, strategic sourcing, and so on. On the sell side, they provide low-cost introduction to customers, better capacity management and efficient inventory management via demand aggregation. They also provide analytics that help suppliers to better position their product in the market (Rajkumar, 2001).

There are several criteria for classifying neutral e-marketplaces. Kaplan and Sawhnew (2000) offered a classification based on the type of goods and the way these goods are purchased. An e-marketplace can either provide indirect goods that support the business process or the direct goods used in production.

Neutral e-marketplaces may also be classified with base on their degree of openness. E-marketplaces with a high degree of openness are those accessible to any company. At the other end of the spectrum, e-marketplaces with a low degree of openness are accessible only upon invitation. Based on this distinction, Hoffman *et al.* (2002) recognized three main types of e-marketplaces: public e-marketplaces, consortia and private exchanges.

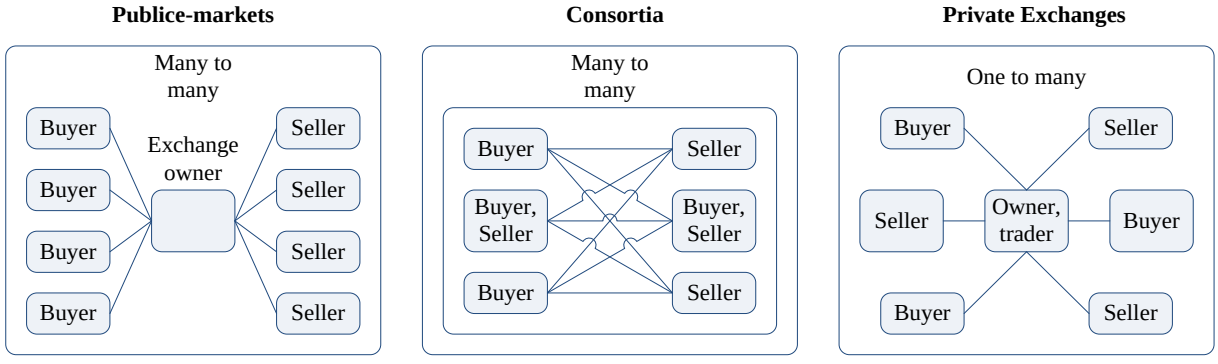

Figure 6 - Main types of neutral e-marketplaces. Adapted from Hoffman *et al.* (2002)

2.4. End to end electronic document/message exchange systems.

In the initial phase of e-commerce from the mid 1990s, leading companies established extranet connections with their suppliers and customers. While EDI automated paperwork, extranets went considerably further, providing a secure private electronic environment for

real-time communication on the upstream and downstream supply chain. Many companies actually run more than one extranet and use enterprise portals, which combine extranets so as to provide one integrated entry point for interaction between large companies and their partners, providing several services like buying, selling or informing (Rosson, 2000).

In order to overcome the proprietary nature of EDI and extranet, XML is rapidly becoming a common standard for the exchange of B2B messages or documents. There are several XML-based standard development efforts. Generic templates provide interoperability, enabling businesses to communicate efficiently over the Internet. Some examples are the XML/EDI, ebXML, RosettaNet, BizTalk, eCo, UDDI, OBI, OTA and cXML (Willaert, 2001). Companies have benefits in choosing one or more of these formats because:

- There's no need to reinvent what was already invented;
- These standards are extensively defined, and can be easily adapted to any particular situation. Otherwise, custom made formats, may not be enough in future situations;
- There is high probability that external systems and both parties, can process that message without additional developments.

However, too much industry XML formats for exchanging commerce messages have been developed and there is no agreement on cross-industry standards. But, unlike EDI, transforming XML messages from one format to another is easy, using XSLT technologies or a middleware platform, which usually brings graphical message mappings for developing XML transformation (Neef, 2001).

Those electronic document or message exchange systems are established for ordering direct and indirect goods under negotiated contractual arrangements. Those systems are also preferred to fax, e-mail, and traditional mail for sending purchase orders, invoices and payments as well as for request for quotation, proposal or information exchanges for direct bilateral negotiations or bidding with pre-established suppliers in a secure end-to-end environment.

2.4.1. Buyer-centric e-Procurement systems

In the Buyer-centric e-Procurement systems (shown in Figure 7) the buyer maintains in-house the catalogs and databases of multiple suppliers' goods and services, and is responsible for integrating all transactions into the company's purchasing and financial systems.

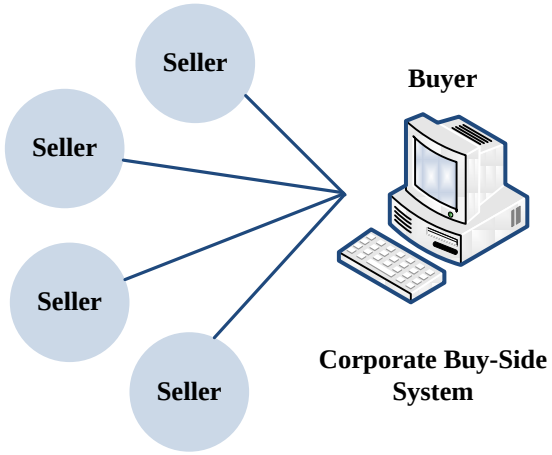

Figure 7 - Buyer centric e-Procurement systems. Adapted from Neef (2001)

The requisitioners or purchasers access multi-vendor catalogs in a buyer-specific format from a web browser, select the items, and initiate the requisition that is processed for approval through workflow. Approved requisitions are automatically turned into purchase orders flowing directly to the supplier. As these applications empower end-users to perform individual buying operations in accordance with corporate buying rules, they allow the purchasing department to reduce their administrative workloads and to focus on strategic activities (Kim, Shunk, 2004).

E-procurement systems include: Sell-side solutions or suppliers own web shops, marketplaces hosted on the internet where many buyers and suppliers can trade online and buy-side systems, designed to streamline the internal workflow associated with procurement. Regarding the different kinds of e-Procurement arquitectures it's important to remember that our analysis focuses on the e-Procurement solutions located on the buyer. Typically buyer-centric e-Procurement systems, owned by large companies with require the participation of numerous small and medium suppliers.

2.5. **E-Procurement Technology**

ICT play an important role in e-Procurement. They allow automating the ordering process with the suppliers systems, and within customers systems to ease the operation of the supply chain. Such an effort is expensive not only in terms of money invested, but also in terms of time to implement those technologies. Their implementation on core business processes involves risks. Adopting a losing technology may mean not only losing the resources invested, but also higher operating costs and, at some point in the future, a further transition to the appropriate technology (Davila *et al.*, 2003).

E-Procurement systems typically may be divided in two types of philosophies: Enterprise Portal and Enterprise applications. While various e-Marketplaces have been launched based on the enterprise portal philosophy, the implementation of e-Procurement systems within the enterprise applications consists in workflow systems that supports requisitions to payment cycles and the electronic catalogue that lists suppliers items and prices over the internet (Vaidya *et al.*, 2006).

Service-oriented architectures (SOA) are emerging as a new wave for building agile and interoperable e-Procurement systems. SOA is about designing and building IT-based business systems using heterogeneous network addressable software components over Internet. These interoperable standards-based components or services can be directly invoked by business users or executed as basic steps of business processes. They can be combined and reused quickly to meet business needs. They can be implemented as Web services or functions of Web applications and, therefore, be located anywhere in the organization or on the Web (Herzum, 2002).

With the growth of information systems, organizations are starting to make pressure on their trading partners to interchange data electronically. After SOA adoption, buyers and suppliers will be able to build new solutions faster than those that have to develop end-to-end or custom-built interfaces between systems. In fact, there are industry-specific defined formats, usually defined by international committees that help organizations to define their services using market-proved standards that can be easily adopted to any particular situation,

and with high chances that their partners can process those messages without additional developments.

Procurement processes should not be restricted to the company landscape. They must flow between multiple organizations and interested parties, like suppliers and payment gateways, and should interact with various systems and people.

2.6. **E-Procurement Adoption**

Companies are may have different supplier approaches to e-Procurement. Some larger suppliers have already invested in P2P systems which they would like the buying organizations to use. Others have not yet to invest or are probably still deciding on the 'when' and 'how' in order to maximise their business growth. The OGC (2005) declares that the variables affecting supplier engagement include business objectives, market share, knowledge of ecommerce, ability to invest, size, market sector and level of skills.

It is necessary to put together a supplier adoption team, train the suppliers, and get them synchronized with the organization's implementation (Rajkumar, 2001). Otherwise this may lead to a low adoption rate that can constrain users from leveraging the full associated capabilities from the solution. The lack of a critical mass of suppliers accessible through the organization's e-Procurement system might limit the network effects that underlie these technologies, further delaying the acceptance and adoption of the technology. Users of e-Procurement technologies reported that they can acquire goods over the Internet from only 15 per cent of their supply base, which supports the need to increase supplier adoption (Davila *et al.*, 2003).

3. Framework for the adoption of e-Procurement

In this chapter an attempt was made to develop a theoretical framework for the adoption of e-Procurement by suppliers. Some important models for the adoption and diffusion of technology in organizations are analysed. Based on these models, the main factors affecting the e-Procurement adoption are explained and supported by the literature. The pertinent hypotheses for the dissertation are also presented.

3.1. **Reference Models**

The IT adoption process has been investigated using some reference models, developed in the broad literature of technology diffusion. We present four basic models that represent the building blocks for identifying the variables affecting the choice to adopt IT.

The first of the four models is the Technology Organization Environment (TOE) model. This framework comes from the work of Tornatzky and Fleisher (1990) and it contains three main predictors of IT adoption: The technology context, organizational context and environmental context. This model is largely consistent with the general theory of technology diffusion developed by Rogers (1995) and it considers the firm as the reference point for the adoption process. The TOE model has been widely applied to explain the adoption processes of e-Procurement, For example LI (2008) to identify the major factors that impact the adoption of electronic procurement in Chinese manufacturing enterprises, and by Teo *et al. (2009)* to examine the various factors associated with the adoption of e-Procurement.

A second model which has been employed to explain IT adoption processes is the Technology Acceptance Model (TAM), developed by Davis (1989). This framework is mainly focused on the cognitive characteristics of the decision maker, and it has been frequently used to analyze automation processes in the early phases or IT diffusion. This model has been mainly employed to understand the process of adoption of the simplest forms of IT (Ordanini, 2006).

A third model developed to explain IT adoption among firms is similar to the previous one, being rooted in social psychology theories, but it pays attention to some exogenous conditions, and it is known as the Theory of Planned Behaviour (TPB). In this framework the intention to

adopt IT solutions depends on the perceptions of the decision maker. This model enlarges the set of individual and cognitive drivers potentially affecting the decision to adopt IT solutions, paying attention to the external factors which could influence the decision maker (Ordanini, 2006).

