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Analysis of the moderating effect of industry on online behaviour

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Abstract

Purpose – The main objective of the current work is to analyse the importance of the moderating effect of industry type on technological firms' behaviour and on the acceptance of online business management applications.

Design/methodology/approach – The conceptual model, based on a technology acceptance model (TAM), has been tested across structural equation modelling techniques. Thus, a multi-sample analysis has been developed to study the significance of the effect on industry. Data were collected using e-mail and post-mail survey.

Findings – The findings show that there are several factors influencing the acceptance process, such as ease of use and usefulness, but their effect depends on the industry in which the organisation operates. Likewise, greater experience in technology – which is the case for some sectors – facilitates the acceptance of IT.

Research limitations/implications – Managers should be aware that the synergies gained through their economic activity must be applied to adopt more new online business management applications, as this will help them to improve their competitiveness.

Originality/value – In contrast to other studies which analyse employee behaviour, this paper describes the technology acceptance process establishing the perceptions of the manager decision maker in the company, a perspective which increases the explanatory power of the models, and permits some of its weaknesses to be resolved. Moreover, the moderating effect of the industry has been empirically tested for a group of firms and variables which have rarely been analysed previously.

Keywords Online operations, Employee behaviour, Electronic commerce, General management

Paper type Research paper

Introduction

The importance of technological innovations as generators of value for firms is an idea that has generally been accepted in recent decades (Doms *et al.*, 1995; Aghion and Howitt, 1998), changing the manner in which the work is developed (McKenna, 1997; Jones and Kochtanek, 2002). However, despite the fact that technology has diffused considerably among firms, authors observe that the actual use that is eventually made of these technologies is still limited in some cases, or at best progressing very slowly (Weiner, 1993; Johansen and Swigart, 1996). Thus understanding the different motivations which encourage users to accept new technologies has been a priority for

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researchers and businessmen for several years (Chow, 1967; Bass, 1969; Moukdad and Large, 2001; Chau and Hu, 2002).

Among the theories of individual behaviour related to the question of new technology application, Davis's (1989) technology acceptance models (TAM) have been widely used. These models analyse the acceptance of different innovations and establish a connection between the users' perceptions and their final decisions, with these latter being measured by their intention to use and/or observed intensity of use (Davis, 1989; Adams *et al.*, 1992; Gefen and Straub, 2000; Lee *et al.*, 2003).

The majority of studies consider only the employee as end-user of each technology in their analyses, ignoring other key agents in the firm who actually make the decision to adopt an application. We cannot ignore the fact that in the workplace the decision to use one technology or another, one tool or another, does not correspond with the employees who will eventually apply it. The employees may give their opinions and even influence the decision making, but the actual acceptance is imposed from above by the management, since it affects the company as a whole (Hartwick and Barki, 1994; Holland and Light, 1999).

Thus the first objective of our study is to examine the behaviour of the organisation in the area of information technology (IT) acceptance, applying for this purpose a TAM model to test the influence of managerial perceptions on firms' use of online business management applications. We consider that these applications, apart from helping firms to carry out their basic business functions (customer relationship, financial accounting, budget management and after-sales service), also allow them to share information with the agents with whom they interact when carrying out their business activity, turning the flow of information bi-directional thanks to the use of the internet. The subject analysed in each firm is the agent responsible for deciding to accept new technology systems.

On the other hand perceptions about a technology – its usefulness, complexity, ease of use, etc. – may vary in the function of the user firm's economic activity. This may influence both the firm's predisposition to apply other innovations and the intensity with which it subsequently uses them. Hence it would be interesting to analyse whether managerial perceptions change in the function of the sector of activity, modifying the technological decisions for particular systems. With this objective in mind we compare two samples: one representing a population of IT-sector firms[1]; the other, a sample of firms from the "traditional" sectors[2]. In this way we can determine whether there are significant differences in behaviour depending on the economic activity carried out – consequently verifying the existence of the so-called "industry effect" – and calculate the importance of this effect in the technology acceptance process.

