Exploring the Constraints to the evolution of Electronic Business: The Portuguese reality

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Abstract

It is imperative for an organization to identify potential constraints to e-business in order to minimize the risk derived from its e-business initiative.
Hence, in this paper, we have used a maturity stage model (Stages Of Growth Model for e-business – SOGe) to identify the maturity stage of the biggest Portuguese enterprises and to report the findings of a study that sought to explore a range of constraints that the literature suggests influences e-business evolution, so that organizations could be better equipped in anticipating any difficulties while in progress through their e-business initiatives. Questionnaires were applied to investigate the research problem. It was administered to 1000 managing directors of the biggest (according to the amount of business) Portuguese enterprises. Results suggest that Portuguese enterprises had a positive evolution between 2005 and 2007, and that, in lower maturity stages, the constraints are more significant.

Keywords: Stages of growth, e-business progression, constraints

1. Introduction

During the 1980s, an effort was made to standardize the digital exchange of information by using the Electronic Data Interchange (EDI). However, it required a pre-arranged agreement that was often implemented on an expensive value-added network. Therefore, this situation had limited commercial viability. In the early 1990s, by using the Internet and open computer technology, connectivity became affordable [1].
The Internet has become an integral part of most successful businesses. There are few businesses today which do not have a website [2]. However, the terminology involved within the field of Information Communication Technology (ICT) usage on the Internet is vast and contradictory. Two frequently used terms are e-commerce and e-business.
There are numerous reports and literature highlighting the potential benefits of e-business. As an organization conducting e-business, there are a range of issues to think through as well as the challenges and opportunities presented by e-business. More interestingly however, it is how these challenges and perceived opportunities affect the progress of an organization e-business.
E-commerce has suffered from the same syndrome as many other theories or new issues that arrive in the business world. Firstly, there was great enthusiasm, organizations had to adapt to the new online world otherwise they would disappear. This was closely followed by the bursting of the dotcom bubble, with some famous failures. As a consequence, opinion changed and the literature reflected a radical change in the approach to e-commerce. It was no longer a strategic weapon and its value came to be considered as simply a marketing tool. Finally, the e-commerce approach has been reassessed and it has entered a more mature stage, where some organizations have been able to take advantage of the possibilities of doing business electronically [3].
The present paper, identifies the e-business maturity stage of the biggest Portuguese enterprises and it explores the constraints associated with e-business evolution.
The remainder of the paper is organized as follows: the next section reviews the concept of e-commerce and e-business; section 3 reviews the e-business maturity models; sections 4 and 5 briefly discuss e research design and simple profile. Section 6 presents and discusses the results obtained.

2. E-Commerce and E-Business

There is neither a universal agreement on the definition of e-commerce nor a unique theory about the differences between e-commerce and e-business. As a result, each author uses his or her own definitions. All of them, however, agree with the basic notion that it is about business activities electronically conducted.
In [4] define e-commerce as the "… buying and selling of information, products and services via computer networks". In [5] identify e-business as business facilitated by ICT. Others argue that e-business encompasses the entire word of internal and external electronically based activities, including e-commerce [6].
E-business is defined as any commercial or administrative transaction or information exchange that an organization makes available over a network [7], and is frequently based on web technologies [8]. Basically, e-business is about conducting business electronically over the Internet. This could include activities such as communication, marketing, and collaboration [9]. Others define e-commerce as the "use of the Internet and the Web to transact business" [10].
In the scope of this paper, e-commerce will be regarded as a subset of e-business. E-commerce is limited to financial transactions (buying and selling), and e-business includes buying, selling or supporting products and services, such as information exchange, marketing, and pre and pos sales support.

3. Stages of Growth Model to Explain E-Business Maturity

Since the introduction of computer technology into organizations in the 1960s, there have been numerous attempts to develop models of Information

Systems/Information Technology (IS/IT) maturity ([11]; [12]; [13]; [14]; [15]; [16]; [17]; [18]; [19]; [20]; [21]). All of these models are premised on the idea that organizations pass through stages of maturity with respect to the way they use and manage IS/IT to support and facilitate business activities, processes and operations.

