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Journal of Enterprise Resource Planning Studies

Vol. 2011 (2011), Article ID 250358, 381 minipages.
DOI:10.5171/2011.250358
www.ibimapublishing.com

SMEs E-Business Behaviour: A Demographics and Strategic Analysis

Author

Ilias P. Vlachos

Athens, Greece

Abstract

The aim of this research was to understand the strategic uses of e-business systems and technologies

by classifying companies and particularly small and medium businesses according to demographics as well as e-business behavior variables.

The study was based on data from a large quantitative survey of European E-business W@tch for the period 2007 using questionnaire

interviews (N=409). We employed two-step cluster analysis, multinomial logistic regression and stepwise descriminant analysis as the most

appropriate methods for our analysis.

The findings revealed six clusters associated to e-business adoption. The six

groups differ in terms of demographic characteristics as well as e-business applications they use. We found that the following clusters exist: (a)

Leaders: large companies that extensively use e-business in a strategic manner (b) innovators: use e-business in an way that allows them to innovate

and differentiate from other companies (c) Beginners: small and medium companies across all sectors that only recently start to use e-

business (d) Unready Adopters: micro and small companies that lag behind (e) Late Adopters: small-size companies but larger that the Unready Adopters,

that appear not to be interest in the advances of ICTs and (f) Laggards: micro companies with little use of e-business.

The results of our survey can positively contribute to managers aiming to take advantage of technological advances in electronic business as well as to any

researcher who study e-business management and applications.

Keywords: SMEs, E-business, Competitive behaviour, Cluster Analysis

Introduction

In many cases, e-business is a truly innovative means to manage and compete in the global business settings.

According to a recent survey of Sectored e-Business Watch (Selhofer et al. 2007), which was supported by the European Commission, in 29

European countries; 64.2% of companies has already adopted e-business applications, while 54.5% of these businesses have mentioned positive changes

to their operation, managing to increase their competitive attitude almost

by 47.2%. Yet, other companies, including SMEs,

lag behind and do not follow leading companies in taking advantage of e-business applications. Hidding (2001) suggested that the velocity of e-

business adoption is a matter of each sector's dynamics and strategy paradigms against new technologies. Furthermore, the same researcher

remarked that e-business is a continuous process, which can alter business competitive attitude within the sector, a fact which

underlines the business clusters' existence.

Therefore, the technological differentiation and the

extent of e-business diffusion can provoke creation of business groups of common characteristics within comparable sectors.

The relation of e-business adoption with organizational performance has studied extensively over time but results seem to be inconsistent,

particularly when bringing contextual variables into the equation. For example, Ozer (2002) highlighted the combination of managerial tasks and e-business

applicability and tried to emphasize that the growing customers' demands is one of the managerial aspects that each firm needs to seriously consider in order

for e-business strategy to be more effective. Pavic et al. (2007) measured the diverse challenges which e-business provoke and found that demographic

factors, such as business explain to a large extend e-business success on internal process. Xirogiannis and Glykas (2007) affirmed that

e-business could provide superior value to business customers, while Phan (2003) suggested e-business as an appropriate managerial tool that each

company needs to adopt in order to differentiate its operations from competitors.

This paper is based on the assumption that the adoption of various types of information systems and technologies by Small and Medium-sized Enterprises

(SMEs) is revealing of the strategic orientation of SMEs. Creating profiles of SMEs based on their e-business behaviour helps us connect demographic

variables with strategic options, thus uncovering hidden patterns of information systems development.

The assumption grew out of a widely held view that e-business plays a critical part in helping organisations reconstruct, renovate, and

metamorphose internal processes in order to increase efficiency, effectiveness and competitiveness (Eikebrokk and Olsen,

2007; Boutilier and McNaughton, 2006; Guerrieri and Meliciani, 2005; Lan and Du, 2002). Consequently, a set of questions can be generated

according to e-business penetration among businesses: ‘Which are the factors that differentiate business behaviour regarding e-business

adoptability' and then 'How e-business applications can potentially generate dissimilar business groups with common attitudes?'. 'Is it only demographic

variables or a set of e-business applications that can create different e-business profiling groups?’