Recently Gunasekaran and Ngai (2008) made an attempt to develop a specific framework for the adoption of e-Procurement in an organization. This framework was based on a literature survey, some reported cases and empirical studies. They considered the following building blocks to e-Procurement adoption:

- Perceived benefits of e-Procurement;
- Perceived barriers of e-Procurement;
- Critical success factors of e-Procurement adoption.

While TAM and TPB models are useful for understanding why individuals accept particular technologies across a range of populations, these models are not suited for investigation of organizational-level acceptance of technologies since the decision to adopt e-Procurement is generated as a strategic firm-level initiative.

Thus, given the rapid evolution of e-Procurement the framework proposed by Gunasekaran and Ngai (2008) is an actual and specific framework to explain the intention to adopt e-Procurement. Furthermore Andrade and Alturas (2009) proposed the Gunasekaran and Ngai framework to study the factors affecting e-Procurement adoption between suppliers. However they didn´t considered the external environment, which plays an important role in this research. Typically the first step to supplier adoption on buyer centric e-Procurement systems is performed by the purchasing company. They invite an initial range of suppliers to use the system (Neef, 2001).

The Gunasekaran and Ngai framework was complemented with the environment dimension of the TOE model (Figure 8). More specifically the business partner influence was used to explain the environmental dimension of the TOE model as proposed by Teo *et al. (2009)*. Next we will examine more deeply the four factors presented in the figure below.

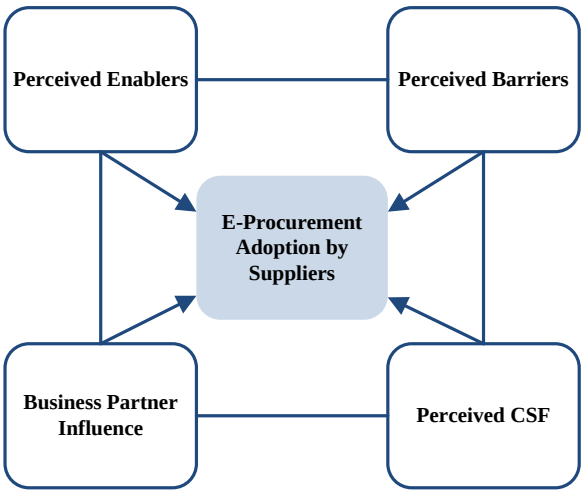

Figure 8 - Framework for e-Procurement adoption by suppliers

3.2. **Perceived Benefits**

On this research, we define benefits as the factors having positive impact on the intention to adopt e-Procurement. Gunasekaran and Ngai (2008) describe it as the perceived benefits of e-Procurement as seen by companies having tremendous implications whether one goes for the technology or not.

3.2.1. Sales Growth

For suppliers, the adoption of e-Procurement may be an opportunity to expand sales. According to Sharifi, Kehoe and Hopkins (2006) they will find e-Procurement attractive because they could easily and cost effectively reach new customers. A greater exposure to larger buying communities, with improved reach, range and efficiency, increases the potential for more transactions.

Also, by making the electronic catalogue accessible in a direct way to all employees and buyers, or using e-hubs and e-commerce communities, the seller can widely increase the number of sales orders (Berlak, Weber, 2004). After the implementation, e-Procurement systems can function as a new sales channel improving the chances of sales growth.

Suppliers also appreciate the chance to develop new business thought participation on electronic reverse auctions. According to Beall *et al.* (2003) even the most reluctant participants, rarely refuse the chance to participate. This is expected, since electronic reverse auctions (e-RAS) represent a new sales opportunity. For Moser (2002) the fact that supplier´s can change their bids during an online-auction also increases their changes to win the contract. This is because online auctions improve the visibility over the negotiation process. They allow seeing online the competitor price, and while they know how lower they can bid, the chances of winning the action are improved. This leads to the following hypothesis:

H1: *Suppliers with higher sales growth expectations are more likely to adopt EP.*

H2: *Suppliers with higher expectations to reach new markets are more likely to adopt EP.*

3.2.2. Operational efficiency

The integration between the buyer and the seller systems allows the exchange of information automatically. Therefore, it is possible for the buyer to make an order more quickly. This will also reduce the chance of occurring errors that are common when an order is dependent on paper (Berlak, Weber, 2004).

Linking to a customer directly and collaborating to ensure accurate and on-time delivery provides better service and lower overall procurement costs to the customer. This can result in much more collaborative buyer-seller relationships. As a preferred supplier, or if the buyer begins to provide forecasts of requirements to its vendors, the supplier can begin to predict and prepare for individual buyer requirements well ahead of time, reducing the uncertain on sales (Neef, 2001).

Other potential benefits of e-Procurement include lower marketing and sales costs (Beall *et al.*, 2003). The mere conversion of paper documents to electronic can free up employees for higher value tasks such as price negotiation and post bid analysis (Moser, 2002). This leads to the following hypothesis:

H3: *Suppliers with lower order processing costs expectations are more likely to adopt EP.*
H4: *Suppliers with higher operational efficiency expectations are more likely to adopt EP.*

3.2.3. Negotiable Transparency

E-Procurement tools have been seen as able to provide a better negotiable transparency compared to traditional means. The conclusions of a study conducted by Beall *et al* (2003) indicated that suppliers considered electronic reverse auctions a fairer process of doing business because they “level the playing field” through increased transparency and much more information.

Carayannis and Popescu (2005) analyzed and evaluated the e-Procurement projects carried out by European Commission. They concluded that the transparency of EU public procurement market was improved by a systematic use of electronic tendering. The improvements on the transparency allowed the involved parties to know how the system is

intended to work, and all potential suppliers have the same information about procurement opportunities, award criteria, and decision process.

Croom and Jones (2007) reinforced the idea that e-Procurement has the potential to improve transparency in supply management, in purchasing companies through greater consolidation of purchases. They also found the majority of respondents had reduced their supply base and had a closer relationship with those remaining.

Beall *et al.* (2003) also showed that most of the services associated with goods purchased like design repair, emergency delivers and so forth were now included in the specifications of e-RAS, allowing suppliers to fairly price and bid in the complete package of goods and related services, and allowing the buying firms better know what they were paying for. This leads to the following hypothesis:

H5: *Suppliers with higher negotiable transparency expectations are more likely to adopt EP.*

3.2.4. Longer buyer-supplier relationships

In considering how e-Procurement will impact buyer-seller relationships Ellram and Zsidisin (2002) argue that the adoption of e-Procurement contributes to closer buyer–supplier relationships. Therefore, while e-Procurement technology may not deliver improved levels of trust, it has been found that e-Procurement transactions are more likely to be established first between partners in high trust relationships. In addressing this issue, both Croom (2001) and Kumar and Peng (2006) support the view that increased use of e-Procurement and inter-organizational systems enhance opportunities and tend to create more effective customer–supplier relationships over time.

According to a European Union report "companies maintaining long-term relationships with suppliers and customers are more likely to use technologies supporting inter-company collaboration, in comparison with their peer-group in the same sector" (EC, 2008). However, the number of companies using collaborative tools in Europe is relatively low when compared with non users.

The adoption of e-Procurement solutions by supplier´s can improve the relationship with the buyer. But this may depend on the type of tools used by the purchaser. For certain goods the use of tools like electronic reverse auctions may have the opposite effect, by destroying the

trust and mutual interdependence between the buying company and a key strategic supplier (Beall *et al.*, 2003).

A good buyer supplier relationship leads to a more robust e-procurement initiative. In Scotland, the government e-Procurement program promoted the collaborative behaviour between support staff, buyers and suppliers. Building multi-national and multi-disciplinary networks can also facilitate and foster the exchange of knowledge and develop practical standards (AGIMO, 2005). This leads to the following hypothesis:

H6: *Suppliers with higher expectations of longer buyer-supplier relationships are more likely to adopt EP.*

3.2.5. Gain of competitive advantage

Increased profitability of a supplier will result in an advantage being gained over its competitors. E-Procurement allows procurement activities to be conducted 24 hours a day, 7 days a week, and 365 days a year. It allows going beyond the geographical barriers giving a distinct advantage over other competitors. These improvements in competitiveness are further highlighted by Wong and Sloan (2004). Gains of competitive advantage, reducing order fulfilment costs, and increased profitability are seen as some the most important perceived benefits of e-Procurement for suppliers. This leads to the following hypothesis:

H7: *Suppliers with higher gain of competitive advantage expectations are more likely to adopt EP.*

3.3. **Perceived Barrier´s**

Perceived barriers are considered as factors not contributing to the intention to adopt e-Procurement. Identifying the barriers themselves is part of the major managerial function in developing the right plan for the adoption of e-Procurement among suppliers (Gunasekaran, Ngai, 2008).

3.3.1. Price pressures

Buyers are concerned that e-Procurement technologies will push prices down to the point where suppliers cannot invest in new technology, product development, upgrade facilities, or add additional productive capacity. Additional price pressures can even push suppliers down if they have a poor understanding of their cost structure (Davila *et al.*, 2003). Suppliers need to know how low they can bid, and still observe an acceptable return. They also must consider the buyer´s location to calculate shipping costs, and their financial status (Moser, 2002).

White and Daniel (2004) concluded that strategic considerations are among the key inhibitors of e-Procurement adoption, as some of the methods deployed in e-Procurement tools such as reverse auctions are perceived to potentially damage long-term supplier relationships, by pushing prices down. This leads to the following hypothesis:

H8: *Suppliers expecting price reduction pressures are less likely to adopt EP.*

3.3.2. Implementation and maintenance costs

According to Tanner *et al.* (2008) a main objection of e-Procurement in organizations is the high installation costs of new solutions and it must be taken seriously. The cause, is the high heterogeneity of the supplier and buyer IT environments, organizational structures and business processes. Hawking *et al.* (2004) also identified implementation costs as one of the barriers to e-Procurement adoption in Australia. According to Koorn *et al. i*nitial implementation costs may be substantially higher than with those of an EDI system, unless an online intermediary with low enrolment fees is chosen (Koorn *et al.*, 2001).

