Organizational forms based on information & communication technologies (ICTs) adoption.

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Abstract

Based on previous research that classified the Information and Communication Technologies (ICTs) into five categories, this article examines empirically the new organisational forms which are coming from the use of every different ICT. Specifically, this paper presents the organizational categorization of Small and Medium sized Enterprises (SMEs) in accordance with the type of ICTs that have been adopted (ICT-Organizational forms). The results suggest that there is a statistically significant relationship of the investments in ICT with the new ICT-organizational forms and strategy for the adoption of ICTs. The empirical analysis is based on a joint methodology of fully structured questionnaires and personal interviews in 54 Greek SMEs.

Keywords: ICT-Organizational Forms, ICT-Investments, ICT-Strategy, Small and Medium Sized Enterprises (SMEs), ICT-Classification

Introduction

It is commonly accepted that our era is characterized by the intense globalisation of markets and the constantly increasing competition. Within this global competitive environment the small and medium sized enterprises (SMEs) are required to wage their own fight, a fight for modernization, for survival and for distinction. The SMEs are a component element of the structure of all economies and societies of our planet. Quite a few studies, research institutions and, of course, researchers have come to the conclusion that small and medium sized enterprises significantly contribute to economic development, production, competitiveness, employment, as well as decentralization and social coherence. They also function as the seedbed of new enterprises, innovative products and applications, flexible business forms, servicing of local needs and a zoning plan for the distribution of employment and income (Storey 1994; Singh and Garg 2008; Thomson and Gray 1999).

The available to businesses ICTs are numerous (Hughes, Golden, and Powell 2003). Most small and medium sized enterprises use information and communication technologies. Relevant research has shown that the use mainly of computers serves administrative and functional uses, such as the rendering of accounts, payroll, the drawing up of a budget, inventory, and other similar functions (Bridge and Peel 1999). The basic condition that arises for the use of computers, but also for all technologies, old or new, electronic or not, is not only their acquisition by the SMEs, but also their correct and functional use (El Louadi 1998).

However, the use of ICTs extends beyond the above mentioned uses, and, if we take into account the development of new technologies, then the business environment is constantly changing with the ICTs leading to this change.

Because of the great number of different ICTs, there has been created a blurred picture which affects both their application and the drawing of conclusions from this application. For this reason, we adopted the following Classification of Information and Communication Technologies (table 1), which includes the ICTs used by enterprises and comprises of five main categories, within which the technologies-systems comprising the category are distributed individually.

At this point, we should clarify that in every main category we have included those technologies which are mentioned by international bibliography as "main" and/or those technologies which are already used by the enterprises. This means that there are also technologies, which have not been included either because of the lack of their use by enterprises or due to their particularity in the area of application. For the creation of these five main categories, we relied on international bibliography and articles pertaining to the ICTs (Davenport 2000; Hitt, Wu, and Zhou 2002; Kumar 2001; Malone et al. 1999; O' Leary 2000; Laudon and Laudon 2006; Grover and Saeed 2003; Kumar and Hillegersberg 2000; Palaniswamy and Tyler 2000).

Table 1: ICT Classification

Main ICT Categories	Technologies - Systems
Enterprise Systems	Enterprise Resource Planning – ERP & ERP II or XRP Customer Relationship Management - CRM Supply Chain Management - SCM
Information Systems	Transaction Processing Systems - TPS Management Information Systems - MIS Decision-Support Systems - DSS Executive Support Systems - ESS
Digital Technologies	E-Commerce (refers to electronic transactions such as procurement and sales over the Internet) – B2B, B2C, B2G E-Business (refers to automated business processes (both intra-and inter-firm) over computer mediated networks – Intranet, Extranet
Telecommunication Systems	Internet, e-mail, voice over IP Local Area Networks Wide Area Networks Virtual Private Networks
Identification and Data Capture Technologies & Telematics Technologies	Portable Data Collection, Hand Held Readers, Magnetic & Smart Card Readers, RFID and so forth.

