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The influence of organizational factors on e-business use: analysis of firm size

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Abstract

Purpose – There are two purposes of this paper: first, to analyze the effect of size and other organizational factors (IT knowledge, IT external support and the level of employees' education) on the use of e-business; and second, to identify similarities and differences among these factors in micro, small, medium-sized and large enterprises.

Design/methodology/approach – The proposed model is empirically tested using data from the Sectorial e-Business W@tch survey. A logit estimation for the whole sample and for each type of firm size has been implemented on the use of e-business.

Findings – The study finds positive and significant effects of all the organizational factors on the intensity of e-business use. When analyzing the effect of size, it was found that medium-sized and large firms are more likely to use e-business more intensively. Although medium-sized and large firms are similar, some differences have been found between small and medium-sized firms. Only small firms use IT outsourcing as a key factor to use e-business.

Research limitations/implications – This study is based on a cross-sectional data set. Longitudinal research would be needed for comparing results over time. Future studies could focus on the use of each type of e-business technology, instead of a global measure of e-business use. Future research could also analyze the differences of e-business adoption rates among countries.

Practical implications – The paper concludes that small and micro firms are less likely to conduct e-business than medium-sized and large firms. An important influence on the use of e-business is workforce education, implying that training could substitute hiring IT employees. Outsourcing IT activities is a suitable strategy only for small firms.

Originality/value – The paper contributes to the literature on e-business with new evidence of the importance of size and human capital. Additionally, an analysis for each firm size has been done, which allows comparison of results.

Keywords E-business, Small to medium-sized enterprises, Information technology knowledge, Electronic commerce

Paper type Research paper

1. Introduction

The adoption of e-business technologies has influenced the way firms do business. Firms that use these technologies intensively have improved their competitive level and have increased the efficiency of their value chain. New technologies have also enhanced the effectiveness of the company-customer interface (Tapp and Hughes,

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2004). Because of the multiple benefits of conducting e-business, academic research has largely focused on analyzing the antecedents of its adoption (Wu *et al.*, 2003; Lin and Lin, 2008).

Firm size is one of the main determinants of adopting information and communication technologies (ICTs) (Teo and Pian, 2003; Lee and Xia, 2006). Small and medium-sized enterprises (SMEs) show different levels of adoption of e-business to large firms. Previous research has found mixed results about the relationship between size and the use of these technologies. On the one hand, it is suggested that larger firms will be more likely to use e-business because they have larger resources (Bell, 1995; Knight, 2001). It is also found that large firms are the only ones that carry out a real business transformation (Teo and Pian, 2004; Teo, 2007). On the other hand, other studies suggest that SMEs are more willing to innovate and experiment with new business processes than hierarchical large firms (Jutla *et al.*, 2002).

According to innovation theory, there are differences in adopting e-business depending on firm size. However, few studies have addressed this analysis (Teo, 2007; Hollenstein and Woerter, 2008). E-business adoption research has been largely focused on SMEs or large firms, with some exceptions. For example, Ihlstrom and Nilsson (2003) analyzed SMEs but ignored the microenterprise as a valid adopter of e-business. Microenterprise research is scarce, although it is the dominant form of smaller firms. Only a few exceptions have compared medium-sized companies to large firms (Teo and Pian, 2004; Teo, 2007; Hollenstein and Woerter, 2008). Recently, some evidence has been found that even within SMEs, a firm's size is an important factor that explains a wider use of different communication tools (Gabrielli and Balboni, 2010). Recent studies have also highlighted the differences between small and large firms when studying innovation (Rosenbusch *et al.*, 2011) and the concerns about not separating SMEs into micro, small and medium-sized firms (Merrilees *et al.*, 2011). However, instead of focusing on just one type of firm, we want to analyze all of them and compare the results. Due to the characteristics of small firms, it is necessary not only to distinguish large firms from others, but also to distinguish between micro-enterprises, small firms and medium-sized firms. Further research is needed to understand the differences in the adoption of e-business in these firms. One of the purposes of this paper is to provide some empirical evidence about how organizational factors influence the use of e-business for each type of firm, i.e. micro, small, medium-sized and large firms.