Theoretical framework

TAM

TAMs were developed from the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), which explains the individual's behaviour on the basis of factors such as beliefs and intentions. Compared to TRA, TAMs have focused on analysing technology, with all their research making use of two key constructs: perceived usefulness (PU) and perceived ease of use (PEOU) (Davis, 1989; Davis *et al.*, 1989). The initial development can be traced to the influence that these perceptions exert on

intention, which acts either as an endogenous variable and final concept to explain (Lin and Lu, 2000; Amoako-Gyampah and Salam, 2004), or as an intermediary of the final endogenous variable, which in this case would be intensity of use.

In general TAM research has focused on the analysis of technologies from the point of view of the employee as end-user, suffering from weaknesses which are difficult to overcome. The employees lack the authority to choose between tools (Hartwick and Barki, 1994; Holland and Light, 1999), so their perceptions cannot explain the firm's intensity of use of a particular technology. This coercive nature of the application of some innovations has previously been detected by other authors (Moore and Benbasat, 1991; Agarwal and Prasad, 1997), who try to resolve this problem by introducing a new variable, called "perceived voluntariness". The new concept refers to the possibility that a more senior person mandates the use of a technology, capturing those situations in which the employees act under their manager's coercion. Thus this variable can show the existence of measurement errors, deriving from the fact that the end-users' perceptions cannot explain the observed intensity of use. Nevertheless, we consider that it does not provide a tool for correcting the errors, so it does not actually solve the problem.

Our study examines the acceptance of online business management applications through a TAM model capable of testing the influence of company perceptions on the final use. To this end we concentrate on the opinion of the manager responsible for making technological decisions within the firm, analysing the company as a whole (Lu and Yeh, 1998; Riemenschneider *et al.*, 2003; Grandon and Pearson, 2004).

Industry effect

In recent years academics have been interested in analysing the link between business performance and new technology acceptance (Barua *et al.*, 1995; Chan, 2000; Subramanian and Nosek, 2001), with authors suggesting a number of variables that may moderate that relationship, such as environmental dynamism, or the firm's strategy, sector of activity or managerial structure (Li and Ye, 1999). The sector in which an organisation operates conceivably conditions the extent to which management systems are applied, so that the so-called industry effect must be taken into account as a possible explanatory factor of new technology acceptance (Goodacre and Tonks, 1995; Dyer *et al.*, 1998; Shore, 2001).

In this same vein various studies consider the economic activity carried out by the firm to be a key determinant of the intensity of use of e-commerce (Goodacre and Tonks, 1995; Chewlos *et al.*, 2001; Shore, 2001). On the one hand the environment (or sector) in which the firm competes influences the level of efficiency demanded of its management, so that more technologically developed sectors encourage the firms that belong to them to make more and better use of the appropriate computing applications (Dyer *et al.*, 1998). On the other hand such environments help to predict the technological development that firms aim to obtain when they accept technologies, such as for example electronic data interchange (EDI) (Neo, 1991).

Some studies have analysed the IT evolution of companies belonging to different sectors, concluding that firms from sectors like textiles are less technologically developed than the rest, while others, such as electricity companies, adopt vanguard technology in their production systems (Shore, 2001; Thatcher and Foster, 2002). Motiwalla *et al.* (2005) study the differences in behaviour among firms from three

different sectors in an attempt to identify which variables affect their behaviour in the e-business context. They conclude that carrying out a particular activity predisposes firms to develop similar behaviour patterns, at the same time as it modifies their level of IT acceptance.

Likewise, Premkumar and Roberts (1999) introduce the sector's competitive pressure as a determining factor in the adoption of a larger number of computing systems. They reason that carrying out a more competitive economic activity from the technological point of view drives firms to apply increasingly sophisticated tools, which also generates an important investment of resources in technology (Gatignon and Robertson, 1985; D'aspremont and Jacquemin, 1988). This is why firms engaged in information-intensive activities are more likely to accept new IT, largely because using IT generates greater strategic benefits for them (Yap, 1990; Min and Galle, 2003). Hence technology has become a strategic necessity for firms belonging to sectors such as telecommunications or distribution (Premkumar and Potter, 1995).

Despite the above, the relation between economic activity and technological development is not unanimously accepted in the literature, since other studies conclude that there are no significant differences in IT adoption between the services and manufacturing sectors. Thus there can be no generalised, significant industry effect at the global level (Teo and Ranganathan, 2004).

