



Organizational factors affecting Internet technology adoption

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Abstract

Purpose – To explore the factors that affect the implementation of Internet technologies and to what extent the size of the company, as an organizational factor, influences that process.

Design/methodology/approach – According to the innovation adoption theory, it was found that Internet adoption in firms is a process with different stages where a company is in one of a number of development stages depending on some variables related to organizational factors, such as the availability of technology resources, organizational structure, and managerial capabilities. The paper identified empirically different stages in the Internet adoption process and linked them with those factors. It analyzed questionnaire-based data from 280 companies, applying factor and clustering analysis.

Findings – Four main groups of companies were found according to their stage in the adoption of Internet technologies. The paper established that, contrary to the literature suggestions, the size of the company does not have any effect on the availability of these Internet technologies but it does for managerial capabilities. The smaller the size of the firm, the greater the possibilities of using external advice in adopting Internet technologies, because small firms usually have fewer managerial capabilities. In the mean time, a more sophisticated technology development was identified in larger firms.

Research limitations/implications – As in all empirical research, the characteristics of this study limit the applicability of the findings. First, the study concentrated in businesses that already were using Internet technologies, because they have registered their domain name. Consequently, the study firms that did not have a Spanish domain name were omitted; however, firms could have a “.com” or “.org” domain name and still be Spanish firms. Also, other companies without any domain name on the Internet were not included in the study. Second, the study applied a classification analysis with exploratory purposes about the characteristics of the business according to the cluster of pertinence. Nevertheless, a longitudinal study could be more useful explaining whether or not these companies follow the process described. Third, a more detailed questionnaire with more specific questions could be more helpful to gain a better description of the phases of a more sophisticated technology adoption (i.e. the acceptance/routinization and infusion stages).

Practical implications – This paper has some relatively important managerial implications. First, the fact of having a domain name does not mean that the companies are in the acceptance/routinization phase and even less in the infusion phase. From this, the paper identified how the majority of firms were in the so-called initial stages of the Internet technologies adoption process. Second, it is possible that managers who do not perceive the strategic value of these technologies are managing the majority of these firms. Third, as more businesses implement these technologies in their processes, presumably more competitive pressure will exist to adopt Internet technologies.

Originality/value – This paper contributes to the research into the organizational factors that affect Internet adoption.

Keywords Internet, Innovation, Companies, Communication technologies, Spain

Paper type Research paper

1. Introduction

Internet technology has a direct impact on companies, customers, suppliers, distributors and potential new entrants into an industry (Porter, 2001). In some



cases, Internet technology adoption and use contribute to the creation of competitive advantages (Del Aguila-Obra *et al.*, 2002). Far from having all the related issues resolved, some questions arise when thinking of particular uses of this Internet technology, for either internal or external purposes. In the meantime, the adoption of information technology (IT) by firms is a question that has been analyzed from different points of view and theoretical perspectives, such as transaction cost economics, population ecology, or resource dependence theory (Iskandar *et al.*, 2001). However, there is a shortage of specific research analyzing the factors that influence Internet technology adoption by firms. Moreover, if we mainly consider one stage of the innovation process (the implementation stage), the scarcity of studies is more evident. Innovation adoption theory (Rogers, 1983) provides an appropriate theoretical framework to explain the innovation adoption process in organizations and to describe what factors influence it, as well as to identify the phases within this process.

In this paper, we are interested in analyzing the effect of organizational factors in the implementation stage of the adoption process of Internet technology (Damanpour, 1991). Within this stage, we aim to explore and analyze the size-related characteristics of the different phases that, according to the theory and our empirical study, the organizations pass through: initiation, adoption, adaptation, acceptance, routinization and infusion.

Consequently, the main purpose of this study is to explore what the factors are that affect the implementation of Internet technology and to what extent the size of the company, as an organizational factor, influences that process.

The paper continues with a literature review of technology adoption theory and of the main findings of the research carried out on Internet technology adoption. An empirical study on Spanish firms is also presented. A discussion about the main findings follows, including the limitations of the study and some managerial implications. Some preliminary conclusions finish the paper.