The potential administrative and implementation costs which will be incurred as companies utilize e-Procurement should also been taken into account. As with all technological adoption,

the relatively high cost of maintaining and implementing an e-Procurement system is a major factor when deciding the adoption of e-Procurement. (Teo, Ranganathan, 2004). This leads to the following hypothesis:

H9: *Suppliers expecting high implementation costs are less likely to adopt EP.*

H10: *Suppliers expecting high maintenance costs are less likely to adopt EP.*

3.3.3. Interoperability

For e-Procurement technologies to succeed, suppliers should provide e-catalogues in the formats required by customers, reflecting custom pricing or special contractual agreements and send updates on a regular basis (Davila *et al.*, 2003). However, no common standard has yet emerged for web catalogs. Small suppliers often end up having to provide and regularly update catalogue data in a number of different formats to meet each buyer's specifications. Whereas this approach is satisfactory for small numbers of buyers or suppliers, it is not scalable to many buyers or suppliers. With a large company, there may be hundreds or thousands of suppliers. Each supplier may have thousands of catalogue items (Kim, Shunk, 2004).

Hawking *et al. (2004)* support that that barriers to e-Procurement also include lack of interoperability and standards with traditional communication systems. Developing standards and systems for facilitating effective interoperability will facilitate the adoption of e-Procurement. However, there is still considerable uncertainty and a lack of clear direction regarding standards for data interchange. Until a clear industry standard is identified and supported, this challenge will continue for all participants (AGIMO, 2005). This leads to the following hypothesis:

H11: *Suppliers expecting lack of interoperability between systems are less likely to adopt EP.*

3.3.4. Lack of legal support

In the European Union, Julia-Barcelo (1999) reviewed EU regulation of electronic contracts. Difficulties highlighted by Julia-Barcelo were: lack of specific legal regulation, different national approaches, validity of electronic documents, enforceability or evidentiary problems.

Wong and Sloan (2004) also questioned the legal validity of electronic information exchange and considered it as a barrier to e-Procurement. It showed that only 26% of the respondents agreed that electronic documents were admissible as written proof during transactions.

The uncertainty surrounding the legal issues of e-Procurement was the top barrier in e-Procurement within Northern Ireland's construction industry. The parallel use of paper copies and electronic documents leaded to difficulties on achieving a fully internet solution using e-Procurement tools (Eadie *et al.*, 2007). This leads to the following hypothesis:

H12: *Suppliers expecting lack of legal support are less likely to adopt EP.*

3.3.5. Lack of Information security

According to Neef (2001) some of the reasons for companies not moving into e-Procurement are related to concerns over security and trust. For most companies, some of their most important assets are their buying plans, their pricing models, and their new product designs. Many executives are concerned that once information goes outside the company firewall, these key assets may be exposed to competitors. The lack of security in transactions is an important barrier to e-Procurement (Eadie *et al.*, 2007).

A PriceWaterhouseCoopers survey with senior business leaders in the U.K., Germany, France, and the Netherlands found that security issues were cited as the most important factor holding back e-procurement progress. This was particularly true in the case of direct procurement (ComputerWeekly, 2000).

Concerns about security represent barrier to the systems integration between buyers and suppliers. According to Davila et al. (2003) providing other companies with intranet access to company internal data, or integrating applications with company information systems is still unusual. This observation reinforces the prudence that companies demonstrate on integrating e-Procurement technologies into existing systems and relationships leading to the following hypothesis:

Suppliers expecting lack of information security are less likely to adopt EP.

3.3.6. Lack skill and knowledge

Archer *et al.* (2008) conducted a paper with the objective to identify and measure the perceived importance of barriers in the SME community to the adoption of e-Procurement. Few differences were found between adopters and non-adopters. They noticed a lack for education for all SME management on the benefits and drawbacks to using e-business solutions. Some of the informal comments they received indicated that there is a lack of knowledge of e-business and its benefits. The respondents disagreed significantly with the statement "we know what kind of e-business solution is right for us". This shows the need for education about e-Procurement applications. This leads to the following hypothesis:

H13: *Suppliers with lack of skill and knowledge in e-Procurement are less likely to adopt EP.*

3.4. **Critical success factors**

The factors critical to the use of e-Procurement have been identified based on previous experience and literature available. The critical success factors could be defined as the best practices for the successful use of the e-Procurement system. As mentioned before, we considered that the term "adoption" is more than the decision to use. It encompasses also the successful utilization of the system.

3.4.1. Initial training

According to Robert Eadie (2007) for the successful use of e-Procurement in companies, training is compulsory and should be given, mitigating the effects of the lack of knowledge on this area. Panayiotou (2004) also considered training as a critical success factor for e-procurement implementation. The adequate training of the employees will enable them to take advantage of the new system. It should be assured that employees are able to see the benefits derived from e-Procurement technology (Kothari *et al.*, 2005).

When establishing the electronic reverse auctions implementations framework for the UK public sector the OGC (2005) considered supplier training as part of that framework. Free ongoing training sessions were offered to suppliers. This was responsibility of the change manager, one of the elements recommended by OGC as being critical to help to achieve successful organisational change when implementing e-Procurement. This leads to the following hypothesis:

H14: *Initial training is positively related to EP adoption.*

3.4.2. Integration

A study conducted in the Swiss market revealed that the lack of supplier involvement and infrastructure to optimize B2B processes was an obstacle to integrate B2B scenarios. The integration solutions are not always offered appropriate to suppliers and the majority of companies agree that the position of the suppliers is insufficiently considered (Tanner *et al.*, 2008).

Large companies are increasingly streamlining and integrating their procurement processes, often with advanced e-Procurement schemes based on standardised data exchange. As a result, smaller firms that cannot comply with the technical requirements of their customers, run the risk of elimination from the supply chain (EC, 2008). Large companies must provide several means for suppliers to access their e-Procurement applications. Otherwise smaller suppliers may not be able to meet the requirements. This leads to the following hypothesis:

H15: *Integration with current systems is positively related to EP adoption.*

3.4.3. Top management support

If an organization wants to implement e-Procurement successfully top management has to support the e-Procurement implementation into their business. When the top executive level advocates electronic commerce, an organization can elevate the importance of e-Procurement for the organization (Pani, Agrahari, 2007). This is even more relevant in SME companies. Due to its reduced hierarchy, the decision to go or not for e-Procurement should be made by top management.

Gunasekaran and Ngai (2008) considered top management support as a critical success factor for e-Procurement adoption between Hong Kong industries. Top management involvement and support was viewed by 70% of the respondents as one of the most important of all the factors affecting e-Procurement adoption (Teo, Ranganathan, 2004). Therefore top management support is positively associated with the adoption of e-Procurement. This leads to the following hypothesis:

H16: *Top management support is positively related to EP adoption.*

3.4.4. Business process reengineering

The complex relationship between the members of the supply chain leads to different level on accessing and managing information. Gilbert (2000) said that companies were jumping onto e-Procurement without fully understand the inter-organizational collaboration and network effects underlying these technology models, the investment required to move the right information from suppliers to employees, and the complexities of integrating these technologies with existing Enterprise Resource Planning systems. So companies should not

model their current paper-based processes into e-Procurement. An implementation of an e-Procurement platform, as any new system, represents an opportunity to reengineering business processes (TIBCO, 2008). The simple introduction of technology into existing processes, may lead to duplication of work, without providing the expected benefits. This leads to the following hypothesis:

H17: *Business process reengineering is positively related to EP adoption.*

3.4.5. Adoption process support

Finally, the supplier must be supported throughout the adoption process. This was evident in Scotland and Italy where a supplier engagement process was developed, documented and facilitated to ensure that suppliers business and technical requirements were met. The result was a high incident in supplier activity. In contrast, the buyer centric approach adopted in Western Australia meant that suppliers did not understand the benefits of joining e-Procurement and therefore were reluctant to join (AGIMO, 2005).

According to Corini (2000) supplier participation is critical to the successful implementation of any e-procurement solution. He says that without supplier participation the software is useless. Moreover Neef (2001) recommends that key suppliers should be seen as an integral part of the e-Procurement project, provided with clear and attainable milestones and directly included in the change management plan. This leads to the following hypothesis:

H18: *Adoption process support is positively related to EP adoption.*

3.5. **Business Partner Influence**

Previous research on EDI has found that business partner influence plays an important role in technological adoption. For example, Chwelos *et al.* (2001) concluded that external pressure and readiness is considerably more important than perceived benefits in EDI adoption. Hart and Saunders (1997) concluded that firms with greater power can influence their trading partners to adopt EDI. However, when firms use coercive power to force trading partners to adopt EDI, less powerful partners may be left more vulnerable. And, over time this perceived vulnerability may become a constraint in inter-organizational relationships that prevents improvements in coordination through expanded use of EDI.

Similar results were found for e-Procurement. Grandon and Pearson (2004) identified external pressure as influencing electronic commerce adoption. Further Teo *et al.* (2009) examined various factors associated with the adoption of e-Procurement. They found that business partner influence was positively associated with the adoption of e-Procurement. This leads to the following hypothesis:

H19: *Business Partner Influence is positively related to EP adoption.*

4. Empirical results and analysis

In this chapter, the results of the survey (in attachment on page 66) and empirical analysis are discussed with the objective of developing a framework for the adoption of e-Procurement.

4.1. **Survey and Procedures**

Our target respondents were assured of confidentiality and an executive summary was promised as an incentive to encourage their participation. Specifically, we captured the following information in the survey:

- Demographic profile of the companies (in terms of number of employees, average annual revenue and type of industry);
- Profile of the respondents (job position);
- Actual status of e-Procurement in the company (relevant e-Procurement tools for the company, business partner influence and current status of e-Procurement);
- Factors associated with e-Procurement adoption (Benefits, Barriers and CSF´s);
- Intention to adopt future initiatives of e-Procurement.

A database of 50.000 Portuguese companies was acquired. Only 2.287 companies from the 50.000 visited the survey page suggesting about 4,5% of successfully e-mails sent out. A number of 735 companies completed the survey but about 14 responses were rejected due to errors or invalid data, resulting in 721 valid answers and a response rate of 32%.

An open question at the end was also included in the survey to obtain comments from the respondents. Subsequently, we incorporated some of their comments in the conclusions sections later in this research (also in attachment on page 75).

4.2. **Companies profile**

Specific demographic information from the 721 participating companies is shown in Table 1. The responses include a broad range of companies based on different types of markets[2] served and products sold. The number of employees currently working in the company is presented in Table 2 and the total annual revenue presented in Table 3.