E-business Strategies for SMEs in Relation to Business Performance

According to Stone (2003) e-business adoption by

SMEs and large corporations usually follows a similar normal diffusion curve, in which the technological effectiveness between

“Early adopters” and “Laggards” has a time gap more than 20 years. Stone (2003) investigated the relation between the e-business applications and

customers expectations finding critical factors of e-business success towards customer relation management (CRM) such as web site quality, value

proposition and trusted brand. Stone (2003) defined a 3-stage model related to continued technological investments and technical applications

that usually occurred in business environment; and named these groups as “Early adopters”, “Integrating adopters” and “Advanced adopters”. Stone

(2003) concluded that ‘SMEs are keen to adopt new technological applications quickly and cost effective in comparison to large businesses which

usually operate under complexity and non-flexibility procedures'. Furthermore, the researcher recognised that businesses' attitudes, after

technological investments, are significantly dependent on a sector's competitiveness and issues of 'good-will' (Hedelin and Allwood, 2002). Salmela

and Spil (2002) remarked the importance of innovation management related to e-business applications as an informal and continual planning

process so as to ensure flexibility, creativity and strategic thinking to their emergent policies. Researchers urged the need for a dominant

organizational process to ensure a non-stop strategic alignment among businesses. Salmela and Spil (2002) suggested a 4-

cycle method divided into four-planning steps:

1) ‘Agreeing on planning objectives’,

2) ‘Aligning business and information objectives’,

3) ‘Analysing ICT resources with the respective infrastructure’, and

4) ‘Authorising actions’. Researchers found that e-business adoption is a matter of organizational flexibility, a necessary path of development, which

businesses need to follow in order to successfully integrate the operational process with business goals. In this direction, the most applicable e-business

model will be preferred by ‘good management practices’ in order to meet at least the minimal requirements, such as financial resources and ICT

infrastructure; a fact which could provide a more competitive behaviour and cost-benefit policy.

However, the adoption and utilization of new technological models have to be proposed under extensive internal investigation by ICT

executives; a policy which unfortunately many businesses, independently of their size, fail to adopt (Morgan at al, 2006).

Horner-Long and Schoenberg (2002) aimed to measure the different business profiles as well compare leadership between traditional ‘bricks

& mortars' businesses with e-businesses. Researchers used a sample of 400 randomly selected top-businesses from leading UK food industries, half of

which had already established a substantial e-business infrastructure. They found that the leadership awareness of ‘brick & mortars’ towards

collaboration, product development and new markets identification was significantly low and was mostly limited to charities development (Parsons,

2002). This means that leaders in such traditional businesses usually target to ‘stay alive’ in competition rather than innovate technologically.

In the case that such (traditional) leaders wish to follow a more competitive strategy based on digital requirements, this path could take a short

time, due to the sector's traditional stability, a fact which means that in most cases this strategy is overruled. On the other hand, corporations with

e-business applications usually operate in a rapidly changing environment, where demand for new products development and new quality services are

a continuous process meaning that internal structure is always redesigned to meet customer's expectations (Falk, 2005). Collaborations

and trust partnerships were rarely applied in this business area, except in the case of new markets development.

Lal (2005) used a different mix of variables in order to analyse and distinguish business behaviours related to e-business adopted applications. He

measured variables such as demographic characteristics, export intensity, and profit margins, while his research sample was grouped into

three business categories: 1) Offline businesses, 2) Online businesses, and 3) Portal using businesses.

Using a database from the Indian manufacturing sector, the researcher found that variables such as size of business can significantly differentiate

operational behaviour, while the business's orientation can be measured with variables such as exports awareness and technological

collaboration, which, in turn, can determine business performance.

Motiwalla et al. (2003) sought to measure the

intra- and inter-industry financial performance of three industrial sectors: retail, consumer products, and food & beverages and tobacco, in order to

examine whether e-business applications are the appropriate managerial tool, which can affect financial performance.

The sample was collected from 165 companies from three different sectors by gathering the financial statements for a period of 10 years. Motiwalla et al.

(2003) developed a financial model, which included a list of performance dependent variables, such as ROI (Return on Investment),

ROA (Return on Assets), ROS (Return on Sales) as well as revenue growth, and found that those ratios are considered as the most crucial for measuring the

financial performance of any business or industry related to applicable e-business strategies.

Furthermore, they found that e-business applications had a long-term impact on the intra-industry financial performance providing a higher net and gross profit,

an inventory turnover, increased sales, and low operational costs in comparison to inter-industry financial performance. Hence, they

urged that e-business applications can generate unlike financial business groups with different behaviour on sales' revenue, cost of producing

goods or services, new investment policy, and service quality not only to industrial sector but also to inter- and intra- industrial area (Lu and Zhang, 2003).