The current work proposes testing for the existence of an influence called industry effect which moderates the perceptions and use of online business management applications among Spanish firms, concluding that one set of firms will be more predisposed to accept sophisticated technology systems.

Objectives and hypotheses

The objective of this work is, on the one hand, to analyse Davis's (1989) TAM in two samples of firms differing in the function of their sector of activity; and on the other, to determine the importance of the industry effect. For this purpose we propose two sub-goals.

The first of these is to determine the relationships of TAMs in each activity sector. For this we have adapted Davis's (1989) TAM to our context of analysis, in which we analyse the agent making the strategic decisions to accept new management systems, rather than each of the employees separately.

The technology analysed is online business management applications, chosen because firms' investment in these tools has become relatively important, and because this technology forces firms to change their traditional way of doing business (Lee, 2001). In order to achieve this objective we have formulated the following hypotheses, which are shown in Figure 1.

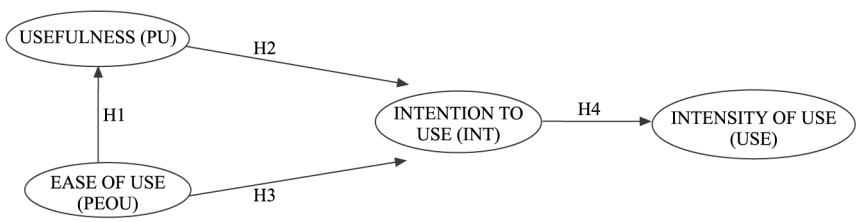

Figure 1.
Research TAM model

The relationship between PEOU and PU varies according to the context and the tool analysed, and it was found that some research supports it (Liaw and Huang, 2003; O'Cass and Fenech, 2003; Shih, 2004; Shang *et al.*, 2005) and other research rejects this relationship (Agarwal and Prasad, 1999; Hu *et al.*, 1999; Venkatesh, 1999; Venkatesh and Morris, 2000). Thus, the direct effect between them should be analysed for the business management applications:

H1. The firm's perception of the ease of use of online management applications positively influences its perception of the tool's usefulness.

It seems, as Davis *et al.* (1989) point out, that the influence of a belief such as usefulness on a subject's intention to use contradicts the underlying theories of the TRA models, but researchers have developed a substantial body of theory on the question, and it has been demonstrated empirically, so we can be confident that there is a direct link between both variables (Brinberg, 1979; Igbaria, 1993; Liaw and Huang, 2003):

H2. The firm's perception of the usefulness of online management applications positively influences its intention to use the tool.

In contrast to Agarwal and Prasad's (1998) findings, in this work we try to verify that PEOU increases the firm's intention to use management systems:

H3. The firm's perception of the ease of use of online management applications positively influences its intention to use the tool.

Finally, our model proves that the intention or willingness to apply online management applications directly precedes its subsequent intensity of use (Agarwal and Prasad, 1997; Chen *et al.*, 2002, among others):

H4. The firm's intention to use online management applications positively influences its real intensity of use of the tool while carrying out its business activity.

The second objective is to determine if there are significant differences in the TAM analysed, depending on the firm's sector of activity. i.e. contrasting the so-called "industry effect" and measuring its importance in the technology acceptance process.

Since the theoretical approach taken here assumes that the economic activity carried out by the firm may condition its perceptions and concerns with regard to IT, our final objective is to analyse whether the conclusions associated with technology acceptance depend on an effect linked to the sector of activity (Goodacre and Tonks, 1995; Chewlos *et al.*, 2001; Shore, 2001; Thatcher and Foster, 2002). This influence acts as a moderator of the firm's technological development, conditioning the firm's acceptance of online business management applications.

In consequence, we have developed an inter-sectorial study through a multi-sample analysis which contrasts the significance of the differences between companies. We suggest that the relations captured in the above hypotheses (*H1-H4*) will be altered depending on the firm's sector of activity. Thus the following hypotheses are proposed:

H5. The industry effect alters the relation between the PEOU of online management applications and its perceived usefulness.

H6. The industry effect alters the relation between the PU of online management applications and the intention to use it.