Different antecedents of e-business adoption have been studied. There are many studies that classify the factors that influence adoption. For an extensive and detailed review of the drivers of e-business, see Premkumar (2003), Fillis *et al.* (2004a, b), Aguila-Obra and Padilla-Meléndez (2006) and Parker and Castleman (2007, 2009). Among the most important of these drivers are organizational factors (Premkumar, 2003; Aguila-Obra and Padilla-Meléndez, 2006). Two main characteristics (the limited resources and the lack of skills and knowledge) differentiate small and large firms in conducting e-business (Longenecker *et al.*, 2003; O'Toole, 2003; Gutierrez *et al.*, 2009). These two factors have been widely used in the e-business literature. It has been found that the level of skill and knowledge of the owner is related to the firm's capabilities (Colombo and Grilli, 2010). Size and human capital are the organizational factors that are repeatedly significant in the literature. Thus, these two factors are the ones we focus on in our study.

The paper is structured as follows. In section 2, we introduce the importance of e-business technologies and their determinant factors and review previous research about this topic. We also explain the hypotheses we are going to analyze. The third section includes the data and methodology. In the fourth section, we present the results. Finally, we discuss the main results and implications of the study.

2. Theoretical background and hypotheses development

Different factors can affect the level or intensity of use of IT, and therefore the extent of e-business use. Recent studies suggest that external factors are not as important as internal factors (Teo *et al.*, 1997: Teo and Tan, 1998); some researchers focus their analysis only on the organizational factors (Lin and Lee, 2005; Aguila-Obra and Padilla-Meléndez, 2006). An explanation for the interest in organizational factors is that, although e-business has technical components, management issues are even more important because of the changes in organizational processes the firm has to address (Ash and Burn, 2003). Managing process innovation and increasing the learning capacity of workers have become a source of competitive advantage (Nonaka and Takeuchi, 1995). Moreover, developing organizational learning and knowledge management strategies have been considered key factors for the successful adoption of a technological innovation (Martin and Matlay, 2003). All these factors have been analyzed in the adoption and use of e-business by SMEs (Thong, 1999; Premkumar and Roberts, 1999; Mehrtens *et al.*, 2001; Lin and Lee, 2005) or by large firms (Lee *et al.*, 2007). However, empirical studies have seldom addressed the organizational factors influencing the level of e-business adoption for different firm sizes.

According to the literature, resources, skills and knowledge seem to be the most important differences between large and small firms. In this paper, we want to analyze the effect of three main internal factors that may be differentiators of the use of ICTs. Namely, we focus on the effect of size, IT knowledge and level of education as key organizational factors that may influence the use of e-business to a different extent depending on firm size.

2.1 Organizational size and e-business

Size is an important determinant facilitator of e-business adoption (Wu *et al.*, 2003; Nicholls and Watson, 2005). Larger firms are more likely to achieve economies of scale that would bring faster returns on their investment (Zhu *et al.*, 2003). Larger firms have more resources with which to bear the risks associated with the uncertainty of e-business investment (Wu *et al.*, 2003). Larger firms are found to have greater resources and can more easily allocate resources to try innovations (Palvia *et al.*, 1994).

Although some articles have found a positive relationship between size and the adoption of new technologies (Teo and Pian, 2004; Al-Qirim, 2007), other research has found the opposite effect (Fuentelsaz *et al.*, 2003) and others have concluded that size has does not have a significant effect (Mehrtens *et al.*, 2001; Hollenstein and Woerter, 2008).

We, hypothesize that:

H1. Larger enterprises will show a greater likelihood of conducting e-business than small and medium-sized enterprises.

2.2 IT knowledge and e-business

From a competence-based view, distinctive capabilities are the main source of firms' sustainable competitive advantages (Grant, 1996). The distinctive capabilities are related to the knowledge and skills of their employees and, especially, of their founders (Colombo and Grilli, 2010) and to innovation capability through superior management capabilities (Merrilees *et al.*, 2011).

IT knowledge is an important factor in the adoption of new technologies and increases the levels of a firm's technology adoption (McGowan and Madey, 1998; Thong, 1999; Robey *et al.*, 2002). Moreover, Tiessen *et al.* (2001) found that technical capability facilitated firms' e-business adoption. By contrast, firms that do not have IT expertise may be unaware of new technologies or may not want to risk adopting them. Cragg and Zinatelli (1995) identified the lack of technical expertise as a key factor inhibiting information systems (IS) evolution and sophistication.