2. Literature review

Internet technology adoption can be considered as a package of innovations (Prescott and Conger, 1995; Daniel *et al.*, 2002). Regarding this innovation, the process of adoption by businesses and the factors that influence the adoption, as an IT, have been studied in the literature.

In general terms, the innovation adoption process in firms has the following phases (Rogers, 1983):

- agenda-setting;
- matching;
- redefining/restructuring;
- clarifying; and
- routinizing.

These stages can be summarized in two phases, according to Damanpour (1991):

- (1) initiation; and
- (2) implementation.

In the first of these – initiation – the firm considers the need to introduce the innovation, it searches for information, training is carried out, resources are proposed, the process is evaluated, and finally the decision to adopt the innovation is made. In the second phase – implementation – first use of the innovation is made, and subsequently organizational routines are modified appropriately. Similarly, Premkumar and Roberts (1999) considered five phases in the adoption process:

- (1) awareness;
- (2) persuasion;
- (3) decision;
- (4) implementation; and
- (5) confirmation.

Cooper and Zmud (1990) argued that the IT adoption process could be divided into six stages:

- (1) initiation (active or passive search for opportunities);
- (2) adoption (negotiations for backing IT implementation);
- (3) adaptation (applying the IT and revising organizational procedures);
- (4) acceptance (company members are encouraged to use the IT);
- (5) routinization (the use of the IT becomes standard); and
- (6) infusion (efficiency is increased as a consequence of the IT use).

Concerning the factors influencing adoption, there are many studies classifying them (see Kim and Galliers, 2004). The factors are grouped into different categories: internal or organizational, external and technological factors (Tornatzky and Fleischer, 1990). A summary of the main factors mentioned in the literature that affect innovation adoption in firms is shown in Table I, which includes the main literature about factors affecting innovations and in particular Internet and other IT technology adoption in organizations.

Among the external factors relating to IT adoption, and specifically the adoption of the Internet, researchers have found that the following are common:

- pressure from competitors, customers or suppliers;
- the role of government (incentives);
- partners' alliances;
- technological infrastructure;
- technology consultants;
- image of Internet technology; and
- users' expectations.

These external factors, according to some research (Teo *et al.*, 1997; Teo and Tan, 1998) are less important than internal and technological factors.

The technological factors identified in the literature are related to barriers to technology adoption and its perceived benefits. The perceived benefits for managers could be direct, such as cost savings or income generation, or indirect, such as potential

	Organizational factors	External factors	Technological factors
Cooper and Zmud (1990)	User community (job tenure, education, resistance to change) Organization (specialization, centralization, and formalization) Perceived financial cost Perceived technical competence	Organizational environment (uncertainty, inter-organizational dependence) Perceived industry pressure Perceived government pressure	Technology being adopted (complexity) Task to which the technology is being applied (task uncertainty, autonomy) Perceived direct benefits Perceived indirect benefits Perceived direct benefits
Iacovou <i>et al.</i> (1995) Kuan and Chau (2001) Vadapalli and Ramamurthy (1997)			
Teo <i>et al.</i> (1997); Teo and Tan (1998)	The organizational features of the firm Championship of Internet adoption		Ranking of Internet applications Objectives of web sites Benefits of adopting the Internet Reasons for not adopting the Internet Criteria for selecting Internet access service providers Benefits of intranet Benefits of IT
Fink (1998)	Internal resources In-house IT expertise Organizational culture Availability of IT IT selection IT implementation	Outside support External resources External environment	
Igbaria <i>et al.</i> (1998)	Demographic variables Intraorganizational factors (internal technical and top management support, experience, training) Top management support Size IT expertise	External pressure (government and large businesses) Extra-organizational factors (external IS support, training) Competitive pressure External support Vertical linkages	
Premkumar and Roberts (1999)			Relative advantage Cost Complexity Compatibility

(continued)

Table I.
Factors affecting
innovation adoption in
organizations

Table I.