H7. The industry effect alters the relation between the PEOU of online management applications and the intention to use it.

H8. The industry effect alters the relation between the intention to use online management applications and the intensity of its use.

Methodology

We built two independent samples of firms differing in function within their industry. The first group consists of firms belonging to a sector that has become increasingly important in the economy in recent years[3], but which despite this has not yet been studied from this perspective – the new technology or IT firms. Given the nature of their business, these firms are in direct contact with technology, so their perceptions of simplicity and efficiency will presumably differ from those of firms from other sectors. Computing firms are also likely to implement online management applications at a higher rate. The second group of firms consists of the three major sectors of the economy (primary, industrial and services), and brings to the research the view of industries that have a "traditional" productive structure.

The technique employed to obtain the information was the survey, with questionnaires sent by post and e-mail to a group of IT-sector firms (449 firms) and a sample made up of 1,256 Spanish firms from the remaining sectors. After the refinement process 109 valid cases were obtained from the first group of firms, and 110 from the second. The fieldwork took place in November 2004. We should highlight the number of responses achieved, considering the difficulty of obtaining responses from this type of subject (Baldauf *et al.*, 1999; Min and Galle, 2003; Bennet *et al.*, 2005). As is the case in similar research (Lu and Yeh, 1998; Riemenschneider *et al.*, 2003; Grandon and Pearson, 2004), the gathered data refer to the firm as a whole and not to each of its employees, so the questionnaires were directed at the managers responsible for making decisions about the firm's technology use. The managers were requested to respond in their firm's name.

The endogenous variable (intensity of use (USE)) consists of different online management applications, so the managers' perceptions of them must involve the same ITs, including the main business functions capable of automation: customer relationship management, financial accounting, budget management and after-sales service (see Table I).

Indicators included in the questionnaire (see Table I), are those that have been used most often in previous TAM studies (review carried out by Legris *et al.*, 2003). In all cases the variables analysed were measured using seven-point Likert scales, in which 1 indicates "completely disagree" and 7 "completely agree".

Empirical analyses and results

In this section, we present the empirical results obtained from our estimations of the proposed model for each of the two samples.

	Item	Emp. analysis[a]
Intensity of use		
Customer relationship management program is intensively applied in the performance of the activity	USE_1	Accepted
Financial accounting program is intensively applied in the performance of the activity	USE_2	Accepted
Budget management program is intensively applied in the performance of the activity	USE_3	Accepted
After-sales service program is intensively applied in the performance of the activity	USE_4	Rejected
Perceived ease of use		
In general, customer relationship management program is easy to use in the performance of the activity	PEOU_1	Accepted
In general, financial accounting program is easy to use in the performance of the activity	PEOU_2	Accepted
In general, budget management program is easy to use in the performance of the activity	PEOU_3	Accepted
In general, after-sales service program is easy to use in the performance of the activity	PEOU_4	Rejected
Perceived usefulness		
Customer relationship management program is useful for the performance of the activity	PU_1	Accepted
Financial accounting program is useful for the performance of the activity	PU_2	Accepted
Budget management program is useful for the performance of the activity	PU_3	Accepted
After-sales service program is useful for the performance of the activity	PU_4	Rejected
Intention to use		
I intend to apply business management programs in the course of my activity in the coming months	INT	Accepted

Note: [a] Results obtained from the empirical analysis

Table I.
Measurement scale

Preliminary analyses

First, we carried out exploratory analyses[4] to allow us to approximate the model's underlying structure, as well as to improve its internal consistency and guarantee the unidimensionality of the scales.

The initial reliability studies focused on eliminating all indicators with an item-total correlation under 0.3 (Nurosis, 1993), or those whose exclusion raises the value of the Cronbach alpha (the limit set for exploratory studies is 0.6). On this basis we eliminated for both samples the items about after-sales service software from the factors USE, PU and PEOU (see Table I). Table II shows the final Cronbach alpha values. The item-total correlation exceeds the threshold in all cases, so we did not eliminate any other indicator.

Likewise, after this first refinement an exploratory factor process was undertaken, using varimax rotation when necessary, as the literature advises (Kaiser, 1974; McDonald, 1981; Hair *et al.*, 1999). In all cases (PEOU, PU, INT and USE) one construct

is extracted through the eigenvalue criterion, the factor loadings exceed 0.7, and the variances explained for the constructs exceed 50 per cent (Table II).