New maturity models, better adapted to the realities of e-business, have been developed by other researchers and practitioners. Recent research on growth stages and e-business has shown the usefulness of these models in describing the company position in terms of e-business development and of its possible development in the future [22], [23], [24], [25] and [26].

In [27] was used the comparative framework to evaluate e-business stages of growth models. This comparative framework contained the following eight elements [28]: perspective, development, emphasis, verification, barriers, focus, source and stages. Were compared eight models (see table1): KPMG [29], Grant's Model [30], Mckay's Model [22], Earl's Model [23], SOGe [31], Rayport and Jaworsky's Model [25], Rao's Model [26] and Chan and Swatman's Model [32].

Table 1: Comparison of the maturity models using the comparative framework of Jones et al. (2006)

Model	Perspective	Development	Emphasis	Verification	Barriers	Focus	Source	Stages
KPMG	Business	Linear	NS	No	No	EC	Private Sector	3
Model of Grant	Business	Linear	SME	Yes	No	EB	Academia	5
Model of McKay	Technology	Linear	NS	No	No	EB	Academia	6
Model of Earl	Business	Linear	NS	No	No	EB	Academia	6
SOG-e	Business	Linear	NS	Yes	No	EB	Academia	6
Model of Rayport and Jaworski	Technology	Linear	NS	No	No	EB	Academia	4
Model of Rao	Technology	Linear	NS	No	No	EB	Academia	4
Model of Chan and Swatman	Business	Linear	NS	Yes	No	EB	Academia	4

After comparing these models the authors concluded that none of the models considers constraints on development and strategic development within the framework, but it is obvious that enterprise growth is inhibited by barriers to development such as limited skills and finance. Three models were verified: Grant's Model, SOGe and Chan and Swatman's Model. Of these three models, Grant's model is specific for Small and Medium Enterprises (SME) and Chan and Swatman's model is for Business to Business (B2B). Therefore, in order to explain the progression of e-business in the context of the Portuguese enterprises, we used the SOGe model. As with all other stages of growth models, the SOGe model assumes that a normal progression is from a less mature to an increasing sophistication over time [31]:

Stage 1: There is no clear direction for the organization's e-business initiatives;

Stage 2: E-business initiatives are increasingly considered to be an important component of the organization business. However, there is no proper planning and a lack of direction for IS/IT development and implementation;

Stage 3: E-business initiatives are considered an important component of the organization's business. There is a clear direction for the development of e-business initiatives within the organization. However, e-business development is still very much focussed on technology-centric perspective and not influenced by business needs;

Stage 4: E-business adoption and development is becoming more business-focussed. There is a move towards integration and greater coordination between the components of e-business (e.g. IS/IT and the Internet) and the organization's business processes;

Stage 5: Integration between traditional business processes and activities and e-business processes and activities creates seamless communication and flow of processes within an organization. E-business initiatives aim to provide strategic benefits by building strategic systems;

Stage 6: E-business is deeply embedded throughout every aspect of the organization. There is a strong integration between the components of e-business and business processes within the organization as well as with those of its suppliers and business partners. E-business initiatives are aimed at creating and maintaining the organization strategic advantage.

4. Research Design

The objectives of this research are to identify the e-business stage of maturity of the Portuguese enterprises and explore the constraints associated at each stage of maturity, during 2005, 2006 and 2007.

We make an exploratory study to try to identify possible constraints associated with the development of e-business. This exploratory study consisted mainly in the review of the literature. Afterwards, the questionnaire was developed. Prior to distribution, a series of pilot tests were conducted with a group of 10 information system director enterprises from a range of businesses and a group of 5 PhD students. The test participants were asked to complete the questionnaire and then evaluate the questionnaire and make suggestions. After the questionnaire had been finalized, it was administered to the 1000 managing directors of the biggest (according to the amount of business) Portuguese enterprises. The information about the enterprises was given by the Portuguese National Institute of Statistics [33].

We chose the questionnaire and not other method of data collection, such as interview, for reasons of time and cost. Besides the questionnaire as a tool of data collection, there are other studies that address similar issues, namely case studies, and which lead to similar results [34].

A total of 1000 presentation letters of the questionnaire were sent by post and 774 by e-mail to some of the 1000 companies that have an e-mail address. This presentation letter and e-mail referred the website, the login and password for the survey. All the enterprises had a login and a password to access to the questionnaire to guarantee that each enterprise would only answer once.