The level of IT knowledge among employees is a key factor that drives the adoption of e-technology (Mehrtens *et al.*, 2001). Firms that have an e-business specialist are more likely to adopt IT innovations because they could develop their own website or use specific technologies for a better management of the value chain (Lin and Lee, 2005).

Individuals who have greater educational attainments and greater work experience are likely to have better specialized knowledge than other individuals (Colombo and Grilli, 2010). Specialized IT employees can be a resource used by large companies to increase their IT expertise. However, SMEs that have a lower level of resources are less likely to hire these employees. We expect that large firms will have more specialized employees than SMEs.

Another way to implement e-business without having internal skills and resources is through outsourcing (Drew, 2003). Outsourcing is becoming more popular and firms are more willing to adopt IT technologies if there are other firms that offer IT supporting services (Bahli and Rivard, 2003; Ramdani *et al.*, 2009). In general, a function is more likely to be outsourced if there is a lack of internal human resources for that specific function (Green, 2000; Wright, 2001; Hong and Zhu, 2006). The variety of ICTs requires a special knowledge that is provided by external partners. For SMEs, outsourcing is frequent (Gabrielli and Balboni, 2010). Outsourcing overcomes the lack of intellectual resources. (High initial costs in conducting e-business can act as a barrier, so outsourcing might be a suitable solution for SMEs; Taylor and Murphy, 2004).

We hypothesize that:

H2. IT knowledge will increase the likelihood of conducting e-business.

H3. Outsourcing IT activities will increase the likelihood of conducting e-business.

H4. Outsourcing will have a stronger effect on the likelihood of conducting e-business for small firms than for large ones.

2.3 Level of education and e-business

The knowledge of non-IT workers is another organizational factor that may help to conduct e-business. Implementing and understanding the importance and benefits of e-business technologies is resource-intensive, so SMEs may be unable to invest in them

(Johnston *et al.*, 2007). One of the main factors that has been suggested for the limited use of e-business, is the failure to see its benefits, such as the increase in sales, the cost reduction and a better customer relationship management (Pratt, 2002; Vlosky and Smith, 2003). The level of education of employees has been used as a metric for human infrastructure and skills (Jutla *et al.*, 2002). This characteristic makes a firm more innovative (Rogers, 1995; Bayo-Moriones and Lera-Lopez, 2007). Because the adoption of ICTs is a complex process, having highly educated employees makes it easier to train them for the use of these new systems and would increase their awareness of ICT benefits (Premkumar and Roberts, 1999). Some studies have found a complementary relationship between the level of firm innovation and the level of workers' education (Bresnahan *et al.*, 2002). It was found that the educational level of employees played an important role in the adoption of IT systems and technical skills are integrated by hiring both IT employees and educated non-IT employees (Lucchetti and Sterlacchini, 2004). Moreover, Bertschek and Fryges (2002) found that a firm's B2B use is positively influenced by the proportion of a firm's workforce that have a university degree.

Problem-solving and non-routine processes involved in the adoption of e-business technologies require more highly skilled workers (Carniero, 2000). We hypothesize that:

H5. Having more highly skilled employees will increase the likelihood of conducting e-business.

3. Methodology

The dataset used for this study comes from the August/October 2007 enterprise survey from e-Business W@tch (2007).

The key objective of e-Business W@tch is to gather information about the use of ICTs and their application for electronic business. The e-Business W@tch survey is an important tool for gathering relevant empirical data. The survey was carried out in different European countries and in the USA and analyzed two different industries:

(1) manufacturing; and

(2) retailing.

E-business data were collected through CATI interviews, usually with an IT manager or a senior professional in the IT department. In the case of larger companies, there are positions dedicated to e-business management, while in micro and small enterprises, the respondent is someone at the level of managing director or owner.

For this study, the sectors included are chemical, steel, furniture and retail. The countries included are the USA, France, Sweden, the UK, The Netherlands, Spain, Italy, Poland and Portugal. The dataset contains 3,272 responses.

3.1 Variables

The dataset contains information about the number of employees in the firms. SMEs are non-subsidiary, independent firms that employ less than a given number of employees; this number varies across countries. The most frequent upper limit designating a SME is 250 employees. Following the European Union classification (Organisation for Economic Co-operation and Development, 2005), we created different groups according to the number of employees:

- micro enterprises (fewer than ten employees);
- small enterprises (10-49 employees);
- medium-sized enterprises (50-249 employees); and
- large enterprises (more than 250 employees).