In order to guarantee the reliability and validity of the scales, the second step was a confirmatory factor analysis for each model (IT sector and remaining sectors) following the development methodology proposed by Hair *et al.* (1999)[5].

Thus we progressively eliminated the indicators failing to satisfy one or more of the criteria proposed by Jöreskog and Sörbom (1993)[6]: weak convergence (Steenkamp and Van Trijp, 1991), strong convergence (Steenkamp and Van Trijp, 1991) and explanatory coefficient ($R^2 < 0.3$). All the indicators of our study achieve acceptable values in the three criteria, so that we tested the measures of fit of the measurement model. The values obtained from this exceed the optimal levels (Table III), so the last step before the structural analysis was to study the reliability and validity of the constructs (Churchill, 1979; Gerbing and Anderson, 1988).

Following the initial testing of Cronbach's alpha, the reliability of the scales was tested using the composite reliability coefficient (CRC) (Jöreskog, 1971). The results achieved exceeded in all cases the recommended limit of 0.6 (Bagozzi and Yi, 1988): in the traditional industries 0.660, 0.733, and 0.685, and in the IT sector 0.777, 0.787, and 0.773, for USE, PU and PEOU, respectively.

With regard to validity, this is divided into convergent validity and discriminant validity. The first of these is satisfied, since we find that the standardised loadings exceed 0.5, and also they are significant at the 99 per cent confidence level (Steenkamp and Van Trijp, 1991). The discriminant validity is established by calculating the confidence interval between different factors, and verifying that 1 is not included in any of them (Table IV).

Results of TAM by sector

The next step was to analyse the causal relations postulated in the working hypotheses for both samples. Having applied structural equation techniques, we find that the model (Figure 1) has a good fit, since the majority of indices achieve the optimal theoretical values (Hair *et al.*, 1999) (Table V).

Table II.
Exploratory analyses

	Cronbach alpha		% variance explained	
	Traditional sectors	IT sector	Traditional sectors	IT sector
Intensity of use (USE)	0.722	0.677	65	62
Perceived usefulness (PU)	0.765	0.723	69	65
Perceived ease of use (PEOU)	0.737	0.694	66	63

Table III.
Goodness-of-fit indices for confirmatory factor analysis

	Absolute fit				Incremental fit		
Indicator	Recommended value	Traditional sectors	IT sector	Indicator	Recommended value	Traditional sectors	IT sector
P de X^2	$p > 0.05$	0.0312	0.064	NFI	>0.9	0.958	0.979
GFI	>0.9	0.936	0.970	NNFI	>0.9	0.954	0.998
MFI	>0.9	0.913	0.990	CFI	>0.9	0.979	0.997
RMSEA	<0.08	0.049	0.000	CFI robust	>0.9	0.984	0.950

Variables	Traditional sectors Correlations	Traditional sectors Confidence intervals	IT sector Correlations	IT sector Confidence intervals
USE-PU	0.91*	(0.831-0.991)	0.74*	(0.616-0.874)
USE-PEOU	0.728*	(0.582-0.874)	0.80*	(0.705-0.925)
USE-INT	0.64*	(0.457-0.837)	0.69*	(0.528-0.864)
PU-PEOU	0.62*	(0.448-0.796)	0.63*	(0.490-0.770)
PU-INT	0.55*	(0.366-0.746)	0.62*	(0.512-0.812)
PEOU-INT	0.45*	(0.228-0.672)	0.51*	(0.310-0.710)

Note: * Significant at 99 per cent level

Table IV.
Validity analysis

Indicator	Traditional sectors Value	IT sector Value
Absolute fit		
P de X^2	0.035	0.009
GFI	0.900	0.910
MFI	0.903	0.892
RMSEA	0.087	0.059
Incremental fit		
NFI	0.936	0.939
NNFI	0.918	0.935
CFI	0.958	0.967
CFI robust	0.965	0.976
Parsimony fit		
X^2/gl	2.67	2.083