Cuervo and Menendez (2006) examined the digital gap among 15 European countries and utilised cluster analysis in order to firstly identify a group of

countries with common characteristics towards technological adoption and then to identify if the cost effect and governmental policies could influence e-

business implementation. The researchers were successful in identifying four groups of common behaviour towards technological penetration:

Cluster 1 includes less developed countries regarding ICT penetration, Cluster 2 includes countries with less public e-services and high accessibility cost,

Cluster 3 includes high public e-services and low accessibility cost and Cluster 4 includes countries with the largest ICT adoption. Accordingly,

Greece was placed in Cluster 3. They found that cost is usually a business issue, which could dictate which e-business strategy could be the most suitable,

leading to a high operational performance and high competitive pathway. Additionally, they affirmed that businesses in different countries have

different e-business policies and consequently different business performances, due to a set of factors such as governmental support and cost of internet access.

Indeed, regarding governmental financial support, Lasch et al. (2006) remarked that it is a critical success factor especially for start-up businesses related

to any technological development.

Ledz and Nobis (2007) found four clusters using hierarchical cluster analysis

to measure the business activities related to e-business applications in the geographical area of Germany. The most advanced cluster was

cluster 4 described as the highest technologically penetrated one and included facilities such as e-shopping, increased e-mail usage, mobile applications

through laptops, and high internet usage. Researchers found that e-business adoption is a matter of general digital awareness that businesses have

towards competition and the individual's attempt towards future digital economy, which can transform the current business attitude by

increasing the e-business adoptability (Lal, 2005). Harris et al. (2001) suggested that this adoption has to be proposed by e-business

managers, following a strategic path of having, firstly extensive investigation of all the background information of the business and secondly

taking into consideration the nature of the company and its needs for further development in relation to the external environment.

E-Business Adoption in Greece

In Greece, more than 95% of companies are SMEs across all sectors (official

statistics, 2005). Like any EU SMEs, a Greek SME is an enterprise: (a) which has fewer than 250 occupied persons, and (b) has either an annual turnover not

exceeding [50] million euro, or an annual balance sheet total not exceeding [43] million euro, and (c) either does not belong to a group of linked enterprises, or it

belongs to a group of linked enterprises that fulfils the conditions laid down in (a) and (b) above.

Xanthidis and Nicholas (2004) evaluated the existing technological implementation including the Internet in the public as well as business sector.

Researchers made a quantitative survey and found unsurprisingly low Internet usage among Greek businesses. Additionally, the

researchers asserted that although Greek small businesses (SMEs) have already adopted a set of technological applications, the lack of ‘knowledge

management' prevents businesses from adopting a complete e-business model. Thus, the business performance towards e-business applications is

extremely negative in Greece and only scattered e-business adoptions take place. Papathanassiou et al. (2003) measuring the attitude of e-commerce in

the Greek food sector, asserted that this behaviour can create different technological business groups with similar performances. Additionally,

they argued that food and beverage sector has a great perspective for e-business development and stated that ‘Price, brand name and logistics for convenience

and preference are easily compared on web sites', meaning that businesses will take advantage of e-commerce sooner or later. Moreover, they asserted

that only a very limited number of Greek food & beverage SMEs (27.1%) have recruited an IT executive team or even an IT executive. On the

contrary, the great majority of companies use e-business for supporting purposes of regular, ‘traditional’ business activities (81.3%).

Papathanassiou et al. (2003) concluded that there is a need for e-business future investments, despite a low technological budget, which

Greek SMEs plan to invest for e-business applications in the near future.

Bakouros et al. (2002) highlighted that e-business

implementation can be succeeded only by large Greek companies and not by SMEs due to the net profits and high competitive attitude,

indicating that the firm's size is the most important factor for adopting e-business applications. Only a few SMEs can successfully adopt a set of e-business

applications, mainly based on individual efforts of managers related to technological issues and high-levels of ‘know-how’ (Tsiamis, 2008).