	Organizational factors	External factors	Technological factors
Mehrtens <i>et al.</i> (2001)	Level of IT knowledge among IT professionals Level of IT knowledge among non-IT professionals Level of IT use in the organization	Internet user expectation	Advantage over traditional methods Improved communication A business tool
Sadowski <i>et al.</i> (2002)		Competitive pressure External support Incentives	Improved communication
Doherty <i>et al.</i> (2003)			Potential inhibitors and facilitators Internet strategy Internet target segment Infrastructure and development capability Market development opportunity Internet marketplace Relative advantage Internet communications Internet cost opportunity Market development opportunity Cost of Internet trading Concerns Consumer sensitivity Advantage over traditional methods (marketing channels)
Santarelli and D'Altri (2003)			<i>External</i> Interactivity Connectivity Feasibility
Kim and Galliers (2004)	Lower cost structure Near-zero inventory High quality customer service	Internet business Global electronic markets Dynamic market	<i>Internal</i> Secure payment system Order fulfillment system Shipping information system

opportunities in new markets, marketing, or publicity (Poon and Swatman, 1999). In this respect, when adopting a technology, firms must perceive the positive effects of the adoption – and hence its potential value – before starting the process (Vadapalli and Ramamurthy, 1997).

The internal or organizational factors that have been studied mostly include the following:

- IT users' community;
- organizational structure;
- firm's processes;
- firm size;
- technological capabilities of the organization's members;
- the technological and financial resources available;
- the culture of the organization;
- process of selecting and implementing the IT;
- management backing and support for the project; and
- the project leader.

The project leader is mentioned as being essential in innovation processes in firms (Rogers, 1983), and the managerial factors are considered the most important (Iskandar *et al.*, 2001). In this respect, two types of firm can be identified in adoption processes:

- (1) proactive firms; and
- (2) passive reactive firms.

Past studies on Internet technology adoption

From the numerous studies on Internet technology adoption, we shall concentrate on the reports more related with our research. In this sense, Mehrtens *et al.* (2001) studied Internet adoption in seven SMEs and found three factors that significantly affect this adoption:

- (1) perceived benefits;
- (2) organisational readiness; and
- (3) external pressure.

Similarly, Grandon and Pearson (2004), in a study regarding electronic commerce adoption in small and medium US businesses in the context of the technology acceptance model, found four factors that influence this adoption:

- (1) organizational readiness;
- (2) external pressure;
- (3) perceived ease of use; and
- (4) perceived usefulness.

They also identified the perceived strategic value of electronic commerce by managers as being crucial for having a positive attitude toward its adoption. Furthermore, Daniel *et al.* (2002) studied e-commerce adoption in SMEs and found four clusters of

companies that suggested a set of sequential steps or stages, through which firms passed during the adoption of e-commerce.

Moreover, Dholakia and Kshetri (2004) studied the factors affecting the adoption of the Internet among SMEs. Their conclusion was that specific factors contribute to the SMEs' involvement with the Internet, such as prior technology use and the customer service subscale of perceived competitive pressure, and they influence the different stages of Internet technology adoption. Moreover, the relative importance of these factors decreases as the level of Internet involvement increases. This level of Internet involvement has also been analyzed by these authors in terms of ownership of a web site (adoption) and use of the Internet for selling purposes (routinization). In addition, Kim and Galliers (2004) proposed a theoretical model of Internet technology diffusion among companies, with four groups of factors:

- (1) external market factors;
- (2) external technical factors;
- (3) internal organization factors; and
- (4) internal systems factors.

In our study we build on this, from an empirical point of view, but dividing those factors into three groups:

- (1) organizational factors;
- (2) external factors; and
- (3) technological factors.

Based on this literature review we tried to identify the proposed ecommerce adoption stage model (Daniel *et al.*, 2002) in a broader context – Internet technology adoption. Taking into account the scarcity of these studies at an international level and even more in the case of Spain (the country where we conducted the empirical study), we think it is interesting to cover these research gaps by performing an exploratory study. Therefore, our research questions were the following:

RQ1. What are the main organizational factors that affect Internet technology adoption?