The dataset contains mainly qualitative information about the use of ITs. Firms were asked about the use of different types of ICTs, such as an intranet, extranet, website, ERP, SCM or CRM. These technologies were adopted in all industries. The survey also has some questions related to ICT requirements and skills. Firms were asked whether the company hires ICT practitioners to take care of the company infrastructure, or whether the company outsources its ICT maintenance, taking care of data backups and the percentage of employees with a college or university degree. With the first two questions, we generated two dummy variables (IS employees and external IT). These two variables, together with the percentage of employees with a college or university degree will be used as proxies of ICT knowledge.

Our dependent variable is the extent of conducting e-business. Firms were asked the following question about the extent of their use of e-business: "Would you say that most of your business processes, a good deal of them, some or none are conducted as e-business?". The values were then used to generate a binary variable "conducting e-business" that takes value of 1 if the firm conducts a good deal or most of its processes as e-business and 0 otherwise.

3.2 Control variables

Sector may also have an influence on the adoption of e-business (Nicholls and Watson, 2005). Retailers whose products better fit the online environment are more likely to adopt and use internet technologies (Nikolaeva, 2006).

The age of a business may also be an influence on the adoption of e-business. New firms are more likely to adopt a new technology than old firms because they are more flexible (Christensen and Rosenbloom, 1995). However, older firms usually have more technological experience; they can integrate new processes into their business more easily than younger firms (Evans, 1987).

Some multi-country studies have found that there is considerable variability in adoption from country to country (Fillis *et al.*, 2004a, b; Scupola, 2009). Some studies suggest that the level of engagement with the digital economy of American SMEs is lower than in the EU (Buckley and Montes, 2002). Some studies have also used data from the USA and the EU (Amit and Zott, 2001), but no comparison was made.

3.3 Analysis

According to the EU classification, the number and proportion of enterprises in each group is shown in Table I. As we expected, micro and large firms are the smallest groups and the greatest number of firms covered in the study are small and medium-sized enterprises.

To provide more insights into the use of ICT systems, we compared the proportion of firms that use intranet, extranet, website, ERP, SCM and CRM, depending on size. There are multiple e-business technologies that a firm can adopt. These e-business technologies are very different in use and requirements (Chong, 2006), so SMEs might be interested in implementing some specific ICT systems (Bordonaba-Juste and

Cambra-Fierro, 2009). Table II provides information about the proportion of firms that use each ICT and if there are differences in the use of each technology depending on firm size. Large firms use IT systems to a greater extent. This suggests a positive relationship between size and the use of ICTs. The main IT systems used by firms are websites, intranets and ERPs. More specifically, micro firms have a website (50 per cent) and only one in four uses an intranet. The same order is followed by small firms. Medium-sized enterprises also use ERP systems. Many larger companies have adopted most of the ICT systems that are related to employee, supplier and client management. However, micro and small firms have only implemented two ICT systems. As size increases, firms use different ICT systems to a greater extent. The contingency value suggests that the use of each technology is positively correlated with size.

Tables III and IV show some descriptive results related to the variables used in the analysis. For the dichotomous variables, we provide the proportion of firms that have a positive and a negative answer. For the continuous variables (age and percentage of employees with a college or university degree), we calculate the media and the standard deviation. As can be seen, fewer than one in four firms conduct their business processes as e-business, employ specialized IT employees or outsource their IT service. The average age of the firms is 31 years, but the standard deviation is very high so the data contain not only mature firms, but also young ones. The same conclusion can be drawn from the percentage of employees with a college or university degree. The results also show that most of the European firms conduct e-business and that more than half of the retailing firms do not conduct e-business.

Table V shows the correlation coefficients of the main independent variables. As can be seen, the correlation between ICT knowledge and educational level has a different level of impact depending on the size of the firms. For small and micro-enterprises, the percentage of employees with a college or university degree is much higher than for the other firms, and outsourcing seems to be more correlated to smaller firms than for any other firm size. These results suggest that there are differences depending on the size of the firms.

The contingency table (Table VI) suggests that there are differences in the extent of conducting e-business depending on the size of the firms. The results also suggest that hiring IS employees and outsourcing IT services also depend on firm size. Large firms are the group that conduct e-business in a greater proportion. However, it is interesting that 20 per cent of micro firms and 17 per cent of small firms conduct e-business.