Methodology

Questionnaire Design

This study was based on the research project of

European e-Business Market Watch 2005 (Selhofer et al. 2007) in the European Union (EU) aiming to provide reliable empirical information

about the factors which contribute to e-business development in Europe. In particular, e-Business W@tch observatory did a survey on e-business

maturity investigating the following areas: (a) ICT infrastructure and e-skills development in the company, (b) E-commerce and e-business usage, (c)

Impact of selling and procuring online, and (d) Impact of and satisfaction with electronic business. Results, reports, newsletters, statistics as

well as Methodological limitations and details of survey and other material on e-business can be found at the e-Business W@tch website, as it has already

been mentioned. Finally, the quantitative survey was employed using a computer-aided telephone interview we carefully evaluated all the variables

and we decide to measure the ICT infrastructure and e-business applications in Greek entrepreneurship by measuring the following issues:

- **Module A**: ICT infrastructure

- **Module B**: ICT Expenditure and Investments

- **Module C**: Internal and External e-Collaboration and e-applications

- Module D: Online Sourcing and Procurement

- **Module E**: Online Marketing and Sales

- **Module F**: Background Information about the

Company (Demographic Variables)

Table 1 lists the variables which were used in the two-step cluster analysis.

Variables were demographics (sector and size) and ICT and e-business applications which included the ICT infrastructure variables:

type of internet access, E-applications: intranet, ERP, Knowledge Management Software, Accounting Software, Enterprise Document Management

System, SCM (Supply Chain Management System), CRM (support marketing and online sales), E-Procurement (how large a share of the total volume of

your orders is placed online), Internal and External e-Collaboration (percentage of invoices received as e-invoices; and percentage of invoices sent

as e-invoices), Expenditure and Investments: (Share of ICT budget, including hardware, software, services and personnel, as

percentage of the total costs in 2005).
All the categorical variables are presented in Table 1. These variables are divided into two groups:

demographic and e-Business variables. The former include: sector and size of the sampling; and the latter are associated with e-Business such as

website, e-business technologies, e-orders, e-invoices, type of internet access and ICT budget. Each variable was assessed on categorical variable of 5-

point scale apart from 2.3, 2.4, 2.5 and 2.6. Those variables are dichotomous.

Table 1: Categorical Variables Used in the Cluster Analysis

Please see Table 1 in full PDF version

Sample

Data was collected by the European survey of the Sectored e-Business Watch, which included 407 Greek

businesses from six different sectors. Additional information is available on the website of e-Business Market Watch (www.ebusiness-

watch.org). Questionnaires were designed based on experience from previous surveys in order to assess the level and magnitude of adoption of e-business in

EU companies. Data were collected by computer-assisted telephone interviews with managers over a few weeks in early 2007.

Data Analysis

We conducted a two-step cluster analysis using Two Step Cluster in SPSS v.15.0. The two-step Cluster

Analysis is an exploratory tool designed to reveal natural groupings (or clusters) within a data set, which can be a mix of

interval and nominal data (Okazaki, 2006).

For our purpose, we set two groups of variables: demographic and

technological: The former are suitable due the nature of this research indicating potential areas of the technological characteristics of

businesses among different Greek sectors. The latter are appropriate for pervasive use among different sectors measuring the impact of e-business on

a firm's performance (Johnson et al. 2007; Cuervo and Menendez, 2006; Hayes and Finnegan, 2003). Hence, we consider two-step cluster analysis as

the most appropriate methodological approach in order to distinguish different business clusters with great homogeneity of characteristics.

Two-step clustering generates pre-clusters and finally it clusters the pre-clusters. By using Principal Components Analysis (PCA), we attempted to

analyse information from the variance related to the set of variables that we initially posed (Table 1). For this reason, we defined the pre-cluster method and

by measuring the log-likelihood function and we managed to measure the variables distributions and to maximise the distance among clusters. Then, we

used the Schwarz's Bayesian Criterion (BIC) as the most suitable clustering criterion avoiding alias in order to determine the number of clusters that fit

better in the data. Using this criterion, six clusters were revealed as presented in Table 2.

Table 2: Cluster Distribution

Table 3: Results of Auto-Clustering

Please see Table 2 and 3 in full PDF version

Notes:

a. The changes are from the previous number of clusters in the table.

b. The ratios of changes are relative to the change for the two cluster solution.

c. The ratios of distance measures are based on the

current number of clusters against the previous number of clusters.

Results

Demographic and E-Business Application Profiling of E-business

Demographic variables are suitable for streaming businesses into different sectors by providing conceptual similarities such as size and business sector.