Source: Papastathopoulos, Anastassopoulos, Beneki (2009)

For the categorization of the SMEs, was used the definition provided by the European Committee (2003). According to this new definition, in article 2 the complete definition of small and medium sized enterprises is given, after having determined that the basic condition for an enterprise to be recognized as a small and medium one is to respect the limits regarding Staff headcount and financial ceilings (annual turnover or annual balance sheet). The new definition introduces three different categories of enterprises (micro, small and medium). Each corresponds to a type of relationship which an enterprise might have with another. This distinction is necessary in order to establish a clear picture of an enterprise's economic situation and to exclude those that are not genuine SMEs. The definition categorizes SMEs in the following three categories:

1. The category of micro, small and medium-sized enterprises (SMEs) are made up of enterprises, which employ fewer than 250 persons and, which have an annual turnover not exceeding 50 million EUR, and/or an annual balance sheet total not exceeding EUR 43 million.
2. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million.

3. Within the SME category, a micro-enterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

The new definition is the result of wide-ranging discussions between the Commission, Member States, business organizations and experts as well as two open consultations on the internet. The changes reflect general economic developments since 1996, and a growing awareness of the specific hurdles confronting SMEs. The new definition is more suited to the different categories of SMEs and takes better account of the various types of relationships between enterprises. It helps to promote innovation and foster partnerships, while ensuring that only those enterprises, which genuinely require support, are targeted by public schemes.

In this paper, we want to explore some issues that run through current discussion of ICT-organizational forms in SMEs. In particular we want to touch on three issues:

1. The first issue to be approached in this study concerns the new organizational forms of SMEs which arose from the research in relation to the ICTs used as well as the proportion of these ICT-organizational forms to each SME size and industrial sectors.
2. The second issue concerns the extent to which the various combinations of ICT organizational forms and Industrial sectors have an effect on the expenditure for the acquisition of ICTs.
3. Finally, a two-way Analysis of Variance (ANOVA) model was implemented in order to see the relationship of the loged ICT investments with the organizational forms and the ICT-strategy of SMEs.

The remainder of the paper is organized as follows. Section 2 discusses the relevant literature. Data selection and research methodology are described in Section 3. Section 4 provides analysis and interpretations of the empirical results and Section 5 concludes the paper.

Literature Review

Technology constitutes an inseparable part of business transactions and activities for every enterprise and not just a luxury commodity or a fad that will soon be outdated. The use of the respective technologies by enterprises, and especially by the small and medium sized ones, is deemed necessary for their viability in the future. New technologies combined with globalization intensify international competition, the state's regulatory role, and at the same time they provide small and medium sized enterprises with new potential for participation in the international market. Of course, all this technological equipment brings about the structural change of the market as new dexterities are created accompanied by the constant need for training and information sharing, the review of technological issues by the owners – managers of SMEs, the active participation of the state and the European Union, as well as the academic research which will pave the way for the secure and supported acceptance of new Information and Communication Technologies.

It is to this direction that the European Commission is already moving, having underlined quite a bit of time ago the importance of ICTs for the prosperity of the European economy. According to the European Commission's e-Business Report (2008), the effective use of ICTs by enterprises constitutes a crucial factor of success both for the innovation and for the competitiveness and the development of SMEs. Also according to the e-Business Report, the analysis of potential provided by ICTs in the creation of new business models is deemed necessary.

The first appearance of information systems in enterprises was in the form of card processing machines which were especially used in the accounting departments and focused on historical information reporting. At the end of the 1950s and at the beginning of the 1960s, appears the mainframe computers that were, in processing power, miniscule compared with today's desk top computers or even PDA's. In the next decades, technology increasingly gains ground resulting in the transaction processing, management reporting, forecasting, and decision support enabled by information technology to participate in practically every activity of the modern enterprise. Most recently, information systems transcended departmental, divisional and organizational boundaries in order to link the firm electronically, often instantaneously, to its customers, suppliers, and distribution partners (Ives et al. 2002).