The same result is obtained when examining the use of external IT service providers. As we can see, IT outsourcing is a strategy followed by all firm sizes. More than 40 per cent of micro, medium and large firms opt for this strategy. On the other

Number of employees	Number of firms	Percentage
1-9	333	10.2
10-49	1,593	48.7
50-249	1,038	31.7
250 +	308	9.4
Total	3,272	100.0

Source: Sectorial e-Business W@tch (2007)

Table I.
Number and proportion of firms according to size group

Number of employees	Use of intranet	Use of extranet	Website	ERP	SCM	CRM
1-9	26.5	8.3	49.8	5.9	6.8	8.6
10-49	33.8	10.0	74.6	18.7	11.1	14.1
50-249	57.3	20.5	88.7	40.8	21.8	27.3
250 +	76.5	31.4	90.9	54.4	42.0	41.44
χ^2-test (Pearson)	310.81^{***}	119.25^{***}	260.13^{***}	330.57^{***}	210.968^{***}	178.53^{***}
Gamma test	0.482^{***}	0.395	0.515^{***}	0.560	0.481^{***}	0.445^{***}
Number of observations	3,237	3,265	3,265	3,160	3,184	3,201

Notes: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.001$
Source: Sectorial e-Business W@tch (2007)

Table II.
Proportions of ICT adoption and extent of use by firm size

hand, hiring specialized IT practitioners is more usual in larger than in smaller firms. Comparing the percentage of employees with a college or university degree in each group of firms (see Table VII), it is found that the smaller firms in the retailing sector are those that have a greater proportion of employees with a university degree. This result confirms what we obtained in the correlation table. Manufacturing firms are large firms with a high number of less educated employees and a lower number of people who do office work.

4. Results

Table VIII shows the results obtained from the logit estimation for the whole sample and for each firm size. As can be seen, size has an impact on the likelihood of conducting e-business. Compared to small firms, medium and large firms are more

Table III.
Proportion of firms for each dummy and categorical variable

	Yes	No	Total
Dependent variable			
Conducting e-business	21.6	76.3	3,272
Independent variables			
IS employees	24.3	75.7	3,272
External IT	24.7	76.3	3,272
Sector (retail versus manufacturing)	35.2	64.8	3,272
Europe versus USA	87.0	13.0	3,272

Source: Sectorial e-Business W@tch (2007) and authors' own calculations

Table IV.
Median and standard deviation for continuous variables

	Median	SD	*n*
Age	30.81	29.11	2.839
Percentage of employees with a college or university degree	15.71	20.55	2.883

Source: Sectorial e-Business W@tch (2007) and authors' own calculations

Table V.
Correlation coefficients for main independent variables

	1	2	3	4	5	6	7	8
Conducting e-business	1							
Micro firms	0.012	1						
Small firms	0.11***	0.333***	1					
Medium firms	0.075***	0.232***	0.675***	1				
Large firms	0.098***	0.104***	0.301***	0.21***	1			
IS employees	0.22***	0.121***	0.231***	0.204***	0.215***	1		
External IT	0.088***	0.039**	0.13***	0.081***	0.066***	0.099***	1	
Percentage of employees	1.173	0.248	0.142	0.003	0.0011	0.006	0.072	1

Notes: Phi correlation calculated between dichotomous variables. Point-biserial correlation calculated between dichotomous and continuous variables. Pearson correlation has been calculated between continuous variables

Source: Sectorial e-Business W@tch (2007) and authors' own calculations

likely to adopt e-business. Furthermore, this likelihood increases with firm size, so we accept *H1*.

With respect to IT expertise, hiring ICT practitioners and having contracts with specialized ICT firms also have a positive effect on e-business adoption, so we accept *H2* and *H3*. As we expected, outsourcing IT services shows a positive effect only in small companies but no significant effect for medium and large firms. This result confirms *H4*.

Looking at the level of education, it is found that having a greater percentage of employees with a college or university degree also has a positive effect, so we accept *H5*. This positive effect is found for each firm size.

With respect to the control variables, younger firms and European firms are more likely to use e-business. The sector shows a non-significant effect. This means that the use of e-business does not depend on the sector in which firms operate.