For example, Falk (2005) emphasized the significance of demographic profiling among industries by measuring attributes such as size of companies

and sector segmentations. Regarding the first demographic variable, Table 4 shows that businesses recruited between 1 to 9 permanent

employees (38.1%), 10 to 49 (26.3%), 50 to 249 (17.7%) and more than 250 (4.8%) in comparison to Greek ratios 31.2%, 43%, 17.4% and 6.6%

respectively (Selhofer et al. 2007). Moreover, the sector analysis shown that the beverage sector contributes 12.1%, footwear 7%, construction 18.9% is

similar to tourism sector, telecommunications 11.2% and hospital activities 5.9% in comparison to Greek sectors 25.1%, 7.9%,

29.7%, 29.2%, 4.2% and 3.9% respectively. According to the e-business applications, Table 4 shows that according European survey the ICT

infrastructure is characterised by high DSL usage. In particular, the broadband internet access via DSL is 51.2%, Broadband via Cable is

14.6%, ISDN is 12.4% and 56K (analogue) is 7.2% in comparison to Greek ratios 42.8%, 4.2%, 29.5% and 10.3%. Moreover, Tables 4 shows that ICT budget

between 1% and 4% is contributed to 37.6% and follows businesses with ICT budget between 5% to 9% (25.7%) and 10%-49% (25.4%) respectively to

Greek businesses 44.0%, 44.0% and 8.4% respectively. According to e-business applications European survey indicated: accounting applications

(51.2%), Intranet (37.8%), ERP (21.6%), EDM (19,6%), CRM (14.9%), SCM (14%) and Knowledge Management (12.8%) respectively to Greek

businesses 54.8%, 39.6%, 28.3%, 15.5%, 15.2%, 16% and 11.1% respectively. Furthermore, related to online sales and marketing

Table 4 shows that the website construction for European business is 67.7% while for Greek businesses it is lower (64.6%). Additionally, the

share volume for e-orders for European businesses between 0% and 4% is 16.4%, while for Greek businesses it is 19.4% (it is surprising that in Greece

64.6% of businesses have e-orders between 5% to 9%). Finally, Table 4 shows that 87.9%of the European businesses send e-invoices between 10% to 49% and

88.6% of them receive e-invoices as well, while the Greek ratios are 62.4% and 63.1% respectively.

Table 4: Demographic and E-Business Applications Profiling

Please see Table 4 in full PDF version

Attitudinal Profiling

Table 5 presents the composition of demographic profiles within clusters while Table

6 presents the composition of demographic profile across cluster solutions. Cluster 1 consisted of telecommunication sector (65%) and represents

companies with 10-49 employees (44%). Cluster 2 consisted of hospitality activities (50%) and employees between 10 and 49 individuals (63%).

Cluster 3 included in construction sector (21%) and a number of employees between 1 to 9 permanent individuals (97%). Cluster 4 consisted of

telecommunication sector (18%) and represent companies with 10-49 employees. Cluster 5 included mainly companies of the footwear sector

(34%) and classes of employees between 1 and 9 (98%). Cluster 6 included companies mainly from the construction sector (41%) and food & beverages

(34%). Most companies of Cluster 6 were small companies (98%) having 1-9 employees.

Table 5: Composition of Demographic Profiles in Greece within Clusters (n=407)

Table 6: Composition of Demographic Profiles in Greece across Clusters (n=407)

Table 7: ICT and E-Business Profile within Clusters (n=407)

Table 8: ICT and e-Business Profile across Clusters (n=407)

Please see Table 5, 6, 7 and 8 in full PDF version

Cluster 1 (“Leaders”) characterised by website construction (96.9%), ERP (81.2%), intranet (85.9%), EDM (46.8%), knowledge management (32.8%),

accounting software (10.9%), SCM (50%) and CRM (62.5%). Additionally, the percentage of e-orders that companies of this cluster is between 5% and

9% (76.5%). Regarding the e-invoices that companies of this cluster send is between 10% and 49% (76.5%) and e-invoices received are between 10%

and 49% (76.5%). Finally, ICT infrastructure is characterised by the usage of broadband via DSL (54.6%) and wireless broadband connection

(21.8%) while the amount of ICT budget that companies invest in e-business applications is estimated between 5% and

9% (53.1% of the total businesses).
In conjunction with the ratios of the other five clusters, we name this cluster as “Leaders” having

higher e-business and demographic ratios than others. It is apparent from the data included in Table 7 and Table 8, that Leaders are large companies that

strategically use e-business applications to do their business. Leaders have the highest percentages of advanced e-business applications such as SCM

and CRM. Moreover, Leaders rely upon ERP systems (45.2%) while other companies rely more on accounting software, which is less sophisticated

than ERP applications. To achieve all the above, Leaders afford to spend large sums of monies to e-business applications in

relation to all other companies.
Cluster 2 (“Innovators”) is characterised by the following figures: high website construction

(67.3%), Intranet (65.3%), knowledge management (8.6%), EDM (15.3%), ERP (36.5%), accounting software (52.8%), SCM (12.5%) and CRM (6.7%).