The presentation letters of the questionnaire were distributed in November 2007.

5. Simple Profile

Within the cut-off date, set at 3 weeks after the survey was distributed, there were 208 returned questionnaires and 4 presentation letters of the questionnaires being returned to the sender for various reasons (i.e. the company does not exist in the specific address or the address was no longer the company address). Of the 208 questionnaires, 70 were incomplete (32 do not answer about its maturity stage and 38 do not answer the question where the constraints associated to each maturity stage are questioned), prompting their removal from the sample as this might increase the error and bias of the survey. Elimination of the respondents from the sample due to such circumstances is common when computing the actual response rate [35]. Effectively, 138 usable responses were included in the sample for further analysis, representing a good response rate of 13,8%. This is well above the normally low response rate of 5-10% for a postal survey [36], [37]. Despite several conflicting views on the reliability of electronic surveys as compared to paper-based studies, it has been demonstrated that reliable and comparable results [38] and quicker response rate [39] can be achieved.

6. Results

Demographics

The sample is characterized by values on several variables that are displayed in table 2, figure 1 and figure 2. The respondents self-reported all the demographic values that are reported.

Table 2: The demographics for the sample

Function				
Director (%)	General Director (%)	Administrator (%)	Executive (%)	Other (%)
48,6%	5,8%	5,8%	16,7%	23,2%

Education Level		
Higher education (%)	Post Graduation (%)	Secondary School (%)
58,7%	29,7%	11,6%

Within the sample, 48,6% are directors, 5,8% general directors, 5,8% administrators, 16,7% executives and 23,2% have other function in the enterprise. The respondents who answered “Other”are the majority responsible for Information Systems (IS) department. Only 11,6% of the sample did Secondary school, all the others are graduated or post-graduated.

Respondents were categorized into seven industry sectors: Manufacturing, Information and Communication Activities, Retail and Wholesale, Financial Services, Commerce of Vehicles, Civil Construction, Transports and Others. The final sample, comprised of 138 enterprises, consists of 25% manufacturing firms, 26% retail & wholesale, 4% information and communication activities, 9% financial services, 8% civil construction, 8% transport, 7% commerce of vehicles and 13% enterprises of various categories, as can been seen in figure 1.

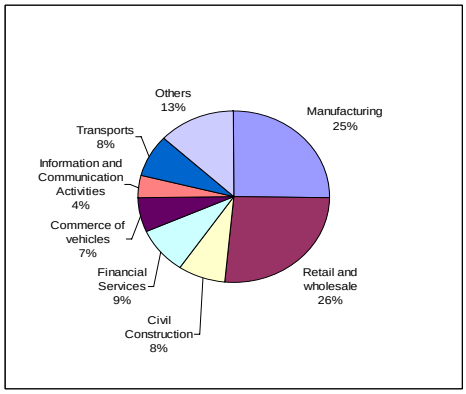

Fig 1. Sector activity representation in the sample

There are a significant percentage of enterprises with more than 250 employees. A percentage breakdown of employee number is shown in figure 2.

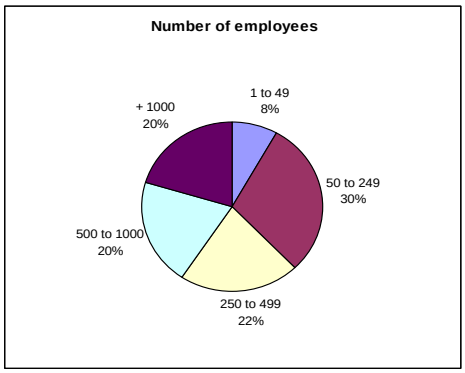

Fig 2. Size of companies within the sample

E-business stage of maturity

Figure 3 shows the evolution of e-business maturity between 2005 and 2007 in the 1000 biggest Portuguese enterprises. It is interesting to verify that in 2005 almost half of the enterprises were between stage 1 and stage 2 and in 2007 approximately 64% were between stage 4 and stage 6. This shows that enterprises are sensitive to e-business.