Comparing the results of different firm sizes, we see that, for all of the sizes, employing ICT practitioners and skilled employees increases the probability of conducting e-business. However, the impact of hiring specialized IT practitioners is greater for micro and small firms than for medium and large firms. Furthermore, for micro and small firms the coefficient of IT knowledge is very similar. The same is true for medium and large firms when we compare the effect of ICT expertise. Additionally, outsourcing their IT services only helps small firms implement e-business. For the other groups, outsourcing is not important. We again obtain some similarities between micro and small firms and between medium and large firms. Outsourcing seems to have a positive effect for micro and small firms (only significant for the latter), and a negative but non-significant effect for medium and large firms. Looking at the

	Conducting e-business	IS employees	External IT
Micro	20.4	8.8	40.4
Small	17.2	14.0	28.7
Medium sized	26.4	36.8	40.6
Large	34.8	53.2	45.1
χ^2 test (Pearson)	60.83^{***}	357.07^{***}	59.63^{***}
Gamma test	0.229^{***}	0.571^{***}	0.146^{***}
Number of observations	3,202	3,239	3,229

Notes: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.001$
Source: Sectorial e-Business W@tch (2007) and authors' own calculations

Table VI.
Proportion of firms that conduct e-business, that hire specialized IT practitioners and that outsource IT service for each firm size

	Micro	Small	Medium sized	Large	F	Micro versus small	Small versus medium	Medium versus large
Percentage of employees with a degree	23.01	12.69	13.94	14.82	43.69^{***}	7.657^{***}	-2.077^{***}	-0.942

Notes: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.001$
Source: Sectorial e-Business W@tch (2007) and authors' own calculations

Table VII.
ANOVA of the percentage of employees with a college or university degree depending on firm size

Table VIII.
Effect of organizational variables on conducting e-business

Independent variables	Main model Coefficient	Micro[a] firms Coefficient	Small firms Coefficient	Medium-sized firms Coefficient	Large firms Coefficient
IT_Knowledge	0.962***	1.269***	1.269***	0.762***	0.770**
	(0.117)	(0.452)	(0.183)	(0.201)	(0.375)
External IT	0.263***	0.3665	0.594***	−0.049	−0.352
	(0.113)	(0.308)	(0.168)	(0.200)	(0.376)
Percentage of employees with a degree	0.014***	0.014***	0.013***	0.0133**	0.027**
	(0.002)	(0.003)	(0.003)	(0.005)	(0.011)
Small firms	−0.003				
	(0.205)				
Medium-sized firms	0.266***				
	(0.125)				
Large firms	0.493***				
	(0.205)				
Age	−0.004**	−0.008	−0.019***	−0.0008	−0.004
	(0.001)	(0.007)	(0.003)	(0.002)	(0.005)
Sector (retail versus manufacturing)	−0.132	N/A	−0.056***	−0.268**	0.3828
	(0.134)		(0.213)	(0.218)	(0.404)
Europe versus USA	0.780***	0.1331	0.790**	0.957**	0.4797
	(0.202)	(0.623)	(0.338)	(0.326)	(0.528)
Constant	−2.641***	−2.159***	−2.684***	−2.387***	−1.802***
	(0.222)	(0.673)	(0.359)	(0.358)	(0.617)
Log likelihood	−1,071.105	−133.26	−563.969	−361.147	−99.760
LR χ^2	175.88***	25.38***	91.42***	37.46***	15.51**
Number of observations	2,479	287	1,349	687	168

Notes: [a]Microenterprises are only found in the retail sector. *$p < 0.1$; **$p < 0.05$; ***$p < 0.001$
Source: e-Business W@tch (2007) and authors' own calculations

percentage of employees with a university degree, the level of education has a similar effect in all groups. It seems that, for all firms, having a high percentage of well-educated employees helps to increase the likelihood of conducting e-business.

In the control variables, we have also found some differences between firm sizes. Age has a negative and significant effect on the extent of e-business use only for small firms. Another difference between estimations is the effect of country. Small and medium-sized European firms have a greater likelihood of conducting e-business compared to American firms. Finally, the effect of the sector is only relevant in the small and medium-sized firms. Specifically, SME retailers seem to have a lower probability of conducting e-business than SME manufacturers.

5. Discussion

The aim of this research was to analyze how size and other internal factors influence the extent of conducting e-business. Although most ICT research has considered SMEs as a group of homogenous firms (Parker and Castleman, 2007), we have questioned that hypothesis, analyzing whether organizational factors have a different impact depending on size and differentiating between micro-enterprises, small firms, medium firms and large firms. The results suggest that the main aspects that influence the use of e-business are size, IT expertise and the educational levels of workers. Outsourcing is a strategy that is mainly used by small firms.