Table 7 shows that the e-orders that the companies of this cluster received online are in great majority between 5% and 10% (96.1%). Moreover, the e-

invoices that companies of this cluster send is between 10% and 49% (92.3%) and e-invoices received are between 10% and 49% (96.1%). Regarding the ICT

infrastructure, Table 7 shows that companies of this cluster use broadband via DSL (59.6%) and ISDN (25%) while the amount of ICT budget that companies

enhance their e-business applications is estimated between 5% and 9% (49%).

Innovators Cluster is a group of companies that has similar demographic characteristics with Leaders, except that most Telecommunication

companies belong to Leaders (65%) than Innovators (6%). Innovators are therefore companies in all sectors that appear to innovate

more often than other companies in various e-business applications: The use of Intranet is high (65%), the usage of applications such as EDM,

ERP, and SCM is relatively higher than the other companies (except than Leaders) while most Innovators use e-business (96.1%) for the 5%-10% of

their orders. Therefore, while Leaders are more extensive users of e-business because of their leading position within each sector and particularly

in the Telecoms, Innovators use e-business to innovate and sustain their competitiveness.
Cluster 3 (“Beginners”) is characterised by a low

percentage of website construction (49.1%), Intranet (52.5%), knowledge management (23.7%), EDM (28.8%), ERP (27.1%), accounting

software (69.4%), SCM (30.5%) and CRM (8.5%). The percentage of e-orders that companies of this cluster received online is between 5% and 10%

(96.6%) while the e-invoices usage between 5% and 9% is (94.9%) and e-invoices received are between 5% and 9% (98.3%). ICT infrastructure

is characterised by the usage of broadband via DSL (47.4%) and ISDN (33.8%) while the amount of ICT budget is estimated

between 5% and 9% (44%).

Beginners Cluster is a unique group of companies, as about half of the small

companies (45%), having 1-10 employees, across all sectors belongs in this cluster. As small companies, they mainly use accounting software than ERP systems

(in sharp comparison to Leaders), while having modest usage of other e-business applications. It is characteristic that only 49.1% of Beginners have

developed their own website, meaning than more than half of them have no Internet presence. The modest percentages of applications such as SCM,

CRM, e-ordering, and e-invoicing can be interpreted as a reaction to suppliers and/or customers demands. The total absence of Internet access via Cable

or direct fibre connection (technologies that Leaders and Innovators use) can be interpreted as a lack of investing in e-business and reveals that these

companies, Beginners, are in the beginning of their e-business experience.

Cluster 4 (“Unready Adopters”) is characterised

by website construction (97.2%), accounting software (61.1%), ERP (25%), intranet (11.1%), SCM (5.5%) knowledge management (2.7%), and

CRM (16.6%). Furthermore, the percentage of e-orders is between 0% and 4% (72.2%). Regarding the e-invoices that companies of this cluster send is between

10% and 49% (63.8%) and received e-invoices are between 10% and 49% (61.1%). Finally, ICT infrastructure is characterised by the usage

of broadband via DSL (33.3%) and ISDN access (30.5%) while the amount of ICT budget is estimated between 1% and 4% (66.6%).

Unready Adopters is the cluster with the less number of companies within it (n=36), consisting of micro and small companies (83%), half of

them operating in the tourist sector. The ‘tourist effect’ in Unready Adopters can explain the high website presence of them, as tourist companies

usually construct a website in order to advertise their services.
The same effect can also interpret high CRM percentages (16.6%) which

is higher than innovators (6.7%). The difference in CRM applications is that tourist companies (and other companies within this group) use CRM as

‘business as usual’ while Innovators use CRM as a tool to innovate and differentiate themselves among other companies within the same sector.

Small companies, such as Unready Adopters, cannot afford an Intranet (11.1%) or SCM (5.5%). The lack of EDM (0%) systems and e-ordering (72%) reveals that

although there is a need to advance their systems, Unready Adopters lag behind, probably due to structural problems. One such problem could be the

lack of available funds to invest in ICTs as 66.6% of Unready Adopters invest 1%-4% of their revenues to ICTS, and only 5.5% of them invest 10%-49% of

their revenues, while 3 times more Beginners do so (15.2%).