The continuous rise in the use of ICTs, as well as their importance for the modern enterprise, is also presented in the study conducted by OECD (2004) entitled 'ICT, E-Business and SMEs'. More specifically, it mentions that SMEs have gradually recognized the positive impact that ICTs, such as computer terminals, e-mail and the Internet and their applications can have on their business. Many types of business software can improve information and knowledge management within the firm, leading to more efficient business processes and better firm performance. At firm level, ICT and its applications can make communication within the firm faster and make the management of the firm's resources more efficient. Seamless transfer of information through shared electronic files and networked computers increases the efficiency of business processes such as documentation, data processing and other back-office functions (for example organizing incoming orders and preparing invoices). Increasingly sophisticated ICT applications such as DSS (Decision Support System) and ERP (Enterprise Resource Planning) allow firms to store, share and use a variety of models to analyze their data or condense large amounts of data into a form in which decision makers can analyze them. At inter-firm level, the Internet and e-commerce have great potential for reducing transaction costs and increasing the speed and reliability of transactions. They can also reduce inefficiencies resulting from lack of co-ordination between firms in the value chain. Internet-based B2B interaction and real-time communication can reduce information asymmetries between buyers and suppliers and build closer relationships among trading partners (Moodley 2002). In fact, adopters of e-commerce tend to reduce transaction costs, increase transaction speed and reliability, and extract maximum value from transactions in their value chains (OECD 2002).

New Organizational Forms have constituted the subject of study for quite a few years with a particular value having been assigned to them in approximately the last fifteen years (for example, Daft and Lewin 1993). In the beginning, they were disseminated in between enterprises as a new experimental way of transaction management through new methods of delimiting their potential abroad as well as in the domestic environment (Foss 2002).

The concept of "organizational forms" was adopted in a short period of time and by all those management scholars who have already accepted concepts such as the `knowledge economy' or the 'new information economy' (for example, Halal 1998) and who vigorously supported that the emergence of the Internet would have revolutionary effects on the organization of business transactions (Tapscott 1999).

According to Drucker (1997), businesses of the new age have confirmed the power of technology in the matter of competition as well, but also in the matter of being the main factors of the promotion of change in the organizational forms. For this reason, the New Organizational Forms that respond to the need to align strategy-structure- direction processes (Miles et al. 1997) are influenced by the profound changes in the environment, being themselves technological and economical changes and examples of those (Fernandez and Borjas 2008). The new organizational forms create new transaction management modes

especially in relation to the internal organization of the business and the way in which they transact with other businesses (Foss 2002).

Based on the findings from the literature review, an empirical study has been carried out among 54 Greek SMEs to identify the emerging forms of organizations based on ICTs.

RESEARCH METHODOLOGY

A joint methodology of fully-structured questionnaire and in-depth interviews was selected as the primary research instrument in order to gain as broad a view as possible of the issues surrounding application of ICT, amongst a spectrum of SMEs from 4 out of 51 Greek geographical areas (States/provinces) which fulfilled the criteria of GDP-sharing, working population and total number of population. A total of 100 companies were selected and letters were sent out requesting an interview, while follow-up telephone calls by the researcher negotiated access to each business. Fifty four SMEs responded positively. The main reason why the authors have attempted to use a combination of techniques was to minimize bias and error and overcome any ambiguities.

The survey questionnaire was divided into four parts. Part 1 deals with the adoption and use of ICTs and Part 2 covers questions addressed to evaluate the degree of emphasis placed on strategic and operational planning of ICTs and whether the strategic process was systematic and formal. Part 3 covered the financial information and the last part was based on general information about SMEs.

Personal interviews were conducted with the person deemed to be most knowledgeable on the developments of ICTs within the firm. For that reason, the interviewees ranged from director or owner-manager and IT personnel to general managers. Only one interview per company was conducted. A mix of closed and open-ended questions was included to conduct the structured interviews. This provided a collection of quantitative and qualitative data, and enabled comparisons based on rating, ranking and individual contextual analysis. On average, the interviews lasted one hour and 15 minutes based on a fully structured questionnaire. Completed questionnaires were coded and analyzed using SPSS 17.0.