RQ2. Can different stages be identified in this adoption process, similar to the case of e-commerce and IT adoption? In addition, what are the factors that contribute to the adoption behaviors? Therefore, we would like to find the organizational factors that predict the decision of adopting Internet and the stages that the firms follow.

RQ3. Does the size of the firm really influence Internet technology adoption? As some of the previous research has been carried out in the context of SMEs, we conducted the study with companies of all sizes.

These research questions, related with the previous literature described, are shown, as a research model, in Figure 1.

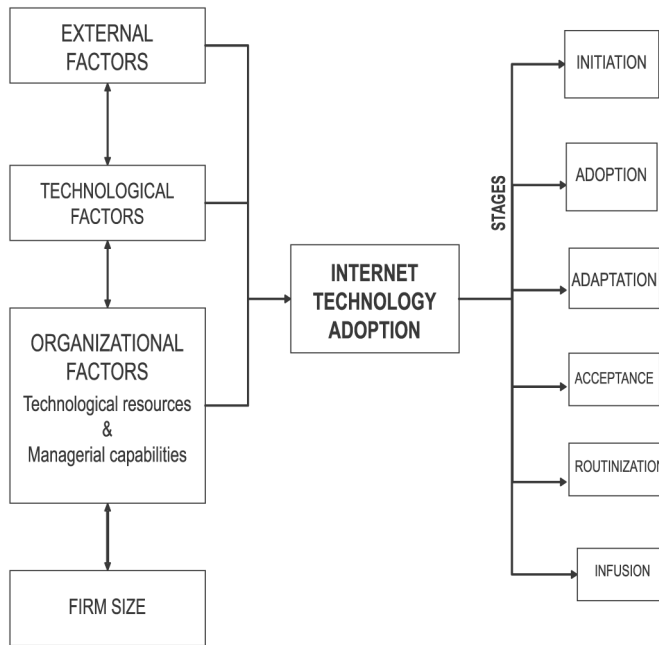


Figure 1.
Research model

3. Empirical study

In order to answer the research questions, we conducted an empirical study on firms that were using Internet technology. To avoid changes due to country-/culture-specific characteristics, we concentrated in firms located in one country, i.e. Spain. Furthermore, as we were interested mainly in the implementation stage of the innovation adoption process, we selected firms that we could demonstrate were in this phase. Consequently, the population for our study was the group of Spanish firms with a domain name registered in the national Internet registry, named ES-NIC. This is the organization responsible for the registration of domain names under the first-level geographical domain “.es” (Spain). Recently, this organization has been renamed Red.es. By doing this, we could confirm that the firm had developed some kind of activity using the Internet. Therefore, they were already in the implementation stage of the adoption process. The only firms who can register under the domain “.es” are ones that are legally established in Spain, i.e. public or private firms or organizations appropriately constituted according to the legal framework that regulates them. Other advantages of using this registry are that it includes firms of all sizes, and that we could select an appropriate sample from the complete list of domain names (which included contact person details).

We used systematic random sampling to select the firms, and the questionnaires were sent out via e-mail and/or fax. As the total population was more than 5,000 firms, we considered it infinite and used an appropriate formula to find out how many answers we needed. To achieve a sampling error of ± 5.88 percent and a confidence level of 95.5 percent, we needed to have 280 valid questionnaires. A total of 4,000

questionnaires was sent, and 280 valid questionnaires were returned (response rate of 7 percent).

The questionnaire was divided into measurement instruments (see Table II), related to internal, external, and technological factors, which could affect Internet technology adoption. Furthermore, some demographics questions, such as type of industry, size of firm (revenues and number of employees) and job title of the respondent, were collected.