There could be a natural tendency for people, who would like to make the questionnaire completion easier, to show the development as a continuous positive development. Nevertheless, according to the report "The Information Society in Portugal 2007" 100% of large firms has Internet connection. 97% are connected to the Internet by broadband, occupying Portugal, the 7 th place ranking in the EU27. About 7 in 10 companies use the Internet to interact with organizations and public authorities, which represents an increase of 20% from 2006 to 2007. 86% of large companies have an Internet presence [40]. This report may be an indicator that the questionnaires were answered seriously.

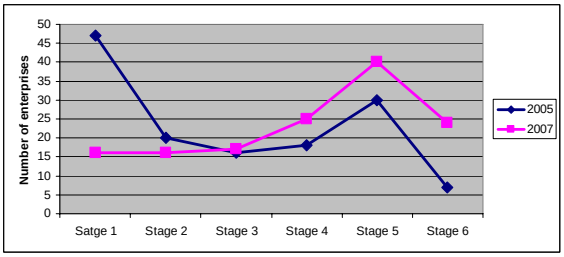

Fig 3. Evolution of the e-business maturity

Constraints to e-business evolution

Respondents were also asked to rate the concerns/problems acting as constraints for the development of their e-business initiatives. Respondents scored each item on a 7-point scale, where 1 is not problematic and 7 is very problematic. The responses are reported in table 3 below.

Table 3: Major constraints encountered in each year

	2005 (N = 138)		2006 (N = 138)		2007 (N = 138)	
Constraint	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
The technology existent is not the most adequate to e-business	3,13	1,89	2,83	1,80	2,53	1,77
Cost of e-business	3,61	1,93	3,38	1,84	3,28	1,84
Uncertainty with aspects related to security	3,23	1,83	3,02	1,69	2,80	1,66
Conflict with traditional trading partners	3,67	2,04	3,46	1,96	3,28	2,03
Conflict with traditional business and e-business initiatives	3,77	2,00	3,59	1,97	3,41	1,98
Lack of senior management support	2,62	1,77	2,41	1,62	2,23	1,52
Managing e-business project	3,08	1,76	2,91	1,67	2,76	1,67
Reengineering business processes	3,69	1,85	3,51	1,79	3,33	1,86
Business-technology alignment	3,75	1,91	3,46	1,82	3,22	1,83
Access to technical skills and expertise	3,39	1,77	3,16	1,64	2,97	1,66
Coordination between business-technology people	3,27	1,77	3,06	1,69	2,93	1,70
Resistance to change	3,41	3,89	3,15	1,73	2,93	1,69

The maturity of the enterprises increased over the years, and with this evolution in the maturity stage it is interesting to verify that the major problems are always the same ones, but simultaneously, they have diminished over time.

Overall, it is reported that conflict with traditional business and e-business initiatives, conflict with traditional trading partners and reengineering business processes are the greater constraints, although they have values less than 4. The less problematic is the lack of senior management support. It is important to remind that we are talking about the biggest Portuguese enterprises.

However, when this finding was examined based on the organization's e-business level of maturity, a clear picture emerges from the data. As expected, there are real differences in how organizations at different levels of maturity perceive the constraints of e-business. Shown in table 4, reengineering business processes is problematic in all stages, although it is more problematic in the first three stages. It is interesting to verify that the major problems in the first three stages of maturity are problems related with change, not only internal change, like conflict with traditional business and e-business initiatives, reengineering business processes but also external change, like conflict with traditional trading partners, in many cases, perhaps, SME. In the last stage of maturity, stage 6, the mean of the problems is always below 3. Therefore, we can conclude that in this maturity stage the problems have already been resolved.