A stratified random sample of SMEs was drawn from four industry sectors according to classification of economic activity by NACE (rev. 1.1).The criteria of total selection of industry sectors and SMEs according to their two-digit NACE code allocation were attendance index of SMEs in each industry sector and contribution index of each industry sector in Gross Value Added and E-Business Index. The data for the two first indices were found in National Statistical Service of Greece and ICAP databases while the last Index was adopted from the European E-Business Report 2003 (Robinson 2003). The final allocation of our sample (n=54) according to industry sector and firm size is illustrated as follows (Table 2):

Table 2: Distribution of Interviews by Firm Size and Industry Sector

Industry Sector	Sub-sector – two digits allocation	Micro Firms (0-9)	Small Firms (10-49)	Medium Firms (50-249)	Total
Other Services	K 70, K 72, K74	13	8	2	23
Manufacturing	D15, D 22	2	5	2	9
Wholesale	G 52	7	3	3	13

Trade Hotels	H 55	1	6	2	9
Total		23	22	9	54

Empirical Results, Analysis and Discussions

Part A: ICT-Organization Forms

The results of this study reveal that the SMEs' journey towards ICT adoption-use can be classified into three levels. For the sake of simplicity, this classification includes the following three levels according to the types of ICTs (see table 1) that have been applied by SMEs. In the creation of the following three levels, previous studies by Azumah, Koh, and Maguire (2005), Lucchetti and Sterlacchini (2004) and by Southern and Tilley (2000) contributed significantly.

Level 1: Basic Use of ICT or ICT-beginners SMEs. On this level the ICTs used by SMEs support the monitoring of basic-elementary activities, transactions and communications of the enterprise. For instance, ICTs perform and record the daily routine transactions necessary to conduct business. In other words, ICT-Beginners SMEs are those with minimum use of ICTs, and their main business processes are still managed by using the 'traditional economy' approach. The dominant perception on this level is that ICTs constitute separate-independent parts of the organization. The ICTs included in this level according to the aforementioned classification (Table 1) are the following:
- Identification and Data Capture Technologies & Telematics Technologies
- Internet, e-mail, basic web-site (no e-commerce or e-business activities)
- Transaction Processing Systems – TPS
- Local Area Networks

Level 2: Advanced Use of ICT or ICT-based SMEs. On the second level the ICTs used by the SMEs serve specialized activities of the modern enterprise, such as programming operations, transaction monitoring, and decision making and auditing. Furthermore, they combine data and advanced analytical models or data analysis tools so as to support the making of semi structured decisions or unstructured decisions. Finally, they allow business and commercial digital transactions as well as the transmission of information with electronic means even to geographically remote places. An ICT-based SME is one with committed and specialized use of ICTs. Their main business processes are based on and managed by using these ICTs and they perceived such technologies as a necessary part of their business. The ICTs included in this level, according to the aforementioned classification of ICTs (see Table 1) are the following:
- Management Information Systems – MIS
- Decision-Support Systems – DSS
- E-Commerce activities
- Wide Area Networks

Level 3: Superior use of ICT or ICT-Driven SMEs. The ICTs used by the SMEs on the third level contribute to the integration of the informational and business processes of the enterprise, and they support the long-term planning activities as well as the digital exchange of information, the carrying out of commercial transactions and collaborations with the external environment of the enterprise. The ICT-Driven SME is one that uses the technologies as the core of the business for managing the entire business processes. The ICTs

included in this level according to the aforementioned classification (Table 1) are the following:

- Enterprise Systems (for example ERP II or XRP, EAI)
- Executive Support Systems – ESS
- E-Business activities
- Virtual Private Networks

The following figure 1 presents the gradual development of SMEs according to the level of ICTs that they apply.
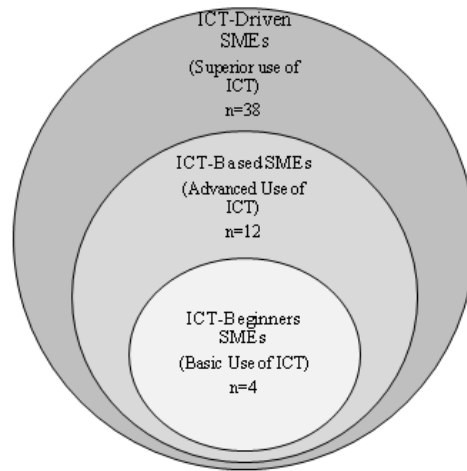
Figure 1: The Three Levels of ICT-Adoption Process