Industry type	**Frequency**	**Percent (%)**
Financial Services	10	1,4
Retail	188	26,1
Marketing & Advertising	27	3,7
Engineering & Construction	71	9,8
Logistics	13	1,8
Services	247	34,3
Manufacturing	134	18,6
Tourism	31	4,3
Total	**721**	**100,0**

Table 1 - Profile of the respondent organizations

Number of Employees	**Frequency**	**Percent (%)**
Below 10	316	43,8
Between 10 and 49	270	37,4
Between 50 and 249	97	13,5
Higher than 249	38	5,3
Total	**721**	**100,0**

Table 2 - Number of employees

[2] Classification adapted from Gunasekaran and Ngai (2008)

Annual Sales	Frequency	Percent (%)
Below 499.999€	247	34,3
Between 500.000€ and 1.999.999€	226	31,3
Between 2.000.000€ and 9.999.999€	155	21,5
Between 10.000.000€ and 42.999.999€	58	8,0
Higher than 43.000.000€	35	4,9
Total	**721**	**100,0**

Table 3 - Annual sales

About 78% of the respondent organizations belong to the Retail (26,1%), Services (34,3%) or Manufacturing (18,6%) industry. The majority of the companies belong to the Services sector while the less representative industries are the Financial Services (1,4%). As such, the sample appears to be representative of a wide range of different companies.

According to the EU classification (2009) we can classify SME's as Micro, Small or Medium companies (Table 4).

Enterprise category	Employees	Annual Sales
Micro	< 10	≤ € 2 million
Small	< 50	≤ € 10 million
Medium-sized	< 250	≤ € 43 million

Table 4 - EU Classification Criteria for SME

Following the EU classification about 93% of the companies of this sample can be classified as SME´s while 7% are considered large companies. The average number of employees is 67 ranging from 1 to 3000. However the majority of companies has less than 10 employees (43,8%). This suggests that the majority of the sample is constituted by small companies (Table 5).

EU Classification	Frequency	Percent (%)
Micro	294	41
Small	272	38
Medium	101	14
Large	54	7
Total	**721**	**100**

Table 5 - Companies classification according to the EU

4.3. **Respondents profile**

As Table 6 shows, about 87 % (55 + 32) of the respondents were people in relatively high positions at their companies. This is expected since the majority of the sample are small firms, which increases the chances of response by superiors. The high hierarchical levels of respondents provides some assurance on the validity of responses, since the respondents in higher management levels could generally be expected to be more familiar about their company's e-commerce activities than those from lower levels.

Job position	Frequency	Percent (%)
President/Director	396	54,9
Department Manager	233	32,3
Others	92	12,8
Total	**721**	**100,0**

Table 6 - Job position

4.4. **Actual status of e-Procurement**

The responses show that 34% of the firms are currently using e-Procurement while 14,8% were in the process of implementing one or more e-Procurement applications (Table 7). Twenty five percent of the companies (24,7%) indicated no consideration in e-Procurement applications, while 26,5% reported some consideration but either took no action or had not yet made a decision.

Status	**Frequency**	**Percent (%)**
No consideration of any applications	178	24,7
Some consideration but no decision yet	191	26,5
Decision to have e-Procurement applications made, but implementation is in progress	107	14,8
We currently use one or more e-Procurement applications	245	34,0
Total	**721**	**100,0**

Table 7- Status of e-Procurement

Companies were asked about what e-Procurement activities were or not important to their business activities from a predefined list. The more relevant e-Procurement activities where the replies to proposals (78%) while the less relevant were the order delivery confirmations (53%). The majority of companies consider all of the activities relevant to their business while more than 50% consider at least 4 e-Procurement activities relevant for their business (in attachment page 78).

Relevant e-Procurement activities	**Yes (%)**	**No (%)**	**Total (%)**
Electronic catalogue offer	73	27	100
Reply to Request for Proposals (RFP),	78	22	100
Receiving Electronic orders	62	38	100
Order Delivery Confirmation	53	47	100
Electronic Invoicing	54	46	100
Electronic Payments	72	28	100

Table 8 - Relevant e-Procurement activities

4.5. **Intention to adopt future initiatives**

Companies were asked to imagine that their company was requested by a client to use an electronic procurement tool, and to classify the probability of their adoption. Table 9 shows that that 19 % of the firms are less probable to adopt a future initiative of e-procurement when invited by business partner. About 44,5 % consider as probable their intention to adopt, 21,4 consider very probable and 12,6 % are certain of their decision. This shows that the majority of the sample was open to future initiatives of e-Procurement.

Intention	**Frequency**	**Percent (%)**
Impossible	18	2,5
Less probable	137	19,0
Probable	321	44,5
Very probable	154	21,4
Certain	91	12,6
Total	**721**	**100,0**

Table 9 - Intention to adopt future initiatives of e-procurement

4.6. **Perceived benefits of e-Procurement**

The supplier perception about the benefits of e-Procurement plays a major role in e-Procurement, starting with the decision to go for e-Procurement. In Table 10 is shown that companies strongly agree that the adoption of e-Procurement will significantly contribute to: achieve a better operational efficiency (28%), reduce order processing costs (24%) and provide gains in competitive advantage (19%). However, respondent companies are in average less optimistic about benefits such as improved relationship with clients, negotiable transparency and sales growth. The respondents were divided (34% and 32% each) about better negotiable transparency and sales growth were or not a resulting benefit from e-Procurement adoption.

Benefits	$\bar{x}$	**s**	**SD (%)**	**D (%)**	**N (%)**	**A (%)**	**SA (%)**
Sales growth	3,56	0,886	3	8	32	46	11
Reach new markets	3,71	0,850	2	7	26	52	15
Reductions in order processing costs	3,89	0,882	2	5	19	50	24
Better operational efficiency	4,04	0,815	1	4	12	56	28
Better negotiable transparency	3,55	0,925	3	9	34	41	14
Improved relationship with clients	3,56	0,932	3	11	28	46	13
Gain of competitive advantage	3,84	0,840	2	4	22	53	19

Table 10 - Mean Rating of perceived benefits to e-Procurement implementation.

Legend: $\bar{x}$ - Mean; s - Standard Deviation; SD - Strongly Disagree; D - Disagree; N - Neither Agree nor Disagree; A - Agree; SA - Strongly Agree.

The results of the spearman's rank correlation test are shown in Table 11. Spearman's rank correlation coefficient is used as a measure of linear relationship between two sets of ranked data (Hill, Hill, 2008). It measures how tightly the ranked data is around a straight line. Spearman's rank correlation coefficient, like all other correlation coefficients, will take a value between -1 and +1. A positive correlation is one in which the ranks of both variables increase together. A negative correlation is one in which the ranks of one variable increase as the ranks of the other variable decrease (Altman, 1991). The data analysis evaluates the direction and the significance of the differences between the linear relationships of each variable for the EPS

adoption. Once the sign of the difference is consistent with the hypothesis proposed and the value of the difference significant, that is, its p-value below 0.05, we consider that there is a statistically significant relationship between the hypothesized variable and the adoption of e-Procurement (Reis, Aguiar, 2006).

There is a positive and statistically significant relationship between each of the independent benefits and the likelihood of adopting EPS. So the companies expecting more operational efficiency (H4), more gains of competitive advantage (H7), sales growth (H1), more negotiable transparency (H5), improved relationship with clients (H6), reach new markets (H2) and reductions in order processing costs (H3) also have a higher intention to adopt e-Procurement systems. This supports the hypothesis described on chapter 3.2.

Variables hypothesized as EPS adoption related	**Spearman's rank correlation**	
	Correlation Coefficient (ρ)	**p-value**
Benefits		
H1-Sales growth	0,21925	< 0,0001
H2-Reach new markets	0,18708	< 0,0001
H3-Reductions in order processing costs	0,18708	< 0,0001
H4-Better operational efficiency	0,33817	< 0,0001
H5-Better negotiable transparency	0,21505	< 0,0001
H6-Improved relationship with clients	0,19845	< 0,0001
H7-Gain of competitive advantage	0,30893	< 0,0001

Table 11 - Spearman´s rank correlation test for perceived benefits

4.7. **Perceived barriers to e-Procurement**

The concerns of companies regarding the adoption of e-Procurement have a tremendous influence on its success. The companies were asked what factors could prevent them from adopt e-Procurement (see the results on Table 12). Some companies strongly agree with the lack of information security (12, 8%). However, companies agree that the integration costs and maintenance (51,0%) of a new system is in average the main impediment against the adoption of e-Procurement, followed by the lack of legal support (49,5%) and lack of interoperability (45,8%).

The respondents were divided (33, 6% and 39% each) about price reduction pressures and implementation costs was or not a barrier for the adoption of e-Procurement. However the majority of confident respondents disagree or strongly disagree that price reduction pressures and too costly to implement were causes for not implementing e-Procurement.

Barriers	$\bar{x}$	**s**	**SD (%)**	**D (%)**	**N (%)**	**A (%)**	**SA (%)**
Price reduction pressures	2,93	0,936	5,4	27,7	39,0	24,3	3,6
Implementation costs	2,93	0,961	5,1	30,7	33,6	27,0	3,6
Integration costs and maintenance	3,52	0,893	1,7	13,3	25,0	51,0	9,0
Lack of interoperability between systems	3,42	0,923	1,5	17,5	26,9	45,8	8,3
Lack of legal support	3,40	0,929	1,8	19,1	23,0	49,5	6,5
Lack of information security	3,40	1,057	3,3	21,1	21,1	41,7	12,8
Lack of skill and knowledge	3,19	1,041	4,4	25,1	25,1	37,4	7,9

Table 12 - Mean Rating of perceived barriers to e-Procurement implementation

Legend: $\bar{x}$ - Mean; s - Standard Deviation; SD - Strongly Disagree; D - Disagree; N - Neither Agree nor Disagree; A - Agree; SA - Strongly Agree.

The differences of the independent variables average values were not statistically significant at a 95% confidence level for the hypothesis H8, H10, H11, H12 and H14 (Table 13). So in what refers to the isolated impact of these barriers on the likelihood of EP adoption, this research is inconclusive. This means that although the costs of integration and maintenance (H10), lack of legal support and lack of interoperability (H11) were in average

the more important barriers to e-Procurement only the cost of implementation (H9) and the information security concerns (H13) are negatively and significantly related to the intention to adopt e-Procurement considering a 95% confidence interval.

Variables hypothesized as EPS adoption related	**Spearman's rank correlation**	
	Correlation Coefficient (ρ)	**P-value**
Barriers		
H8-Price reduction pressures	0,06826	0,0660
H9-Implementation costs	-0,09381	0,0114
H10-Integration costs and maintenance	-0,04618	0,2140
H11-Lack of interoperability between systems	-0,00797	0,8303
H12-Lack of legal support	-0,05840	0,1159
H13-Lack of information security	-0,07303	0,0492
H14-Lack of skill and knowledge	-0,06111	0,0999

Table 13 - Spearman´s rank correlation test for perceived barriers

4.8. **Perceived CSF of e-Procurement**

Many suppliers pretend to have some form of e-Procurement applications in their organizations. The respondents were asked what they saw as being critical success factors, for their successful adoption and use of e-Procurement (see Table 14). The Integration with current systems and initial training has been viewed as critical to the successful adoption of e-Procurement by the respondents. The top management support and business process reengineering have also been considered as important by the majority of the respondents. However in comparison to the other factors they were considered the less critical.