Cluster 5 (“Late Adopters”) is characterised by

accounting software (69.1%) website construction (61.7%), and CRM (4.9%). Table 7 shows that e-orders is between 5% and 10% (97.5%)

whereas e-invoices that companies send are between 10% and 49% (97.5%) and e-invoices received are between 10% and 49% (97.5%). ICT

infrastructure is characterised by the usage of broadband via DSL (43.2%) and ISDN access (34.5%) and the amount of ICT budget is estimated

between 5% and 9% (51.8%).

Late Adopters is a cluster of small companies (10-49 personnel) across all

sectors except telecommunications. Late Adopters totally lack any use of Intranet, Knowledge Management, EDM, ERP, and SCM. In comparison to

smaller companies (clustered together in Beginners and Unready Adopters), they seem that they are not interested in e-business applications. E-

order is not arriving to Late Adopters either. Lost of them use DSL connection (43.2%) which is a cheap and modest solution for Internet access. Their lack

of interest in a broad spectrum of e-business applications reveal that Late Adopters are unmoved from the advances in ICTs, preferring to continue

operating business the same way the operate for decades.

Finally, Cluster 6 (“Laggards”) is

characterised by accounting software (62.5%) and website construction (28.6%) E-orders is between 5% and 10% (100%) whereas e-

invoices that companies send are between 5% and 9% (100%) and e-invoices received are between 5% and 9% (100%). The ICT infrastructure is

characterised by the usage of ISDN (51.7%) while the amount of ICT budget that companies use to enhance their e-business applications is estimated

between 1% and 4% (55.3%).

Laggards resemble a group of companies similar to Late Adopters. A key

difference is that Laggards are mostly micro companies (98%) with 1-9 employees, across all sectors. It is characteristic that Laggards do not use

the e-business applications that Late Adopters also avoid to use, yet, moreover, Laggards have a very low website presence. It is apparent from the data in

Table 7 and Table 8, that Laggards have totally missed all the evolution of e-business. For example, the most advanced of Laggards use DSL to access

the Internet with many of them still use analogue lines, probably to check emails or for personal use.

Validation of Cluster Solution

The validation of clusters is necessary to be assessed in order to evaluate whether

these six-clusters are homogeneous within clusters or heterogeneous between them. For this purpose, two types of multivariate analysis are

used in order to examine the validation of clusters.

Primarily, multinomial logistic regression was used for four categorical

variables, that were not included in two-step cluster analysis: ICT effectiveness on revenue growth, efficiency in business process, internal

to work organisation, procurement cost of supply goods, quality of product and services and quality of customer service, ICT influence on competition in

company’s sector, internal processes differentiation ICT influence on organisational structure, task and job descriptions, education and training of

employees and outsourcing decisions.

The -2 Log Likelihood ratio test measures each

independent variable effect on our model of 6 clusters.

The analysis indicated ‘good fit’, which was statistically significant at

P<0.001 indicating the positive effect of contribution of the independent variables to our model (model's P=0.000, -2 Log

Likelihood=119.91, chi-square=275.2, d.f=165). The Nagelkerke'e pseudo R2 is 0.513 indicating that almost 52% of the variance is explained by variables.

Table 9: Likelihood Ratio Tests in Multinomial Logistic Regression

Please see Table 9 in full PDF version

Next, a stepwise discriminated function analysis is used for the same 8 categorical variables (4 sets) that were not measured in the two-

step cluster analysis: ICT influences (7 items), competition, internal process, ICT organisational influences (4 items). The analysis indicated that F

value has a significant effect on all the independent variables. Table 10 shows the four significant discriminated functions that explained the 100% of

the total variance. Moreover, Table 11 shows a high level of Wilks' Lamda ratio fact which means that functions have suitably separated into clusters.

Additionally, the P value indicates that df act better than chance at separating into groups.

Table 10: Discriminant Function Analysis

Table 11: Wilks' Lambda

Please see Table 10 and 11 in full PDF version

Finally, the classification analysis indicated that 54.6% of the total cases in the 407 questionnaire sampling are classified correctly into 6 clusters.

This rate is much higher than the random chance rate (16.7%) that was calculated on prior probabilities for groups. Hence, it can be estimated

that the results of multivariate analysis are sufficiently well validated with the six clusters method.

Table 12: Classification Analysis for 6 Clusters

Please see Table 12 in full PDF version

Limitations

Due to the fact that our study is based on data of e-business market watch, the questionnaire was not pre-

tested before the survey in order to increase the reliability and validity. Moreover, the e-business terminology that was used in the questionnaire survey

was criticized as complicated (Selhofer et al. 2007). Respondents that found the questionnaire inappropriate or complicated were excluded,

typically by abandoning the interviewing process.