Table 3 shows that 7.4 percent of SMEs use basic ICTs, 22.2 percent use ICTs serving specialized business activities, while for the 70.4 percent of SMEs, technology does not constitute the basis but rather the guide to their business activities. The superior use of ICTs by the SMEs is also accentuated by the data of Table 3, which shows the percentage proportion of each firm's sizes and industrial sectors in each ICT-organizational form. More specifically, through the study it was found that 13 percent of micro firms (≥ 9, n=23) makes basic use of ICTs, 43.5 percent uses specialized technologies, while the same percentage is also encountered in the third category. The tendency of SMEs towards a superior use of technology is depicted in the small firms (10-49) and in the medium firms (50-249), 90.9 percent (n=22) and 88.9 percent (n=9) respectively of which use ICTs that integrate their informational and business processes and provide the potential of long-term strategic planning. In essence, 70.4 percent of SMEs use technology as a guide, 22.2 percent as a basis and a mere 7.4 percent as a separate part of business processes.

Table 3: Firm Size and Industry Sector of the ICT

			Firm Size			Industry Sectors (by NACE)				Total
			0-9	10-49	50-249	Other Services	Manufacturing	Trade	Hotels	
ICT-Beginn	Count		3	1	0	1	1	1	1	4
	%		13.0%	4.5%	.0%	4.3	11.1	7.7	11.1	7.4

							%	%	%	%	%
Organizational Forms based on ICT Adoption	ers SMEs (Basic Use)	within Firm Size									
	ICT-Based SMEs (Advanced Use)	Count % within Firm Size	10 43.5%	1 4.5%	1 11.1%	8 34.8%	1 11.1%	3 23.1%	0 .0%	12 22.2%
	ICT-Driven SMEs (Superior Use)	Count % within Firm Size	10 43.5%	20 90.9%	8 88.9%	14 60.9%	7 77.8%	9 69.2%	8 88.9%	38 70.4%
Total		Count % within Firm Size	23 100.0%	22 100.0%	9 100.0%	23 100.0%	9 100.0%	13 100.0%	9 100.0%	54 100.0%

Out of the three firm-size categories of SMEs, micro firms seem to be adopting technologies at a slower pace in relation to the other two categories, which, according to previous studies is to be expected since micro firms, apart from being less flexible in relation to the other categories due to the insufficiency of funds and many times due to inexperience, views the emergence of new technologies more reluctantly.

The upward trends for the adoption of ICTs are also depicted in the analysis by industry sector. More specifically, in the sector of 'Other Services' (n=23), in 34.8 percent of SMEs the ICTs constitute the basis of their business activities, in 60.9 percent their business activities are the result of the integrated use of ICTs, while a mere 4.3 percent of SMEs still use elementary-basic ICTs.

In the sectors of 'Manufacturing & Hotels' the same situation is depicted with 77.8 percent (n=9) and 88.9 percent (n=9) of SMEs respectively being classified in the category of superior users of ICTs. Finally, a similar picture is depicted in the sector of 'Trade' (n=13) with 69.2 percent of enterprises being guided by ICTs, 23.1 percent of enterprises relying upon ICTs and a mere 7.7 percent contending themselves with the traditional methods of conducting methods.

Part B: The Influence of ICT-Organizational Forms & Industry Sectors on ICT Investments

Next, we will use a two-way ANOVA parametric test in order to test the effectives of two independent variables ICT Organizational Forms and Industry Sectors and also to determine their possible combined effects, that is, the ways in which these variables interact with one another to influence scores on the dependent variable.