CSF	$\bar{x}$	s	UN (%)	LI (%)	I (%)	VI (%)	CI (%)
Initial Training	4,01	,036	1,0	3,1	31,1	24,3	40,6
Integration with current systems	4,07	,035	0,7	3,2	27,3	25,8	43,0
Top management support	3,91	,036	1,5	4,6	29,0	30,8	34,1
Business process reengineering	3,59	,036	2,4	8,3	36,3	34,0	19,0
Adoption Process Support	3,96	,035	1,4	3,2	28,4	32,0	35,0

Table 14 - Mean Rating of CSF´s to e-Procurement adoption

Legend: $\bar{x}$- Mean; s - Standard Deviation; UN – Unimportant; LI - Less Important; I - Important; VI - Very Important; CI – Critical.

Variables hypothesized as EPS adoption related	Spearman's rank correlation	
	Correlation Coefficient (ρ)	p-value
CSF		
H15-Initial Training	0,11058	0,0028
H16-Integration with current systems	0,18370	< 0,0001
H17-Top management support	0,23296	< 0,0001
H18-Business process reengineering	0,17745	< 0,0001
H19-Adoption Process	0,22998	< 0,0001

Table 15 - Spearman´s rank correlation test for CSF´s

All the critical success factors presented in this framework are positively and significantly related to e- procurement adoption. Top management support (H17), adoption process support (H19), integration with supplier current systems (H16), business process reengineering of the

procurement process (H18) and initial supplier training (H15) are significantly and positively related to intention to adopt e-Procurement. This supports the hypothesis presented on chapter 0.

4.9. **Business partner influence**

The influence of business partners plays a crucial role in the early stages of the accession of a supplier to e-Procurement. About 75% of the respondents admitted to have some kind of influence from business partners to use e-Procurement tools.

Business partner influence	**Frequency**	**Percent (%)**
No influence	182	25,2
Some business partners have recommended us to use e-Procurement	315	43,7
Some business partners have requested us to use e-Procurement	172	23,9
Majority of business partners have requested us to use e-Procurement	52	7,2
Total	721	100,0

Table 16 - Business partner influence

In order to test the correlation between business partner influence and e-Procurement adoption we used the Spearman´s rank correlation test since both variables use ordinal scales.

Variables hypothesized as EPS adoption related	**Spearman's rank correlation**	
	Correlation Coefficient (ρ)	**p-value**
Business partner influence	0,334	< 0,001

Table 17 - Business partner influence spearman´s rank correlation test for EP adoption

From Table 17 it's possible to conclude that business partner influence is positively and significantly related to e-Procurement adoption (H20). This supports the hypothesis presented on 3.5.

Finally in Table 18 a summary of the initial hypothesis and the quantitative results are presented. As we can see, some of the barriers proposed were not verified at a 95% confidence interval.

Nº	Hypothesis	Supported
Benefits		
H1	Suppliers with higher sales growth expectations are more likely to adopt EP.	Yes
H2	Suppliers with higher expectations to reach new markets are more likely to adopt EP.	Yes
H3	Suppliers with lower order processing costs expectations are more likely to adopt EP.	Yes
H4	Suppliers with higher operational efficiency expectations are more likely to adopt EP.	Yes
H5	Suppliers with higher negotiable transparency expectations are more likely to adopt EP.	Yes
H6	Suppliers with higher expectations of longer buyer-supplier relationships are more likely to adopt EP.	Yes
H7	Suppliers with higher gain of competitive advantage expectations are more likely to adopt EP.	Yes
Barriers		
H8	Suppliers expecting price reduction pressures are less likely to adopt EP.	No
H9	Suppliers expecting high implementation costs are less likely to adopt EP.	Yes
H10	Suppliers expecting high maintenance costs are less likely to adopt EP.	No
H11	Suppliers expecting lack of interoperability between systems are less likely to adopt EP.	No
H12	Suppliers expecting lack of legal support are less likely to adopt EP.	No
H13	Suppliers expecting lack of information security are less likely to adopt EP.	Yes
H14	Suppliers with lack of skill and knowledge in e-Procurement are less likely to adopt EP.	Yes
CSF		
H15	Initial training is positively related to EP adoption.	Yes
H16	Integration with current systems is positively related to EP adoption.	Yes
H17	Top management support is positively related to EP adoption.	Yes
H18	Business process reengineering is positively related to EP adoption.	Yes
H19	Adoption process support is positively related to EP adoption.	Yes
Environment		
H20	Business Partner Influence is positively related to EP adoption.	Yes

Table 18 - Resume of proposed hypothesis

4.10. **Factor Analysis**

Factor analysis is a statistical approach that can be used to analyze the relations among a large number of variables and to explain these variables in terms of their common underlying dimensions (Hair, 2006). Factor Analysis was evaluated using principal component analysis with varimax rotation. Items were retained based on the following criteria: items with loading of 0.50 or more were retained; items with loading of less than 0.50 were removed. The results of the factor analysis and reliability assessment using cronbach's alpha are presented in Table 19.

Factor Analysis was applied to the Benefits, Barriers and CSF dimensions. The cronbach's alpha values for all the theoretical constructs were above 0.70 required for adequate reliability with the exception of perceived Factor 5 (alpha = 0,482) which was excluded from this analysis.

Factors	1	2	3	4	5
Perceived Direct Benefits (Alpha = 0,836)					
8.1-Market growth	0,086	0,238	-0,024	**0,856**	0,086
8.2-Reach new markets	0,107	0,206	0,054	**0,854**	0,066
Perc. Indirect Benefits (Alpha = 0,816)					
8.3-Reductions in order processing costs	0,147	**0,771**	0,014	0,063	0,101
8.4-Better operational efficiency	0,172	**0,830**	0,052	0,075	-0,047
8.5-Better negotial transparency	0,146	**0,732**	-0,014	0,168	0,055
8.6-Improved relationship with clients	0,173	**0,606**	0,003	0,330	-0,107
8.7-Gain of competitive advantage	0,217	**0,553**	0,049	0,514	-0,069
Perceived Barriers (Alpha = 0,482)					
9.1-Price reduction pressures	0,040	0,046	0,032	0,161	**0,794**
9.2-Too costly to implement	-0,024	-0,079	0,341	-0,055	**0,681**
Perceived Barriers (Alpha = 0,768)					
9.3-Integration costs and maintenance	0,118	0,029	**0,544**	-0,018	0,411
9.4-Lack of interoperability between systems	0,063	0,115	**0,667**	-0,095	0,351
9.5-Lack of legal support	0,039	0,070	**0,780**	-0,103	0,161
9.6-Lack of information security	0,042	-0,058	**0,764**	0,055	-0,066
9.7-Lack of skill and knowledge	0,077	-0,025	**0,711**	0,175	-0,008
Perceived CSF (Alpha = 0,875)					
10.1-Initial Training	**0,809**	0,042	0,152	0,080	-0,048
10.2-Integration with current systems	**0,824**	0,123	0,122	-0,013	-0,008
10.3-Top management support	**0,790**	0,220	-0,006	0,051	-0,007
10.4-Business process reengineering	**0,730**	0,208	0,024	0,184	0,115
10.5-Adoption Process	**0,826**	0,175	0,020	0,081	0,055

Table 19 - Factorial analysis

Gunasekaran and Ngai (2008) divided benefits in two types: perceived benefits and organizational performance. Also the studies conducted by Teo and Ranganathan (2004) and Chwelos *et al.* (2001) proposed this division in two types of benefits: direct benefits and indirect benefits. The performed factorial analysis also showed evidence of two types of benefits in this study. Following the classification proposed by other authors, we classified it in perceived direct benefits and perceived indirect benefits.

Further the correlation test of the factors and the intention to adopt e-Procurement was performed using spearman's rank correlation test. There is a statistically significant

relationship between each of the factors and the likelihood of adopting e-Procurement. The perceived indirect benefits and business partner influence are the most correlated factors.

Variables hypothesized as EPS adoption related	**Spearman's rank correlation**	
	Correlation Coefficient (ρ)	**p-value**
Factors		
Perceived Direct Benefits	0,163	< 0,0001
Perceived Indirect Benefits	0,335	< 0,0001
Perceived Barriers	-0,108	0,0036
Perceived CSF	0,119	0,0013
Business partner influence	0,334	< 0,001

Table 20 - Spearman´s rank correlation test for factors

5. Conclusions

The overall aim of this research was to provide an understanding of the factors affecting e-Procurement adoption by suppliers in buyer centric e-Procurement systems. To achieve this, it was necessary to understand e-procurement, their role in supply chains and the key factors affecting supplier adoption. The next section will revisit the research objectives, summarize the findings and offer conclusions based on these findings. Proposals for future research will be discussed, in terms of how to progress this study.

5.1. **Research Objectives: Summary of Findings and Conclusions**

Part of company's revenue is applied to the purchase of goods and services to incorporate in products or to support business activities. The e-Procurement has become an important enabler for the expansion of the traditional purchasing department to a more strategic role in the organization. The automation of processes with low value adding activities allowed employees to focus in activities with higher added value like negotiating with suppliers.

The advantages of the use of such systems have led many companies to implement e-Procurement in their organizations, hoping to get some of the benefits advertised. However, as we have seen, some of the expected benefits have not been achieved by many companies. Among several factors associated with the success of e-Procurement implementation, suppliers adherence to such platforms has been regarded as critical. A good supplier base in the system allows users to take advantage of the tools available. However, very little scientific evidence exists on how to achieve it.

Different strategies have been adopted to implement e-Procurement. Typically an e-Procurement systems may be sponsored by a company or reside in third party providers. Some analysts defend the abandonment of the model one-to many in favor of the many to many models. However complexities inherent in the purchase of goods and services, security, privacy and collaboration combined to sustain a good deal of interest in the one to many models like e-Procurement systems operated by purchasing organizations (Neef, 2001).

Through an extensive literature review twenty factors were identified as contributing positively or negatively to supplier's intention to adopt an e-Procurement system (buyer

centric) when invited to do so. A framework was developed to structure these factors. Those were divided into Benefits, Barriers, CSF and Business Partner Influence. This was a hybrid model between the framework developed by Gunasekaran and Ngai (2008) and the Technology, Organization and Environment model (TOE), from which we considered only the environment dimension.