This research contributes to the ICT literature by increasing the empirical evidence available and filling a gap in terms of kind of firms analyzed. Therefore, this paper contributes new evidence of the influence of the internal drivers of e-business for different firm sizes, focusing on human capital factors.

Our results suggest that size is an important factor to take into account in conducting e-business. We have found that there are no differences in the organizational factors that influence the use of e-business in medium and large firms, confirming partially Gutierrez *et al.*'s findings (2009). However, there are differences between small and medium-sized firms. This means that, although most of the studies analyze these two groups together, our results highlight the convenience of investigating these firms separately.

Second, our results confirm that knowledge and IT expertise are important factors for conducting e-business (Premkumar and Roberts, 1999; Aguila-Obra and Padilla-Meléndez, 2006; Scupola, 2009). Specialized employees know the importance and benefits of conducting e-business, so they are less reluctant to implement the technologies and to conduct online business processes. This resource is important for all firm sizes. As we expected, and confirming previous results (Hong and Zhu, 2006), outsourcing is a strategy that helps small firms to overcome their lack of IT expertise. This result confirms the idea pointed out by Lacity and Willcocks (1998) that large firms may prefer to create e-business knowledge and culture inside the firm, which is something that the firm cannot achieve if it opts for outsourcing. However, although outsourcing does not influence the use of e-business in large firms, we have found that a great proportion of large firms outsource IT activities. The lack of influence of this variable on large firms means that they outsource their IT maintenance not only when most of the processes are conducted as e-business, but also when just a few processes are conducted online.

Third, our research provides some general evidence comparing Europe and the USA, an aspect that has hardly been analyzed. With some notable exceptions (see

Adam *et al.*, 2002), previous research has mostly studied only one country (Parker and Castleman, 2007). Although the positive impact of conducting e-business is widely known, the degree of diffusion and level of use may vary among countries. Confirming previous results (Buckley and Montes, 2002), US firms are less engaged with e-technologies and the digital economy. Our findings suggest that European firms are more innovative by conducting their business online.

Our findings allow us to provide some managerial implications. This paper highlights the link between workforce education and the use of e-business. This means that one way to increase e-business implementation and use in all types of firms is to increase their workforce's qualifications. Although we have analyzed the effect of hiring IT employees, training could be another alternative that might help the firm to create and develop an e-business culture. Outsourcing is a suitable strategy for overcoming knowledge and financial constraints; however, the balance between the benefits of outsourcing and the costs and risks involved in this strategy seems to be worthwhile only for small firms. Additionally, according to our findings, small and micro firms seem to have some problems implementing e-business in their processes. The proportion of these firms that conduct e-business is very low when compared to medium and large firms. From a policy maker's perspective, governments should focus on these firms to help them have more access to e-business technologies. Finally, European firms seem to be more innovative than US firms. Continuing in this line could make European firms more competitive in the market.

5.1 Limitations and future research

The main limitations of this study lie in the nature of the information and data used. First, we have used a general question to ascertain the level of conducting e-business. However, e-business implies the use of different ICTs. As we have discussed in the paper, depending on the industry and on firm size, there are some e-technologies that are more widely used. For example, almost all the firms use a website but an intranet or CRM are less widely used. Future research could address this issue, analyzing the adoption of each system and its antecedents. For example, some interesting contributions about e-CRM are Harrigan *et al.* (2008) and Kimiloglu and Zarali (2009).

Secondly, the data contain information from different countries, which may have different e-business adoption rates. We have only split the data between European and American firms so, in future research, we could analyze each European country separately to understand whether there are any differences between them.

The third limitation has to do with the cross-sectional nature of the data. We have no information about the evolution of the organizational strategies analyzed in this paper. Further research could carry out a dynamic analysis.

Finally, we have analyzed only some organizational variables. There could be additional variables that impact the extent of conducting e-business. Future research in this area should consider examining whether these groups of firms also differ in other internal factors such as financial resources, strategic focus or customer orientation. Additional research should consider examining not only the antecedents but also the consequences of using e-business. For example, an interesting question would be whether the use of e-business also has a different impact on performance depending on size.

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