Table V.
Goodness-of-fit indices of causal model

The four hypotheses are supported in both samples (traditional sectors and IT sector), since all their coefficients are significant and positive (Table VI). Likewise, we should also analyse the indirect effect of ease of use through the variable usefulness. Here we find that the global effect of PEOU increases considerably, from 0.32 to 0.58[7] in the case of the traditional firms, and from 0.43 to 0.73[8] for the IT-sector firms. Thus we can say that for IT firms the perception of ease of use is more important than the

	Traditional sector Standardised coefficient	*t*-student	Hypothesis	IT sector Standardised coefficient	*t*-student	Hypothesis
H1: PEOU → PU	0.38*	2.271	Satisfied	0.56**	3.84	Satisfied
H2: PU → INT	0.68**	4.977	Satisfied	0.53**	4.925	Satisfied
H3: PEOU → INT	0.32**	3.002	Satisfied	0.43**	4.122	Satisfied
H4: INT → USE	0.97**	5.361	Satisfied	0.89**	7.39	Satisfied
	R^2 (INT) = 74 per cent	R^2 (USE) = 95 per cent		R^2 (INT) = 72 per cent	R^2 (USE) = 79 per cent	

Notes: * Significant at 95 per cent level; ** Significant at 99 per cent level

Table VI.
Results of structural model for both sub-samples (value of β and its *t*-statistic)

perception of usefulness (Table VI), since PEOU's global influence (0.73) exceeds PU's effect on intention (0.53). However, for the traditional companies this global effect is not as strong as perceived usefulness (0.58 for PEOU, compared to 0.68 for PU).

It is important to note that the variables introduced in both models achieve considerable explanatory power of intensity of use ($R^2 = 0.95$ for the traditional sectors, and $R^2 = 0.79$ for the IT sector).

Analysis of industry effect

Having studied the TAM model of each sector, we found that, although in both cases the proposed model was complied with, there were differences in the intensity of the relations depending on the sector studied, so the next step was to test the significance of these differences by a multi-sample analysis.

This analysis shows whether the restrictions considered in *H5-H8* are associated with a significant Lagrange Multiplier test ($p < 0.05$), which would mean that we must reject the equality of the groups and hence accept that the industry effect does have a significant influence.

Before analysing each relation we checked that the fit indices for the multisample model achieve optimal values: CFI 0.921; IFI 0.923; RMSEA 0.096; X^2/df 3.8. From the results obtained (Table VII), we first see that *H5* and *H7* are supported because they are stronger for the IT-sector firms. With regard to the influence of perceived usefulness on intention to use (*H6*), traditional firms attribute greater importance to PU than IT-sector firms. Moreover, the two groups of firms differ significantly in the effect of intention to use on intensity of use (*H8*).

Our study verifies the existence of the industry effect, which alters the firm's behaviour, due to the different valuations observed in firms' perceptions of ease of use, usefulness and intention to use.

Conclusions

The current work has aimed to analyse the acceptance of online business management applications and the importance of the industry's moderating effect on firms' behaviour. For this purpose, the study was divided into two samples differentiated in the function of the economic activity undertaken: on the one hand, IT-sector firms; and on the other, firms belonging to other sectors, which we have labelled "traditional" companies. In this way the so-called industry effect captures the influence of the firm's economic activity on the acceptance of new online business management applications.

First, we should remark on the elimination of the indicators for after-sales service software in both samples. This is due to that fact that firms have adopted such systems less than the online application for other functions, with a significantly inferior rate of

Table VII. Results of multisample analysis

	Non-stand. coefficient				
	Traditional	IT	X^2 diff.	Prob.	Hypothesis
H5: PEOU → PU (diff. between both groups)	0.406	0.625	3.654	0.056	Satisfied
H6: PU → INT (diff. between both groups)	0.917	0.723	14.656	0.000	Satisfied
H7: PEOU → INT (diff. between both groups)	0.462	0.671	14.686	0.000	Satisfied
H8: INT → USE (diff. between both groups)	0.791	0.813	4.212	0.042	Satisfied

implementation[9]: only 26.61 per cent of traditional firms and 48.63 per cent of IT firms use this technology, compared with 75.23 per cent and 86.24 per cent for customer relationship management, 79.81 per cent and 77.98 per cent for financial accounting, and 46.80 per cent and 55.96 per cent for budget management. The after-sales function is not a priority in most firms, so the corresponding system is barely implemented compared with those for other basic tasks. This inequality is emphasised by the elimination of all its indicators (usefulness, ease of use and intensity of use).