Using the data obtained from 721 Portuguese companies, factors previously identified were tested empirically. Through the correlation coefficient between the variables, we measured the intensity and direction of correlation, between each factor and the intention to adopt e-Procurement. A factor analysis was also performed, in order to analyze the coherence of the variables in the framework dimensions.

Now we will analyze deeper the results obtained through the statistical treatment of data related to the framework and provide some recommendations. The analysis was divided in four sub chapters, benefits, barriers, CSF and business partner influence:

5.1.1. Benefits

The following factors were previously identified as the major perceived benefits to the adoption of e-Procurement by suppliers: market growth, reach new markets, reductions in order processing costs, better operational efficiency, better negotiable transparency, improved relationship with clients and gain of competitive advantage. All of the benefits were positively and significantly related to e-Procurement adoption.

Two main types of benefits were identified with the factor analysis: direct benefits and indirect benefits. Direct benefits are associated with marketing and sales and represent an opportunity for the company to generate financial gains in the short term. Indirect benefits are related to benefits obtained in the medium and long term that may not directly result in financial gains, but may contribute to improvements on the organizational performance and sustainability of the company.

The expected gain in operational efficiency was the factor more related to e-Procurement adoption. This means that besides being the major advantage identified by suppliers, it showed to be highly related with supplier intention to adopt e-Procurement. A respondent commented that since he is sending prices and receiving orders online he “free up time” for more value

adding activities. The communication plan to be developed for suppliers should take into account that the gains in operational efficiency are of paramount importance in the success of their decision.

Other factors were commented by the respondents being positive in e-Procurement adoption: The reduction in time and number of errors associated with the orders, the transparency of the negotiable process, reduction in marketing costs, lower paper consumption and enhanced "image of the company" derived from innovation.

Improvement of transparency has generated contradictory opinions. While some respondents expect improvements, others argued lack of transparency, non-application of the criteria defined by the purchasing company and e-Procurement as a tool "just to formalize the purchase". However, data shows that the majority of suppliers believe in transparency improvements.

The recommendations are that companies need to explain to their suppliers the real benefits of adopting e-Procurement. Thus it is necessary to develop a communication plan in order to increase the benefits awareness both in the short and long term.

5.1.2. Barriers

The following factors were identified as the major perceived barriers to the adoption of e-Procurement by suppliers: Price reduction pressures, implementation costs, integration costs and maintenance, lack of interoperability between systems, lack of legal support, lack of information security and lack of skill and knowledge. However only cost of implementation and the lack of information security were negatively and significantly related to the intention of adopting e-Procurement. One possible explanation may lie in the fact that only 34% of companies interviewed have experience with e-Procurement. This may contribute to a low awareness of the barriers to e-Procurement.

The cost of implementation was pointed as a barrier having impact on whether a supplier goes or not for e-Procurement. Large companies should provide financial support and develop standards and systems for facilitating effective interoperability with traditional suppliers systems (Gunasekaran, Ngai, 2008). For example the use of web based portals instead of end to end message exchange systems may lead to reductions in the implementation cost, since

suppliers are not required to integrate with their current systems. If full process integration is desired, then the use of standards and agile architectures like SOA can lead to lower cost of implementation.

Another key issue were the concerns about information security. Some of security tools and procedures recommended in the literature are: the use of digital certificates, clear roles and responsibilities, logging, auditing, error correction procedures, security policies and procedures, firewalls, intrusion detection systems, communication encryption and security reviews and penetration testing (Koorn *et al.*, 2001). Organizations must be certain that unauthorized actions will not disrupt important supply chain activities when committing to e-Procurement.

Respondents also suggested that the lack of "human interaction" in e-Procurement is not suitable for some types of business, especially in complex products that require significant human interaction. As affirmed by Kothari *et al.*(2005), no advanced technology can replace human interactions in establishing and maintaining business relationships. The e-Procurement shouldn´t try to replace human interactions between sellers and buyers. Instead, e-Procurement should support suppliers leaving them with more time to pursue those activities that cannot be automated easily.

5.1.3. CSF

The following factors were identified as the major perceived critical success factors to the adoption of e-Procurement by suppliers: initial training, integration with current systems, top management support, business process reengineering and adoption process support. All the factors were positively and significantly related to the intention to adopt e-Procurement.

Integration with current systems was the more critical factor for the success of e-Procurement implementation. Thus e-Procurement should be integrated both with the purchaser's information infrastructure and in its links to suppliers. Companies must assure that suppliers have internet access and appropriate systems to receive data from the purchaser. A web based platform of e-Procurement may guarantee access to all suppliers while the use of XML communication standards may provide process integration levels to both companies (Muffatto, Payaro, 2004).

The initial training can be a window of opportunity to pass the message to suppliers of the benefits of their adoption. It will also allow the direct interaction with the supplier key users allowing them to better know how the system is intended to work. In addition initial training is also an opportunity to hear supplier comments and suggestions increasing their participation.

Top management support was the factor more related to the intention to adopt e-Procurement. Top management support and commitment has often been considered crucial in any development and e-Procurement implementation process. Further, top management support is essential in overcoming barriers and resistance to change (Teo, Ranganathan, 2004), and will assure that suppliers perform well the activities defined. Companies should address these factors in order to improve the chances of success in e-Procurement implementation.

5.1.4. Business Partner Influence

The business partner pressure has a positively and significantly influence on the adoption of e-Procurement by suppliers. This is consistent other studies on technology adoption. For example Chwelos *et al.* (2001) showed that the pressure from business partners in the adoption of EDI contributes more than the perceived benefits of those who will adopt. However through our analysis we can conclude that the influences of business partners and the indirect benefits have the similar impact. Direct benefits are less related to the intention to adopt e-Procurement than the two compared above.

Companies can have an important influence on their business partners to use e-Procurement. However, they should not force them to do it. Some example with other technologies, show that this can lead to the deterioration of the relations between both companies. It may compromise future improvements that may result from e-Procurement adoption.

5.2. **Limitations & Future Work**

Despite convinced that the proposed objectives for this study were achieved, it is important that future works solve some of the limitations of this study and contribute to the advancement of this area. Some of the factors identified in the literature review were related to the adoption of e-Procurement in a general way and not specifically related to the supplier adoption on buyer centric e-Procurement systems. A deeper analysis on the factors affecting supplier adoption on other models may help to identify additional factors.

Another limitation of the study is that the framework used used by Gunasekaran and Ngai (2008) has not yet been widely tested in the literature. Thus, future studies should use this framework in order to test its applicability under other conditions.

Future studies may also ponder the analysis of dependency between the factors identified and the intention to adopt e-Procurement. For example the application of logistic regression or structural equations on the present framework may provide more empirical evidence on the impact of each factor on e-Procurement adoption.

Finnaly, the respondents from our study were from Portuguese companies. Future studies might explore the differences between Portugal and other countries, or between the industries analysed.

The completion of this study provided great satisfaction for the author, and is recommended for all interested in the fields of technology adoption and e-Commerce. The participation with two papers on international conferences was extremely rich, both in academic and personal terms, and consequently it is well recommended that future students also participate. For example, some of the opinions collected appointed that the initial model didn´t considered the environmental dimension. We had the opportunity to improve it which contributed to a more compressive framework.

This way and to finalize we are convinced that companies and their business partners can take full advantage of their investments in e-Procurement by adopting the recommendations presented.

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7. Attachments

7.1. Survey (English Version)

7.1.1. Email Sent Out

Under a master's thesis research at the Instituto Superior de Ciências do Trabalho (ISCTE), we are requesting your cooperation in a study about *electronic procurement.*

The *electronic procurement* is a software tool that allows companies to negotiate electronically the supply of its products and services. Activities such as price proposals, receiving orders and sending invoices are made through the Internet.

We want to understand better the factors that lead companies to join, or not, the *electronic procurement* when requested by a client.

To respond to the questionnaire click HERE.

Thank you,

*Paulo Andrade (*Student)

*Bráulio Alturas (*Coordinator*)*

7.1.2. Intro Page

The information provided will be treated confidentially.
The questionnaire consists of two pages.
Click the button below to start.

7.1.3. Questions

Nº	Question	Options of Answer	Mandatory
Page I - Provide some information about your company and experience in relation to electronic procurement.			
1	Number of employees (indicate the value)	Free Number	Y
2	Annual Sales	Below 499.999€ Between 500.000€ and 1.999.999€ Between 2.000.000€ and 9.999.999€ Between 10.000.000€ and 42.999.999€ Higher than 43.000.000€	Y
3	Industry type	Financial Services Retail Marketing & Advertising Engineering & Construction Logistics Services Manufacturing Tourism	Y
4	Job position	President/Director Department Manager Others	Y
5	Types of electronic procurement tools relevant for your business (you may choose more than one option)	Electronic catalogue offer Reply to Request for Proposals (RFP), Receiving Electronic orders Order Delivery Confirmation Electronic Invoicing Electronic Payments	Y
6	What is the influence of business partners for the use of electronic procurement tools?	No influence Some business partners have recommended us to use e-Procurement Some business partners have requested us to use e-Procurement Majority of business partners have requested us to use e-Procurement	Y

7	What is the current state of electronic procurement in your company?	No consideration of any applications Some consideration but no decision yet Decision to have e-Procurement applications made, but implementation is in progress We currently use one or more e-Procurement applications	Y
Page II - Imagine that your company is requested by a client to use an electronic procurement tool. Assess the factors that can lead to success or failure of membership and use of this tool.			
8	Benefits Sales growth Reach new markets Reductions in order processing costs Better operational efficiency Better negotiable transparency Improved relationship with clients Gain of competitive advantage	Strongly disagree Disagree Neither agrees nor disagree Agree Strongly agree	Y
9	Barriers Price reduction pressures Implementation costs Integration costs and maintenance Lack of interoperability between systems Lack of legal support Lack of information security Lack of skill and knowledge	Strongly disagree Disagree Neither agrees nor disagree Agree Strongly agree	Y
10	For the success of its use is necessary Initial Training Integration with current systems Top management support Business process reengineering Adoption Process Support	Unimportant Less Important Important Very Important Critical	Y

11	Comment other advantages, barriers or critical success factors you consider relevant. (optional)	Free Tex	N
12	Based on previous answers, evaluate the possibility of your company to join a future initiative for electronic procurement?	Impossible Less probable Probable Very probable Certain	Y
13	Do you wish to receive the final report of this study by e-mail? (optional)	Yes No	N

7.1.4. End Page

Thank you for your participation!

7.2. Survey (Portuguese Version)

7.2.1. Email Sent Out

No âmbito de um trabalho de mestrado a decorrer no Instituto Superior de Ciências do Trabalho e da empresa (ISCTE), vimos solicitar a vossa colaboração num estudo sobre *electronic procurement*.