Table 4: Major constraints encountered at each stage of maturity (weighed mean of 2005, 2006, 2007)

Constraint	**Stage 1 (N=88)**	**Stage 2 (N=62)**	**Stage 3 (N=48)**	**Stage 4 (N=62)**	**Stage 5 (N=110)**	**Stage 6 (N=44)**
The technology existent is not the most adequate to e-business	3,45	3,56	3,00	2,77	2,39	1,40
Cost of e-business	3,71	4,10	3,17	3,18	3,23	2,77
Uncertainty with aspects related to security	3,47	3,22	2,71	3,19	2,88	2,11
Conflict with traditional trading partners	4,51	4,15	4,23	3,37	2,60	1,77
Conflict with traditional business and e-business initiatives	4,99	4,34	3,77	3,08	2,86	1,92
Lack of senior management support	3,21	2,87	2,81	2,39	1,79	1,29
Managing e-business project	3,31	3,77	3,50	2,76	2,44	1,87
Reengineering business processes	4,15	4,44	4,08	3,34	2,80	2,13
Business-technology alignment	3,92	4,60	4,08	3,47	2,67	2,17
Access to technical skills and expertise	4,00	3,64	2,92	2,97	2,77	2,23
Coordination between business-technology people	3,46	4,11	3,23	2,87	2,62	1,96
Resistance to change	3,89	3,79	3,42	3,10	2,57	1,96

Table 5 has the top 5 factors that act as inhibitors to e-business progression in each maturity stage. Although reengineering business process was the common constraint in all maturity stages, in the last two stages of e-business maturity, it appeared in the top constraints associated to a great technological requirement, like costs, technical skills and security.

In a study which examined the key global, environmental and policy factors that act as determinants of e-commerce diffusion, based on systematic comparison of case studies from 10 countries – Brazil, China, Denmark, France, Germany, Mexico, Japan, Singapore, Taiwan and the United States, it was concluded that the key inhibitors to e-business are: business environment and culture, national culture, and political institutions. Organizational readiness to embrace e-business is often low due to business cultures that do not support innovation and the use of new technology. Firms are often reluctant to make the requisite changes to their organizational processes needed for conducting e-business. The study also concluded that for many European countries, cultural resistance to change and innovation is at the root of resistance to B2B e-business (Gibbs et al., 2003).

Making a comparison between this study and our study, it confirms that the issues related to the change, including the reengineering of business processes, the conflict with traditional trading partners and the conflict with traditional business, mainly in lower stages of maturity, are the main barriers to the development of e-business.

Table 5: Rank order of problems encountered at different stages of maturity

	1	**2**	**3**	**4**	**5**
Stage 1	Conflict with traditional business and e-business	Conflict with traditional trading partners	Reengineering business processes	Access to technical skills and expertise	Business-technology alignment

	initiatives				
Stage 2	Business-technology alignment	Reengineering business processes	Conflict with traditional business and e-business initiatives	Conflict with traditional trading partners	Coordination between business-technology people
Stage 3	Conflict with traditional trading partners	Reengineering business processes	Business-technology alignment	Conflict with traditional business and e-business initiatives	Coordination between business-technology people
Stage 4	Business-technology alignment	Conflict with traditional trading partners	Reengineering business processes	Uncertainty in aspects related to security	Cost of e-business
Stage 5	Cost of e-business	Uncertainty in aspects related to security	Conflict with traditional business and e-business initiatives	Reengineering business processes	Access to technical skills and expertise
Stage 6	Cost of e-business	Access to technical skills and expertise	Business-technology alignment	Reengineering business processes	Uncertainty in aspects related to security

In order to explore the relationship between each constraint and the maturity, in each one of the years, we used the Spearman Correlation test. Both the variables are ordinal. The maturity, is an ordinal variable with values from one to six (corresponding to the stage one to six) and each constraint is an ordinal variable with values from one to seven. The results of the test they are shown in table 6.