Let us assume that the first factor (Factor A) is ICT Organizational Forms (where level A1 is Basic Use of ICT, level A2 is Advance Use of ICT and level A3 is Superior Use of ICT), and the second factor (Factor B) is Industry Sectors (where level B1 is Other Services K70, K72, K74, level B2 is Manufacturing D15, D22, level B3 is Trade G52 and level B4 is Hotels H55). There are three sets of hypotheses:

1. The population means of the first factor are equal. That is,
   H_o: Factor A has no effect on ICT Investment
   H_1: Factor A does have an effect on ICT investment
2. The population means of the second factor are equal. That is,
   H_o: Factor B has no effect on ICT Investment
   H_1: Factor B does have an effect on ICT investment
3. There is no interaction between the two factors. That is,
   H_o: The effect of factor A does not depend on Factor B
   H_1: The effect of factor A does not depend on Factor B

We will examine differences in loged ICT Investment (the dependent variable) in relation to ICT Organizational Forms and Industry Sectors. What is crucial to the factorial combination AxB of these two independent variables is that we are also able to assess the possible interaction effect of the two independent variables combined.

Prior to the two-way ANOVA, a check of the normality assumption is performed first. Since Kolmogorov-Smirnov Z=0.590 and p=0.878 (based upon Kolmogorov-Smirnov's test), the null hypothesis of normality of standardized residuals for the dependent variable is not rejected. Furthermore, the homogeneity of the residuals across the levels of each of the two factors is satisfied. In particular, for the Industry Sector (F(3,42)=2.409, p=0.080) and for the Organizational Forms (F(2,39)=3.209, p=0.051). Also, Levene's test is not significant (F(10,35)=1.516, p=0.175), indicating no violation of the overall homogeneity assumption of variances of the dependent variable across all groups. The assumption of independence of the residuals is assumed to hold true since the data were completed completely at random from independent companies.

Inspection of the table 4 indicates a significant interaction effect between ICT-Organizational Forms and Industry Sectors (F=3.285, p=0.016). The main effect for Organizational Forms is not significant (F=1.605, p=0.215), however the main effect for ICT Industry Sectors is significant (F=4.386, p=0.010). A Bonferroni multiple comparison test is performed to determine which means are different. Thus, we are 95 percent confident that there are statistically significant differences only between the categories Hotels H55 and Trade G52 (p=0.020).

Table 4: Effects Between ICT-Organizational forms & Industry Sectors
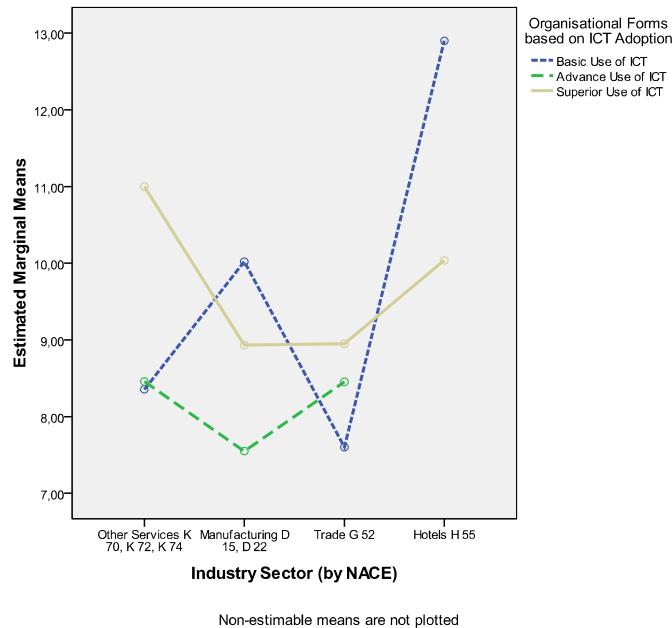(Tests of Between-Subjects Effects. Dependent Variable: loged_ICTinvestment 2006)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	63.625[a]	10	6.363	4.938	.000
Intercept	1664.928	1	1664.928	1292.060	.000
ICT-Organizational Forms	4.136	2	2.068	1.605	.215
Industry Sectors	16.957	3	5.652	4.386	.010
ICT-Organizational Forms * Industry Sectors	21.165	5	4.233	3.285	.016
Error	45.100	35	1.289		
Total	4349.509	46			
Corrected Total	108.725	45			

a. R Squared = .585 (Adjusted R Squared = .467)

The significant main effects tell us that there are significant differences in ICT Investment values among Industry Sectors but not among ICT Organizational Forms. The significant interaction effect indicates that the differences among ICT Organizational Forms depend on Industry Sectors.