The survey of E-Business Watch comprised only business with computer

usage. This limits e-business profiling to companies with computer usage rather than the total business population. This limitation is not significant

to the extent that most companies use computers and DSL is rapidly adopted in Greece (Tsiamis, 2008). Additionally, Greek enterprises may outsource

some e-business applications. This may distort the cluster solution which is derived from expressed, actual e-business behavior

Managerial Implications and Recommendations for Further Research

The six clusters solution indicated that there are

different business strategies and policies among SMEs towards e-business applications. The most technologically advanced SMEs were

labeled as ‘The Leaders’, are characterized by high rates of Intranet (85.6%), EDM (46.8%), SCM (50%), CRM (62.5%) and high ICT investments (5%-9% with a

percentage of total volume 53.1%). Leaders signifies the existence of a segment of companies characterized by technological performance. Cluster 1

includes large enterprises (50-249 employees) and this suggests further investigation: ‘Is it possible that smaller firms follow this technological path of

growth or is it impossible due to their limited ICT budget?'

The demographic segmentation allows us to

understand the business behavior in Greece in relation to sophistication of e-business model strategies.

For instance, cluster 6 ‘Laggards’ includes companies in the construction sector not showing significant percentages of e-business

applications. However, this low adoption is contrary to the annual report of the Greek National Statistical Service (2006) which was completed in 2006, the

magnitude of construction investments was estimated almost at 580 million euros including new assets, alliances, technological investments, while the

growth rate of the construction sector was estimated around 68% (Tsiamis, 2008).

On the contrary, Pontikakis et al. (2006) found that 81% of the construction sector uses ICT applications, an approach which does not support the

low rates of e-business adoption of Cluster 6. Thus, further investigation is suggested on the obstacles that prevent the construction sector from

enhancing its technological applications and automation to planning process and further exploration of the factors that contribute to the

profile estimation. We suggest six types of e-business behavior which exist in Greek economy. There are probably more, which it could be revealed

with a more ophisticated approach model, thus we suggest further investigation. However, we believe that the demographic profile of

Greek business sector can be used in order for core segments to evaluate their position in the marketplace and to identify new trends and possible lack of

technological infrastructure.
It seems that Greek businesses have adopted the notion of digital economy, making e-

business investments for modernizing their operational process towards internet facilities. The majority of Greek businesses are SMEs

lacking sufficient investment resources, a fact which negatively contributes to technological change. SMEs operational flexibility can be the tool for

re-assessing their position in the European marketplace improving their position significantly, especially the ones which are related to retail such as

food and footwear; and tourism as well.
Beyond the primary purpose of the study, the results have to be further compared in order to have

a clear view of the current trends of Greek entrepreneurship and what are the potential needs for further technological development. However, due

to the lack of Greek research based on cluster profiling towards e-business performance, this is difficult to achieve except

for the studies that have already been discussed.

Conclusion

We aimed to investigate Greek entrepreneurship related to e-business adoption and to present the

current trends of all Greek sectors. Evaluating the entire business sector, we surprisingly found that e-business infrastructure is much highly adopted than

the European ones indicating that Greek companies have already integrated their performance with new and efficient technologies.

Additionally, we found that the ICT budget for new capital investments is high, a fact which leads to the notion that Greek businesses aspire to

continue to supply their business with new technological infrastructure, an obligatory strategy in such a competitive business

environment. Furthermore, trying to generate groups of similar attitudes towards e-business integration, using appropriate statistical analyses, we distinguished

six clusters with significant characteristics of e-business applications with great homogeneity. We found that Cluster 1 ‘Leaders’ have significant e-

business adoption, a fact which can make them have great resistance to global competition. However, other sectors such as food and beverage, construction

and hospital activities need to adopt more sophisticated e-business models in order to be more competitive and technologically equipped.

Greek businesses are usually motivated by other Greek businesses in order to adopt new technological applications waiting mainly to distinguish the potential

chances and opportunities. Greek SMEs have to continuously modernize their operations and technologies in order to catch up with the very high

standards of the more advanced technologically equipped European countries.

Acknowledgements

The authors would like to express their gratitude to e-Business-watch observatory

(www.ebusiness-watch.org/) for allowing researchers to use the secondary data for analysis. The authors would like also to acknowledge the

suggestions of two anonymous reviewers and the editor in revising the initially submitted manuscript. However, all

errors remain of the authors.

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