Another point to note is the explanatory capacity of the models proposed, since the one modelling the traditional firms captures fully 95 per cent of the variations in intensity of use, while the model for the IT firms captures 79 per cent. If we compare these coefficients with those obtained in other studies (Lee *et al.*, 2003; Wu *et al.*, 2006), they support our belief that analysing the organisation at the global level is more appropriate. As we have already explained, employees' acceptance of IT can be the result of managerial coercion, so the correlation of their perceptions with intensity of use may be practically non-existent.

The results allow us to confirm the hypotheses proposed in both samples (*H1-H4*). Hence, independently of the sector, perceived ease of use influences the perceived usefulness of such applications. Likewise, the perceived usefulness and ease of use of such tools modifies the firm's intention to use them, so that the greater the perceived simplicity (PEOU) in using online management systems, or the greater their usefulness, the stronger is the firm's intention to accept them. Finally, we find that the stronger the intention to apply a technology, the greater its eventual use by the firm in the process of its normal business activities.

We should also bear in mind the indirect influence of perceived ease of use on intention to use via perceived usefulness (see [7] and [8]). Thus, while the most important motivation in traditional industries is usefulness, in IT-sector firms perceived ease of use takes on greater global importance than usefulness, thanks not only to its direct effect but also to the indirect effect it exerts via PU.

The explanation for this difference relies on the fact that firms with greater knowledge of applying IT take for granted the usefulness of the online applications and are motivated mainly by their ease of use. The rest of the firms give less importance to the ease of use of the online systems, perhaps because they contract a support service with a company expert in these tools; so, they base their decisions on the usefulness that they expect to gain by accepting the technology.

Having confirmed the first set of hypotheses, we want to test whether the differences which have arisen in the previous causal analysis are significant, and whether they are derived from the industry effect. To this end we have used a multi-sample analysis.

Our results (see Table VII) show that the industry effect causes IT firms to give more importance to the ease in the use of the applications than the traditional firms, probably because of their greater familiarity (and knowledge) in using such tools. On the other hand the traditional firms give a higher value to PU, considering that the efficiency gains they can obtain by applying these management applications justify their acceptance. Finally, the economic sector to which the organisation belongs also alters the influence of intention to use on intensity of use, with slight but significant differences between both samples being observed.

Therefore, the industry effect does alter the firm's perceptions about the technology, and it also modifies the rate of acceptance of online management systems. Previous experience of the IT sector leads to significant differences in the intensity of use, because such firms consider it essential to automate their management functions.

Managerial implications and future research lines

The strategic implications of this work centre mainly on the importance of the industry effect on the firm's acceptance of new technologies. Thus, when a software application is regarded as useful for carrying out a particular business function and at the same time is easy to use, the organisation will initially take the decision to accept it, and the technology will spread to all the departments.

However, the importance of both variables changes depending on the experience in IT of the adopting firm. Thus, those firms with less experience (in our analysis, those belonging to the traditional group) value the perceived usefulness to a greater extent, basing their technology policy on the efficiency gains they expect to obtain by the implementation of a new application. Moreover, the perceived ease of use acquires less importance possibly because they still do not know all the difficulties that they will have to face during the use of those applications.

On the other hand those firms with more experience in IT consider the ease of use of the online management systems a key factor in intensifying their use, because their experience of such IT tools makes them evaluate more accurately the barriers and the costs associated with the implementation. Nevertheless, they consider the usefulness of the online business applications a less relevant characteristic than PEOU in the decision to use. The regular use of information technologies makes the advantages associated with any of them implicit, so firms with more experience in IT take for granted many benefits that are, in contrast, highly appreciated by firms lacking in such experience (traditional sectors).

Therefore, it is very important for the firms that commercialise these applications to adopt a marketing perspective by considering the different levels of experience of the potential users. First, to those potential users with less knowledge, they must demonstrate the usefulness of the new systems in order to increase the initial level of acceptance. Second, when the company has acquired some technological experience, marketers of these tools should increase the perception of ease of use, which will be the most valued characteristic at that moment (as is the case of the IT firms in our research).