The direction of the effect can be determined graphically in the plot of the means (Fig. 2).

Figure 2: Estimated Marginal Means of Loged ICT Investment with the ICT-Organizational Forms & Industry Sectors

Non-estimable means are not plotted

The resulting profile plots show a large increase in the ICT Investment for the Basic use of ICT from Trade G52 to Hotels H55. Also, a large decrease is indicated from Manufacturing to Trade. The change for the Advance use of ICT from Other Services K70, K72, K74 to Manufacturing D15, D22 and from Manufacturing D15, D22 to Trade G52 is slight. Furthermore, the change of the Superior use of ICT from Manufacturing D15, D22 to Trade G52 is negligible and from Trade G52 to Hotels H55 is slight, however the change from Other Services K70, K72, K74 to Manufacturing D15, D22 is large.
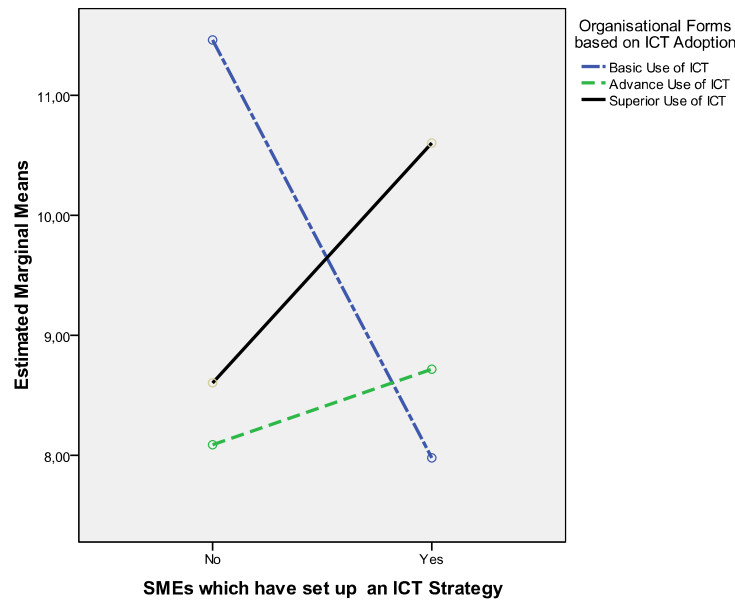
Part C: The Influence of ICT-Organizational Forms & ICT-Strategy on ICT Investments

A two-way Analysis of Variance (ANOVA) model was implemented in order to see the relationship of the loged ICT investments with the ICT-organizational forms and the ICT-Strategy (SMEs which have set up a specific strategy for the adoption and use of ICTs). The results were that the organizational forms had a statistical contribution to the model ($F_{(2,40)}=4.929$, $p=0.012$), the setup strategy on the other hand did not seem to contribute to the model ($F_{(1,40)}=0.4$, $p=0.53$) but the interaction of these two variables was statistically significant ($F_{(2,40)}=11.165$, $p<0.001$). The coefficient of determination (R squared) was equal to 0.559 and the adjusted value of it was equal to 0.504. This means that this model explains 55.9 percent of the variability of the dependent variable or 50.4 percent if we rely on the adjusted value which takes into account the sample size and the number of the estimated parameters.

The reason why the ICT strategy was not removed from the model is due to the existence of interaction.

The interaction indicates that the change of the mean of the response variable stemming from the change in the levels of one factor is different for each of the levels of the second factor. In order to understand the interaction term one must have a look at the following Figure 3.