Mainly, the firms' managing directors (88.1 percent) filled in the questionnaire. As other demographic data (see Table III), we found that 59.3 percent of firms had fewer than 49 employees, and 24.6 percent had between 49 and 249 employees. The remaining 16.4 percent had more than 249 employees. Reviewing the firms' activities, in general terms 24.6 percent were in the industrial sector, while 75.4 percent were in the service sector.

In order to carry out a global exploratory analysis of the information obtained from the sample – specifically to determine groups of organizations associated with particular phases in Internet technology implementation, as well as the organizational factors affecting them – we applied a cluster analysis (Cliff, 1987; Jobson, 1991a, b; Greenacre, 1993). We followed the procedure outlined below:

Measures	Source
<i>Demographic context</i> Industry, size of firm, job title of respondent, geographical dispersion of organizational structure of the firm	
<i>Organizational factors</i> Internal technical support, top management support, IT experience, IT in use, IT knowledge by top management, IT expertise among employees, IT expertise among supervisors, IT training, positive attitude to IT use, organizational structure	Cooper and Zmud (1990), Iacovou <i>et al.</i> (1995), Kuan and Chau (2001), Teo <i>et al.</i> (1997), Teo and Tan (1998), Fink (1998), Igbaria <i>et al.</i> (1998), Premkumar and Roberts (1999), Mehrtens <i>et al.</i> (2001)
<i>External factors</i> Outside consultants, use of IT by trading partners, organisation's image, internet image	Cooper and Zmud (1990), Iacovou <i>et al.</i> (1995), Kuan and Chau (2001), Fink (1998), Igbaria <i>et al.</i> (1998), Premkumar and Roberts (1999), Mehrtens <i>et al.</i> (2001), Sadowski <i>et al.</i> (2002)
<i>Technological factors</i> External communication (e-mail), obtaining information from suppliers, offering information to consumers, contact with governmental agencies, internal communication, sending purchase orders to suppliers, product and market research, receiving orders from customers, ability to reach out to international markets, form and extend business networks, operational efficiency, management effectiveness, competitive advantage, improve organization image, new business opportunities	Cooper and Zmud (1990), Iacovou <i>et al.</i> (1995), Kuan and Chau (2001), Vadapalli and Ramamurthy (1997), Teo <i>et al.</i> (1997), Teo and Tan (1998), Fink (1998), Premkumar and Roberts (1999), Mehrtens <i>et al.</i> (2001), Sadowski <i>et al.</i> (2002), Doherty <i>et al.</i> (2003), Santarelli and D'Altri (2003)

Table II.
Measurement
instruments

Table III.
Demographics of the
study

Demographic context	Percentage
<i>Industry (CNAE-93, SIC)</i>	
Service	75.4
Manufacturing	24.6
<i>Job title of respondent</i>	
Managing Director	88.1
Other	11.9
<i>Number of employees</i>	
< 49	59.3
49-249	24.3
> 249	16.4

- (1) we distinguished between variables of characterization and variables of behaviour, in the function of the research objectives;
- (2) we applied multiple correspondence analysis or homogeneity analysis to the behaviour variables (HOMALS);
- (3) we ran a hierarchical cluster analysis, with Ward's method of amalgamation;
- (4) we ran a *k*-means cluster analysis; and
- (5) we checked the results by applying a discriminant analysis.

As Daniel *et al.* (2002) did for e-commerce adoption in SMEs in the UK, we think cluster analysis is an appropriate technique to classify firms in similar groups, according to their Internet adoption characteristics. This allowed us to classify Internet technology adoption by Spanish firms into different stages.

Consequently, to determine which organizational factors most affect the adoption of the Internet by firms, and bearing in mind the fact that we had 280 cases and 126 variables, we decided first to apply a multivariate technique to reduce the number of variables and explore the main influences of the factors analyzed on Internet technology adoption. All 126 variables were categorical variables, nominal, not numeric, with a range from two (dichotomic variables) to four. In sum, a total of 265 categories was analyzed. Then, we applied a multiple correspondence analysis to the behaviour variables (126 non-numeric variables), HOMALS, as an amplification of the assumptions of factorial correspondence analysis (Greenacre, 1993). As a result, we reduced the total amount of information into two HOMALS factors, as they explained 73.709 percent of the information provided by the initial variables. The following step was to calculate the absolute contributions of each of the categories of the different variables to the HOMALS factors (Tables IV and V). After this, we made an interpretation of the HOMALS factors (see Tables VI and VII).