Table 6: Spearman Correlation test between Constraints and Maturity

		Maturity 2005	Maturity 2006	Maturity 2007
The technology existent is not the most adequate to e-business	Correlation Coefficient	-,280(**)	-,274(**)	-,346(**)
	p-value	,001	,001	,000
	N	138	138	138
Cost of e-business	Correlation Coefficient	-,132	-,103	-,137
	p-value	,122	,127	,109
	N	138	138	138
Uncertainty with aspects related to security	Correlation Coefficient	-,139	-,126	-,176(*)
	p-value	,134	,142	,039
	N	138	138	138
Conflict with traditional trading partners	Correlation Coefficient	-,365(**)	-,410(**)	-,450(**)
	p-value	,000	,000	,000
	N	138	138	138
Conflict with traditional business and e-business initiatives	Correlation Coefficient	-,447(**)	-,457(**)	-,496(**)
	p-value	,000	,000	,000
	N	138	138	138
Lack of senior management support	Correlation Coefficient	-,288(**)	-,346(**)	-,332(**)
	p-value	,001	,000	,000
	N	138	138	138
Managing e-business project	Correlation Coefficient	-,244(**)	-,260(**)	-,303(**)
	p-value	,004	,002	,000
	N	138	138	138
Reengineering business processes	Correlation Coefficient	-,331(**)	-,375(**)	-,392(**)
	p-value	,000	,000	,000
	N	138	138	138
Business-technology alignment	Correlation Coefficient	-,342(**)	-,320(**)	-,363(**)
	p-value	,000	,000	,000
	N	138	138	138
Access to technical skills and expertise	Correlation Coefficient	-,284(**)	-,246(**)	-,255(**)
	p-value	,001	,004	,003
	N	138	138	138
Coordination between business-technology people	Correlation Coefficient	-,241(**)	-,273(**)	-,312(**)
	p-value	,004	,001	,000
	N	138	138	138
Resistance to change	Correlation Coefficient	-,270(**)	-,315(**)	-,376(**)
	p-value	,001	,000	,000
	N	138	138	138

** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.

The test results lead us to conclude that in all the constraints, with the exception of *cost of e-business* and *uncertainty with aspects related to security*, the correlation with the maturity is significant at 1%. That is, the higher the maturity stage is, the less is the constraint, and the smaller the maturity stage is, the bigger is the constraint.

The strongest correlation is with *conflict with traditional business and e-business initiatives* and with *conflict with traditional trading partners.* We cannot establish a dependency with the *cost of e-business* variable and the *maturity* variable and with the *uncertainty with aspects related to security* and maturity. Although for this last constraint, in 2007, the correlation already is significant at 5%.

7. Conclusions

This study attempts to explore the constraints associated to e-business evolution in big enterprises. The study found that big enterprises are sensitive to e-business and that they had an evolution of maturity from 2005 to 2007. This evolution was probably caused by some initiatives launched by governments. In the last few years several initiatives have been taken and, at the end of 2005, the Technological Plan was launched. This plan aims at mobilizing the Portuguese society to overcome the modernization challenge the country has been facing in the last years. This plan, included in a broader plan - the National Action Program for Growth and Jobs, 2005-2008 - is based on three main axes:

Knowledge - To qualify the Portuguese for the knowledge society, fostering structural measures which aim at enhancing the average qualification level of the population, implementing a broad and diversified lifelong learning system and mobilizing the Portuguese for the Information Society;

Technology - To overcome the scientific and technological gap, reinforcing public and private scientific and technological competences;

Innovation – To boost innovation, helping the productive chain to get adapted to the challenges of globalization by means of the diffusion and development of new procedures, organizational systems, services and goods.

In 2006 the program "On-the-Spot-Firm" was launched. This program enabled the establishment of certain online companies in less than one hour. The European Commission acknowledged the relevance of this initiative and recently granted Portugal with the European Enterprise Award, on the category "Red Tape Reduction".

For the constraints associated with e-business, when we look in general, the results are satisfactory, but when the constraints are analyzed by the maturity stage, despite all being great companies (according to the amount of business) there are still companies in a low maturity stage. Some constraints are considered problematic, mainly *conflict with traditional business and e-business initiatives*, *conflict with traditional partners* and *reengineering business processes*. The constraints associated to change, are normally the most problematic. Gibbs et al. (2003) conclude that

for many European countries, cultural resistance to change and innovation is at the root of resistance to e-business. And Portugal, we believe is no exception.

Even so, in the last maturity stages the constraints are not problematic, the ones that appeared on the top are constraints to a great technological requirement, like costs, technical skills and security.

We also evidenced that the higher maturity stage is, normally, the minor is the constraint. With the statistical tests realized we can also conclude that the only constraints that are not dependent on the maturity are the *cost of e-business* and the *uncertainty with aspects related to security*, perhaps because the study was effectuated to the biggest Portuguese enterprises.

It would be interesting to do research by activity sector and also on SMEs, because perhaps the great part of the partners of the big companies are SMEs. And if SMEs will be in a low stage of maturity they will be able to influence the maturity stage of big companies.

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