We suggest that all-sector companies invest in training and information for their employees regarding these new applications, irrespective of their position in the firm. The training may deliver an increase in the perception of ease of use, a reduction in the difficulties encountered in their use, familiarity with the technology, and the achievement of a routine use that will result in some economies of experience. Likewise, it is important that all the staff, from top management to the lowest level of employees, are aware of the benefits inherent in the technology. For the top managers, it is crucial because they will make the decision to adopt an application; their support is a key factor in the adoption of any innovation. For the rest of the employees, it is important because as all of them are going to use IT they will have to adapt to it, they will receive its benefits, and their involvement will be the key to its success.

In particular, for firms with less experience in IT (due to their activity or to their corporate culture) we would recommend that they differentiate themselves by investing in online innovations and developing a technological behaviour similar to those firms with higher experience (such as IT firms). Thus, the existence of an environment (called traditional) that is less competitive in terms of the application of such systems, should not persuade these firms to ignore the potential benefits to be gained from applying IT. On the contrary, they should regard innovations as an opportunity to improve their business and generate greater added value. At the same time, accepting management systems allows these firms to undertake numerous tasks more efficiently, resulting in significant savings in both time and costs. These savings could help sectors of the economy that are currently stagnating to develop in the future.

Likewise, managers should be aware that competing in a technologically developed environment – which is the case for sectors linked to IT – brings some contradictory consequences. On the one hand, it facilitates the achievement of a greater knowledge for the application of present and future IT, but on the other, the greater rivalry that exists in the sector obliges them to be aware of every innovation, to adopt it as soon as possible and, to use it efficiently in order to get the benefits from it sooner than their competitors.

The existence of different levels of technological development, according to the sector of activity, leads us to assume that there is not a uniform information society. The acceptance of one system depends on the implicit characteristics of the potential users. In this context, public administration should try to diffuse IT through the less developed industries, not only subsidising its implementation, but also investing in training courses. The diffusion of knowledge will allow the achievement of a homogeneous level of technological implementation and also increase social welfare[10]. Moreover, this knowledge, extended through all society, may create a bulk of qualified workers which generates more labour flexibility.

With regard to the limitations of this work, we should mention the use of cross-sectional data. This means that our analysis lacks a temporal dimension, and so we cannot observe the evolution in firms' perceptions relating to technology acceptance. Thus, as future lines of research, we intend to test the model presented here during a continuous period, thereby determining the variation in the importance of perception in successive years. Likewise, we shall extend the business TAM model, with the aim of determining the key antecedents of PEOU and PU usefulness. This new research should allow us to understand firms' behaviour through different precursor concepts of IT acceptance, and also in differentiating the function of economic activity undertaken.

Notes

1. The firms are from codes 72 and 73 according to the Spanish industry classification system (CNAE), equivalent to SIC.
2. In other words, activities with an output not included within IT.
3. In 2004, according to the Spanish Ministry of Science and Technology, 6 per cent of the EU's gross domestic product (GDP), 9.4 per cent of the USA's GDP, and 7.8 per cent of Japan's GDP corresponded to the ICT sector.
4. We used the statistics package SPSS/PC version 12.0 for Windows.

5. We used the statistics package EQS version 5.7b, using the robust maximum likelihood estimation, as this does not require that samples comply with the normality properties (Chou *et al.*, 1991; Bentler, 1995).
6. The weak convergence criterion eliminates items not presenting significant factorial regression coefficients (Steenkamp and Van Trijp, 1991). The strong convergence criterion implies rejecting non-substantial indicators – i.e. those whose standardised coefficient is less than 0.5 (Steenkamp and Van Trijp, 1991).
7. 0.58 (Global effect) = 0.328 (Direct effect) + 0.38*0.68 (Indirect effect via PU).
8. 0.73 (Global effect) = 0.43 (Direct effect) + 0.56*0.53 (Indirect effect via PU).
9. These data have been collected from our questionnaire.
10. Thus, Information Society and Technologies is the second Thematic Priority of the 6th Framework Programme of the EU.

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