Next, we made a cluster analysis with the objective of finding groups of firms with similar characteristics. We subsequently ran a cluster analysis where the inputs were the two HOMALS factors obtained from the factor analysis. The aim was to determine distinct mutually exclusive and exhaustive groups in the population associated with the different phases within the Internet implementation stage in firms, and to decide whether these phases could be associated with the two HOMALS factors we had found.

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Table IV.
Biggest contributions to
HOMALS factor 1 (F1) by
categories

Categories	F1	F2	Frequency	Mass	Absolute contribution to F1	Absolute contribution to F2
Own server available	-1.12	-0.32	57	0.001615646	1.89	0.39
Intranet available	-0.79	-0.22	115	0.003523932	2.05	0.40
Use of intranet to communicate company strategies	-1.26	-0.2	49	0.001388889	2.05	0.13
Access to organization's database via intranet	-0.84	-0.24	91	0.002579365	1.70	0.35
Forms replaced by use of intranet	-1.05	-0.17	78	0.002210884	2.27	0.15
Use of intranet as upward communication channel, suggestion box	-1.27	0.02	40	0.001133787	1.70	0.00
Use of intranet to facilitate simultaneous debate among organization's members	-1.4	-0.27	36	0.001020408	1.86	0.17
Presence of home teleworking	-0.83	-0.24	85	0.002409297	1.55	0.32
Web site, hosted on own server	-0.82	-0.27	87	0.002586053	1.62	0.44

Note: F1 and F2 are the two factors found in the HOMALS analysis

Table V.
Biggest contributions to
HOMALS factor 2 (F2) by
categories

Categories	F1	F2	Frequency	Mass	Absolute contribution to F1	Absolute contribution to F2
Outside consultants on hardware	0.29	0.89	77	0.00218254	0.17	4.03
Outside consultants on design and creation of web site	0.35	0.82	89	0.002522676	0.29	3.95
Outside consultants on security	-0.08	1.02	56	0.001587302	0.01	3.85
Outside consultants on electronic commerce	-0.22	1.2	43	0.001218821	0.05	4.09
Outside consultants on promotion of organization's web site	0.14	1.27	44	0.001247166	0.02	4.69
Outside consultants on marketing on the Internet	-0.25	1.47	25	0.000708617	0.04	3.57
Does not have own computing staff	0.33	0.5	134	0.003798186	0.39	2.21

As we did not know the number of clusters we applied cluster analysis with hierarchical classification with the Ward method aggregation, recommended when the analysis is made with factors, and not using direct variables, such as in our case. As a similarity/dissimilarity estimate we used the square Euclidean distance. Using the classification history and the dendrogram we fixed four clusters (see Table VIII) and then we calculated their means and standard deviations with respect to the HOMALS factors (see Table IX).

In order to test the reliability of the clustering we performed a discriminant analysis, taking as independent variables the factor coordinates for each of the cases (hom1_1 and hom2_1), and as the dependent variable that corresponding to its own cluster for

Measure	Items
IT available	An owned infrastructure to access the Internet An intranet (use of online forms, intranet applications, online databases, use of the intranet for communicate the strategy of the firm to its employees)
Organizational structure	Presence of teleworking schemes

Table VI.
Measures explaining
HOMALS factor 1 (F1)

Measure	Items
Outside consultants	External consultants for: hardware acquisitions web pages design security issues electronic commerce Internet marketing

Table VII.
Measures explaining
HOMALS factor 2 (F2)