O *electronic procurement* é uma ferramenta informática que permite às empresas negociarem via electrónica o fornecimento dos seus produtos e serviços. O termo em português significa a negociação e compra/venda via electrónica entre empresas. Actividades como cotação de propostas, recebimento de encomendas ou envio de facturas passam a ser feitas através da Internet.

Pretendemos perceber melhor quais os factores que levam as empresas portuguesas a aderir, ou não, ao *electronic procurement* quando convidadas por um cliente.

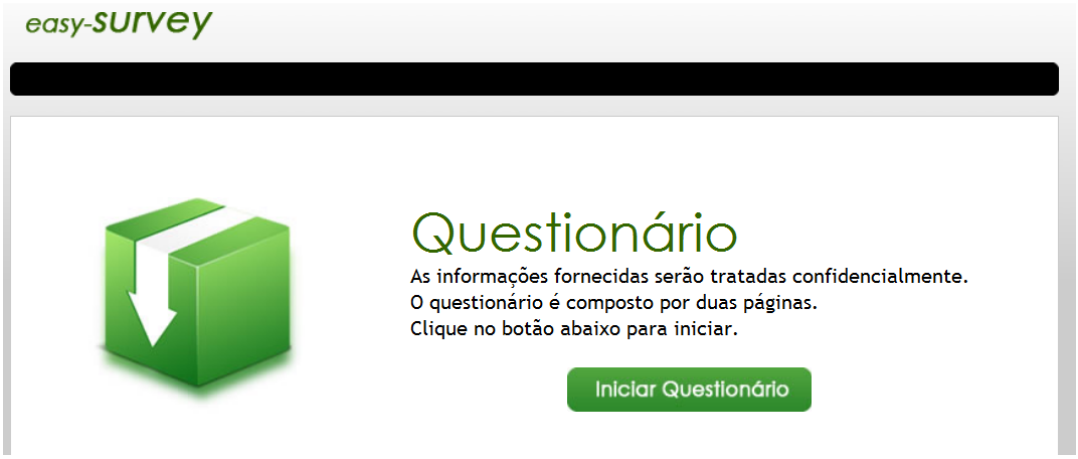
Para responder ao questionário clique AQUI.

Obrigado,

Paulo Andrade (Aluno)

Bráulio Alturas (Orientador)

7.2.2. Intro Page



7.2.3. Questions

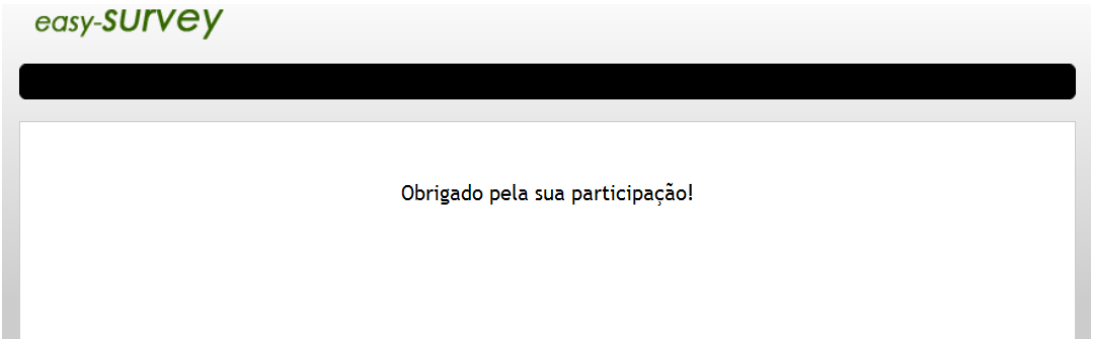
Nº	Question	Options of Answer	Mandatory
Page I - *Indique alguns dados sobre a sua empresa e experiência em relação ao electronic procurement.*			
1	Número de empregados *(indique o valor)*	Numero	Y
2	Volume de negócios anual	Inferior a 499.999€ Entre 500.000€ e 1.999.999€ Entre 2.000.000€ e 9.999.999€ Entre 10.000.000€ e 42.999.999€ Superior a 43.000.000€	Y

3	Sector de Actividade	Serviços Financeiros Retalho Marketing & Publicidade Engenharia/Construção Logística Serviços Transformação/Indústria Turismo	Y
4	A sua posição na (seleccione uma opção)	Administrador Responsável de Área Outras	Y
5	Tipos de ferramentas de electronic procurement que considera relevantes para a sua empresa (pode assinalar mais do que uma opção)	Oferta do catálogo de produtos/serviços via electrónica; Resposta a pedidos de preços via electrónica; Recepção de encomendas via electrónica; Confirmação de entregas via electrónica; Envio de facturas para o cliente via electrónica; Pagamentos Electrónicos.	Y
6	Qual a influência dos parceiros de negócio para a utilização de ferramentas de electronic procurement?	Nenhuma influência Alguma recomendação para a utilização Requisito obrigatório por alguns Requisito obrigatório pela maioria	Y
7	Qual o actual estado do electronic procurement	Nenhuma aplicação Alguma consideração, mas sem decisão ainda Implementação em curso Utilização de uma ou mais aplicações	Y
Page II - *Imagine que a sua empresa é convidada por um cliente a utilizar uma ferramenta de electronic procurement. Avalie os factores que podem levar ao sucesso ou não da adesão e utilização dessa ferramenta.*			

8	**Vantagens** Aumento do volume de negócios Obtenção de novos clientes Diminuição do custo no tratamento de encomendas Aumento da eficiência operacional Aumento da transparência negocial Melhoria da relação com os clientes Melhoria da posição competitiva	Discordo Totalmente Discordo Indiferente Concordo Concordo Totalmente	Y
9	**Impedimentos** Diminuição nos preços de venda Dificuldade em medir o retorno do investimento Custos de integração e manutenção dos sistemas informáticos Falta de interoperabilidade entre os sistemas informáticos Falta de suporte legal Falta de segurança na partilha de informação através da internet Falta de colaboradores com os conhecimentos necessários	Discordo Totalmente Discordo Indiferente Concordo Concordo Totalmente	Y
10	**Para sucesso da sua utilização é necessário** Formação inicial sobre a ferramenta Integração com os actuais sistemas de informação Participação activa e comprometimento da gestão de topo Revisão dos processos de negócio internos Envolvimento dos utilizadores no processo de implementação	Nada Importante Pouco Importante Importante Muito Importante Critico	Y

11	Indique outras vantagens, impedimentos ou factores que considere relevantes. (opcional)	Texto Livre	N
12	Com base nas respostas anteriores, como classifica a possibilidade da sua empresa em aderir a uma futura iniciativa de electronic procurement?	De certeza que não Pouco Provável Provável Muito Provável Com toda a certeza	Y
13	Pretende receber o relatório final deste estudo por correio electrónico? (opcional)	Sim Não	N

7.2.4. End Page



7.3. **Frequencies**

		1-Number of Employees	2-Anual Revenue	3-Industry type	4-Job position	5.1-Electronic catalogue offer	5.2-Reply to Request for Proposals (RFP),	5.3-Receiving Electronic orders	5.4-Order Delivery Confirmation	5.5-Electronic Invoicing	5.6-Electronic Payments	6-Business partner influence	7-Status of e-procurement
N	Valid	721	721	721	721	721	721	721	721	721	721	721	721
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean		67,17	2,18	4,83	1,58	,73	,78	,62	,53	,54	,72	2,13	2,58
Median		11,00	2,00	6,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	2,00	2,00
Mode		3	1	6	1	1	1	1	1	1	1	2	4
Std. Deviation		268,891	1,134	2,066	,707	,444	,417	,486	,500	,499	,449	,874	1,191
Variance		72302	1,286	4,268	,500	,197	,174	,236	,250	,249	,202	,764	1,419
Minimum		1	1	1	1	0	0	0	0	0	0	1	1
Maximum		3000	5	8	3	1	1	1	1	1	1	4	4
Sum		48362	1571	3484	1138	527	560	446	379	388	519	1536	1861

		8.1-Sales growth	8.2-Reach new markets	8.3-Reductions in order processing costs	8.4-Better operational efficiency	8.5-Better negotiable transparency	8.6-Improved relationship with clients	8.7-Gain of competitive advantage	9.1-Price reduction pressures	9.2-Implementation costs	9.3-Integration costs and maintenance	9.4-Lack of interoperability between systems	9.5-Lack of legal support
N	Valid	721	721	721	721	721	721	721	721	721	721	721	721
	Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean		3,56	3,71	3,89	4,04	3,55	3,56	3,84	2,93	2,93	3,52	3,42	3,40
Median		4,00	4,00	4,00	4,00	4,00	4,00	4,00	3,00	3,00	4,00	4,00	4,00
Mode		4	4	4	4	4	4	4	3	3	4	4	4
Std. Deviation		,886	,850	,882	,815	,925	,932	,840	,936	,961	,893	,923	,929
Variance		,786	,722	,778	,663	,857	,869	,706	,877	,923	,797	,852	,862
Minimum		1	1	1	1	1	1	1	1	1	1	1	1
Maximum		5	5	5	5	5	5	5	5	5	5	5	5
Sum		2566	2676	2808	2915	2557	2565	2767	2112	2115	2541	2465	2450

		9.6-Lack of information security	9.7-Lack of skill and knowledge	10.1-Initial Training	10.2-Integration with current systems	10.3-Top management support	10.4-Business process reengineering	10.5-Adoption Process	11-Others	12-Intention to adopt a future e-procurement initiative	13-Final Report
N	Valid	721	721	721	721	721	721	721	65	721	711
	Missing	0	0	0	0	0	0	0	656	0	10
Mean		3,40	3,19	4,01	4,07	3,91	3,59	3,96		3,23	1,19
Median		4,00	3,00	4,00	4,00	4,00	4,00	4,00		3,00	1,00
Mode		4	4	5	5	5	3	5		3	1
Std. Deviation		1,057	1,041	,963	,943	,972	,965	,941		,979	,389
Variance		1,117	1,084	,928	,889	,945	,931	,886		,959	,151
Minimum		1	1	1	1	1	1	1		1	1
Maximum		5	5	5	5	5	5	5		5	2
Sum		2448	2302	2888	2936	2822	2588	2855		2326	843