Cluster	No.	Percent
I	52	18.6
II	57	20.4
III	116	41.4
IV	55	16.6
Total	280	100

Table VIII.
Number of cases in each
cluster

	Cluster I	Cluster II	Cluster III	Cluster IV
<i>Mean</i>				
HOMALS factor 1	0.14	-1.43	0.69	-0.09
HOMALS factor 2	1.23	0.35	-0.05	-1.39
<i>SD</i>				
HOMALS factor 1	0.56	0.69	0.51	0.82
HOMALS factor 2	0.88	0.54	0.41	0.57

Table IX.
Means and standard
deviations of clusters

each variable (qc1_1, rank = 4). The discriminant analysis was applied using Fisher's discriminant function with the stepwise method, and the minimum Wilks's lambda as variable-selection criterion. The Bartlett-Box test (Box's M test) was also applied, on the determinants of the matrix of covariances between groups – in this case the statistic turned out to be highly significant. The two HOMALS factors taken as independent variables were significant, i.e. they were discriminating variables since they were significant in the Wilks's lambda and F -tests. The confusion matrix represents the general level of accuracy achieved by the discriminant functions. In this case, 98.6 percent of the original cases were correctly classified. This demonstrates the adequacy of the classification obtained in the cluster analysis using the HOMALS factors resulting from the multiple correspondence analysis. Thus, we could confirm that the function predicted better than could be done by chance.

4. Discussion

Applying these techniques sequentially and in combination allowed us to find an effective classification of the groups of organizations, as well as to explain the results of the empirical analysis better. We shall now describe generally the groups we identified. We will define the phase at which the organizations of each cluster are in their Internet implementation, and what organizational factors most influence the process. To complete the description, we shall also refer to the different demographic context measures.

Organizational factors affecting Internet technology adoption

Factor 1 (F1) is explained by the variables related to the investment in Internet technology (IT in use or availability of own Internet servers and an intranet technologies). Consequently, this factor differentiates organizations with technology investments and the others, and the existence of teleworkers in the firm. This is mainly related with the level of technological resources available (the first), and the organizational structure (the second).

Factor 2 (F2) is explained by the variables related to the use of outside consultants to implement Internet technology. This can be interpreted as a lack of managerial capability to manage these technologies. As mentioned before, this managerial factor is considered to be the most important in the innovation processes.

Stages in the Internet technology adoption process

We used a number of factors to classify firms in different stages of Internet technology adoption. The factors were the presence of outside consultants, the creation of a department and the use of the IS department to manage the Internet technology, managerial capabilities, and investment in own Internet technology (IT in use or technological resources). The stages where the firms could be included were defined as:

- (1) initiation;
- (2) adoption;
- (3) adaptation;
- (4) acceptance;
- (5) routinization; and
- (6) infusion.

Cluster I: initiation. This cluster is more strongly affected by Factor 1, in a negative way, which indicates that these are firms that do not have their own server providing Internet access, nor have they set up an intranet for their internal communication. These firms are looking for new opportunities but are still using external resources and are beginners in Internet usage. They are involved in commerce, repairs of motor vehicles and of personal or domestic articles, as well as property development and house rental, according to the Spanish industry classification system (CNAE-93, similar to the SIC code in the international context). The biggest group is of firms with less than 49 employees (31 organizations), so they are mainly small firms. These companies do not have different business units in other Spanish regions or countries.

Cluster II: adoption/adaptation. This cluster is strongly influenced in a positive way by Factor 2 – i.e. these are organizations that have outsourced the consulting function in Internet-related areas. Thus, for these firms, external support is fundamental to their process of Internet technology adoption. Moreover, this group is also affected, and again positively, although to a lesser extent than in the previous case, by Factor 1 – hence these are firms with a certain investment in Internet technology. These firms are also beginners in Internet usage but have a relative dispersion of business units in different Spanish regions. Firms belonging to this group are mainly to be found in areas of Spain that are highly developed economically, and their activities include manufacturing industry, property development and house rental, and business services. In this group there are 28 firms (49.12 percent of the total of the group) having fewer than 49 employees.

Cluster III: acceptance/routinization. This cluster is positively influenced by Factor 1, but not by Factor 2. These are firms with their own server to access the Internet and their own company web site. They have set up an intranet for internal communications and they claim to have home-based teleworkers. Their activities include manufacturing industry, commerce, repairs of motor vehicles and of personal or domestic articles, transport, storage and communications, property development and house rental, business services, and other social and service activities provided to the community, or personal services. The biggest group is of firms with fewer than 49 employees (79 organizations), while 25 firms have between 49 and 249 employees.

Cluster IV: infusion. This cluster is influenced negatively by Factor 2 and has a practical null influence from Factor 1. They are businesses that do not use external consultants to implement the Internet; they have a department that carries out this function. Hence, they have developed the necessary managerial capabilities to manage Internet technology.

To summarize, we could say that in this implementation process the level of use of Internet technology is important. In the initiation phase, the level of use is basic. Moreover, it is based mainly in electronic mail and simple company web sites. In the adoption/adaptation stage, there are more Internet technology-based innovations; for example, firms have their own Internet server. In the acceptance/routinization stage, some changes in the organizational routines of firms can be found; for example, the use of an intranet and the presence of teleworkers. Finally, in the infusion phase more changes are seen, such as the creation of different organizational units for managing Internet technology.

The size of the firm. From the empirical analysis – specifically the bivariate analysis – we also deduced that the use of IT is positively associated with the size of

the organization. The exception is in the case of fax and local networks, where the association is negative. We found that in the case of Internet technology, such as a firm's own server, according to the chi-square statistic there is a positive dependence between both variables – i.e. the bigger the organization, the more likely it is to have its own host. However, the relation between firm size and the presence of an Internet-based network could not be demonstrated.

On the other hand, we could demonstrate a positive dependence between firm size and the presence of a company web site. The bigger the firm, the more likely it is to have its own web site. Likewise, we found a dependence between firm size (measured by number of employees), and intranet use: the bigger the firm, the more intensively the company made use of its intranet.

Finally, we also found other relations of dependence between the presence of an intranet and the geographical dispersion of the organization; and between firm size and the presence of mobile teleworkers.

Limitations. As in all empirical research, the characteristics of our study limit the applicability of our findings. First, we concentrated in firms that already were using Internet technology, because they have registered their domain name. Consequently, we omitted from the study firms that did not have a Spanish domain name. But firms could have a domain name of “.com” or “.org” and still be Spanish firms. Moreover, other companies without any domain name on the Internet were not included in our study. Second, we applied a classification analysis with exploratory purposes about the characteristics of the firms according to their cluster. Nevertheless, a longitudinal study could be more useful in explaining whether or not these companies follow the process described. Third, a more detailed questionnaire with more specific questions could be more helpful to gain a better description of the phases of a more sophisticated technology adoption (i.e. the acceptance/routinization and infusion stages). Other limitations are that the empirical evidence was obtained from a study limited only to Spanish firms, so that it may be difficult to generalize our findings to other countries due to cultural, social and/or economic differences. Moreover, the data were obtained from a questionnaire sent and returned by e-mail and/or fax, and hence the information obtained may have significant deficiencies.

Managerial implications. This paper has some relatively important managerial implications. First, the fact of having a domain name does not mean that the companies are in the acceptance/routinization phase and even less so in the infusion phase. From this, we identified that the majority of firms were in the so-called initial stages of the Internet technology adoption process. Second, we can say, in general terms, that managing directors of these companies do not perceive the strategic value of Internet technology. Third, as more firms implement this technology in their processes, presumably more competitive pressure will exist to adopt Internet technology.

5. Conclusion

Technological resources and managerial capabilities are the main organizational factors to explain the Internet technology adoption process. Firms in the Internet implementation stage appear to require an intermediate phase within the stage – i.e. an adoption/adaptation phase with external help or support from outside consultants – in order to be able to evolve and reach the acceptance/routinization phase, when the firm sees real changes in organizational routines and improvements in its effectiveness and

efficiency. This is mainly due to a lack of managerial capabilities to manage Internet technologies.

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