7.4. **Comments**

Respondents Comments and Suggestions
Entrada de encomendas evitando erros de digitação Não utilização correcta do conceito de EDI e cada um acaba por fazer EDI à sua maneira Na prática não se traduziu em redução da papel, pois como continuamos a ter de enviar documentos para controlo
A nossa empresa fornece produtos sob medida, o que não facilita um suporte padrão para encomendas (há necessidade de discutir especificações). Para que os custos incorridos sejam justificáveis, é necessária a adesão de um número considerável de parceiros. Quando existem muitos clientes/fornecedores de pequenas dimensões, isso é difícil.
A maior percentagem do nosso trabalho já está a ser efectuada por estes meios
A NOSSA ACTIVIDADE É A PRESTAÇÃO DE CUIDADOS MÉDICOS. REALIZAÇÃO DE EXAMES DE MEDICINA NUCLEAR. AS QUESTÕES QUE NOS SÃO PROPOSTA NÃO SE ADAPTAM MUITO BEM À NOSSA ACTIVIDADE EM QUE APENAS EM CASOS EM QUE OS CLIENTES NOS SOLICITAM. APENAS TEMOS DOIS QUE NOS PROPOSERAM ISSO. OS NOSSOS PRINCIPAIS CLIENTES SÃO OS HOSPITAIS NÃO SENDO POSSÍVEL, NA MAIORIA DAS SITUAÇÕES, ACEDERM A ESSE PROCEDIMENTO.NA MARCAÇÃO DE EXAMES PODERIAMOS PENSAR NESSA POSSIBILIDADE MAS ISSO TERIA REGRAS MUITO SIGILOSAS.PO
A principal constatação decorrente da experiência na utilização destas ferramentas é que os negócios são feitos fora das plataformas e apenas formalizados nos portais de e-procurement.
Abertura a novos mercados, e aumento da procura comercial de uma forma facilitada.
Alem das anteriores, acrescento a organização interna e contribuição ecológica
As empresas que nos sugerem entrar neste tipo de plataformas são as que pior pagam e que não cumprem acordos de pagamento de facturas. Pretendem apenas espremer os preços pela negociação aberta, mas não se comportam como mais-valia de todo este processo moderno.
Aumento da Produtividade
Como principais vantagens identifico a normalização de processos, o ganho em eficácia/tempo e redução em processos administrativos e, para itens correntes, melhor capacidade negocial, resultando em redução de custos. Não encontro impedimentos, excepto, se aplicável, de vontade política.
Custos elevados
De acordo com a necessidade da firma, julgo prematuro dar opiniões positivas sobre a matéria, embora ferramentas como aquela que descreveu julgo que dever resultar noutras empresas.
Diminui os custos de comunicação
É apenas mais um meio mais rápido de formalizar a comunicação que outra coisa. As informações são as mesmas que as da época em que tudo se enviava em papel. Simplesmente, há outputs directos das ferramentas de gestão para os toushpoints operacionais com clientes e fornecedores. Qualquer dia, tudo terá um protocolo único.
Em relação ao processamento electrónico das encomendas/ cotações o principal problema é: que os clientes estejam dispostos a faze-lo informaticamente. De outro modo nada funcionara.
Evitar pilhas de pastas de papel é uma vantagem...a insistência de determinados sectores do estado e banca em sistemas fechados e plataformas pré-determinadas impede que as trocas de informação electrónica se vulgarizem e sejam mais céleres.
Facilidade na negociação
Falta de formação para correcta utilização.

Grandes clientes estão a transferir as operações para estas ferramentas apenas para transferir o trabalho administrativo para os seus fornecedores esquecendo-se de partilhar os aspectos positivos
Há alguma confusão entre as ferramentas de Procurement para pesquisar fornecedores, pedir RFQ e receber preços-specs e no limite fazer leilões de forma a adjudicar ao fornecedor q tem melhor preço (ver ARIBA e EMPTORIS), com as ferramentas de gestão normais de ERP Gestão de Encomendas/Facturação (ordem compra, confirmação, facturas, etc.) tipo SAP, Primavera, etc.
Imagem da empresa
Impedimento: custo do sistema operativo
Impossibilita a fuga ao fisco
Incerteza sobre a evolução da conjuntura económica; fraca credibilidade dos responsáveis pela politica económica do país quanto á sua capacidade de influenciar o andamento" da mesma; Elevada corrupção que distorce o mercado e deita por terra a competitividade de qualquer empresa idónea; Bloqueio / congelamento da capacidade de resposta do sistema judicial alimenta um elevado risco de crédito e potencia a existência de elevados níveis de desconfiança entre os intervenientes do mercado."
Informo que estão já aplicadas várias ferramentas mencionadas neste inquérito, como catálogo electrónico, colocação de encomendas, consulta de documentos, e-commerce para clientes de consumo final, comunicação de campanhas, promoções, eventos comerciais, etc.
Maior competitividade Internacional, ferramentas altamente dispendiosas na sua implantação, dificuldade de manter nível de fiabilidade da informação, constrangimentos externos de rede disponíveis.
Na medida em que no caso concreto se trata de indústria hoteleira, esta é uma das actividades, a par da aviação comercial, nas quais o comércio electrónico, directo ou via central de reservas electrónicas, é condição cinequanon para vendas
Na n/ área é impossível vender por via electrónica pois temos obrigatoriamente que reunir com o cliente, visitar, medir e explorar o local de implementação da máquina, e até para orçamentar necessitamos visitar o cliente
Nada
Nada
Nada a mencionar
Não existe preparação suficiente por parte dos interessados. Duvidosa transparência de alguns dos utilizadores destes sistemas em Portugal. Os que garantem são pouco interessantes em volume de negócios.
Não vejo grandes vantagens em acabar com o contacto pessoal pelo seguinte: Desvaloriza o produto; Cria desemprego; A factura tem de acompanhar o produto, para quê factura electrónica? A grande dificuldade é receber e não neste sistema uma solução.
No meu caso como individual, e para s/ conhecimentos empresas p/ quem trabalho praticamente implementaram a entrega de notas encomenda e preços tudo por internet que digamos facilitou grandemente o m/ trabalho e já fiquei livre para tratar outros assuntos.
No negócio empresarial, o contacto pessoal com os decisores é fundamental. No entanto esta mudança é inevitável.
No nosso ramo, o EP conduziu rapidamente a uma globalização desvantajosa porque os clientes têm menos contacto pessoal, e tanto lhes faz trabalhar com uma empresa na Europa ou na Ásia. Em alguns casos, os sistemas de EP complica os processos (nomeadamente facturação e plataformas de processamento de serviços) desnecessariamente.
O facto de haver algumas empresas de capitais particulares que são detentoras de plataformas negociais públicas é, por muita transparência que haja, preocupante e transmite insegurança.
Os principais constrangimentos à adopção de ferramentas de e-procurement são o desconhecimento generalizado por parte do mercado fornecedor e, a resistência à mudança por parte das organizações.

Para além da vertente ecológica, que de facto beneficiaria com a adesão em massa do tecido empresarial, esta ferramenta acelera o circuito monetário pois encolhe os prazos logísticos de tratamento e conferência da facturação trocada entre empresas.
Para aumentar a competitividade das empresas no mundo do mercado (nos dias de hoje) é de extrema importância o aumento da utilização desta ferramenta
Parece-me que infelizmente esta ferramenta em vez de tornar o processo mais claro o torna mais escuro. Digo isto porque já aderi a uma plataforma em que num processo negocial em que o requisito preponderante era o preço mais baixo foi adjudicado ao que muito bem entenderam.
Penso que seja esta a altura ideal, com o incentivo do estado, ao nível das tecnologias de informação, as pequenas e médias empresas têm uma proximidade e uma facilidade superior em lidar com plataformas e/ou sistemas informáticos. Ainda existe muito por fazer nesta área, considero que uma plataforma tecnológica depende, para além da programação, da necessidade e das necessidades que à sua volta poderão ser criadas e consideradas uma mais-valia.
Permite-nos enviar informação directamente para a pessoa desejada, ao contrário do fax, em que qualquer pessoa da empresa pode recepciona-la e encaminha-la ou não para a pessoa que pretendemos, o que permite também, maior celeridade da transferência de informação. Menor poluição, não é necessário imprimir todos os documentos
Planeamento e acompanhamento da implementação
Por factores diversos é, no momento e sê-lo-á no curto prazo, difícil o processamento electrónico global no caso específico das micro empresas; não há ainda uma cultura de processamento contabilístico sem papel e as ferramentas e operadores têm custos acima das capacidades financeiras das empresas; e quase nunca um licenciado potencia o seu vencimento convenientemente, a maior parte das vezes por falta de hábitos de trabalho e capacidade criativa.
Princípios ecológicos - a maça de papel DESNECESSARIO que circula é efémero! Não só em relação à matéria-prima (árvores), também em relação ao transporte, das tintas (tóxicos) etc. Este problema é grave e têm de ser atacado
Que todos os intervenientes clientes/fornecedores sejam possuidores do mesmo tipo de ferramentas de gestão e apetência para formação especifica sobre as matérias
Rapidez
Rapidez de processos
Recepção mais rápida das encomendas e execução mais atempada das mesmas
Segurança. Muita segurança, sobretudo nestas transacções via electrónica
Sem comentários
Trabalhamos neste momento com uma plataforma electrónica de negócios, econstroi, e na verdade é importante pois possibilita de forma rápida saber de negócios e fazer propostas de forma a rentabilizar equipamentos e pessoal, é um processo fantástico apenas com um factor negativo, o preço elevado que os utilizadores têm que suportar.
Vantagem - imagem que traduz sobre a empresa (prestígio, inovação, moderna)
Vantagem -Redução de tempo; Mobilidade total em contacto permanentes área de serviços que integro (moldes para plásticos) praticamente tudo é tratado via electrónica actualmente e desde alguns anos.
Vantagem foi a facilidade de operar e rapidez na recepção das encomendas. Desvantagem o custo inicial bem como o valor da manutenção anual (hoje bastante mais económico)
Vantagens: velocidade maior nos negócios; transparência ao nível dos preços e condições impedimentos: Falta de credibilidades ou confiança entre as partes

7.5. **Sum of e-Procurement Activities**

		1-Number of Employees
N	Valid	721
	Missing	0
Mean		3,9098
Median		4,0000
Mode		6
Std. Deviation		1,65460
Variance		2,738
Minimum		0,00
Maximum		6,00
Sum		**2819,00**

Sum of EP Activities	**Frequency**	**Percent**
0	13	1,8
1	50	6,9
2	91	12,6
3	139	19,3
4	149	20,7
5	100	13,9
6	179	24,8
Total	**721**	**100**

8. About the Author

Paulo Andrade has a Bachelor degree in Management and Industrial Engineering by the ISCTE-IUL and is currently student of the Master degree in Information Systems Management at the same University. He has two years of work experience, and participated as a SAP Consultant in several projects from logistics process reengineering to e-Procurement implementation in the banking and telecommunications industry.