Figure 3: Estimated Marginal Means of Loged ICT Investment with the ICT-Organizational Forms and the ICT-Strategy

SMEs which have set up an ICT Strategy

The horizontal axis represents the values of the setup ICT strategy (Yes, No). The lines indicate the organizational forms. As seen, the mean of the loged ICT investments for the companies with basic use of ICT decreases as we move from those who do not use an ICT strategy towards those which use an ICT strategy. The companies with advance or superior use of ICT behave the opposite way. The means (of the dependent variable) for the companies that have a strategy are higher than the means of the companies without a strategy. In other words, the companies with advance or superior use of ICT tend to increase their means of loged ICT investments when they adopt a strategy whereas the companies with basic use of ICT tend to move in the opposite direction.

The model applied in these data is the following:

$$E(y_{ij}) = \mu + \tau_i + \beta_j + (\tau\beta)_{ij}$$

Where:
i=1,2,3 indicating the i-th level of the ICT-Organizational forms (1=Basic Use of ICT or ICT Beginners SMEs, 2=Advance Use of ICT or ICT-Based SMEs, 3=Superior Use of ICT or ICT-Driven SMEs),

j=1,2 indicating whether a company uses or not a ICT strategy (1=No ICT Strategy, 2=Yes ICT Strategy).

$E(y_{ij})$ stands for the expected value of the response variable at the i-th organizational form which either uses (j=2) or does not use (j=1) an ICT strategy.

τ_i term stands for the treatment effect of the i-th organizational form and it shows the change of the mean of the response variable as we move from the reference level (superior use of ICT, $\tau_3 = 0$) to the others given that we have controlled the effect of the ICT- strategy.

β_j term stands for the change in the mean of the response variable as we move from the companies with an ICT-strategy ($\beta_2 = 0$) to those with no ICT-strategy, given that we speak for a specific organizational form.

$(\tau\beta)_{ij}$ term indicates the change in the mean response for the i-th organizational form for the companies that have an ICT-strategy. The constraints imposed ($\tau_3 = 0$ and $\beta_2=0$) imply that $(\tau\beta)_{12} = (\tau\beta)_{22} = (\tau\beta)_{32} = (\tau\beta)_{31} = 0$. If the interaction was not significant that would assume that that the mean difference of the dependent variable between the companies with and without ICT-strategy is the same for all organizational forms. Or else that the three lines in the graph would be parallel. It follows that the term μ is simply the mean response for the companies that have a setup strategy and make superior use of the ICT.

The multiple comparisons bases upon the Bonferroni procedure indicate that only the mean difference between the superior and the advance use of ICT-organizational forms is statistically significant ($p<0.001$). Since the interaction is significant, this implies that the change in the organizational forms depends upon whether a company has an ICT-strategy or not. Thus, the examination of the treatment effects ($\tau_2 = -1.884$) and ($\tau_1 = -2.614$) shows significant changes as we move from the superior to the advance ($p=0.001$) and basic ($p=0.002$) use of ICT respectively. The mean change in the response due to the adoption of a setup strategy ($\beta_1 = -1.998$) is statistically significant ($p<0.001$), given that we take into account the organizational form. This change differs for every ICT-organizational form.

The assumptions of the two-way ANOVA model are satisfied. The normality assumption of the residuals cannot be rejected (Kolmogorov-Smirnov Z=0.625, p=0.829). The overall homogeneity assumption of the residuals is also met (F(5,40)=1.355, p=0.262, based upon the Levene's test). The homogeneity of the residuals across the levels of each of the two factors was also satisfied (F(2,43)=0.044, p=0.957 for the organizational forms and F(1,44)=0.047, p=0.829 for the setup strategy factor). The assumption of independence of the residuals is assumed to hold true since the data were completed completely at random from independent companies.

CONCLUSIONS AND RECOMMENDATIONS

The emergence of new organizational forms of SMEs according to the level of use of ICTs gives rise to new research opportunities in the sensitive sector of SMEs, and, at the same time, it facilitates the drawing of conclusions pertaining to the ICTs. In addition, the need for the emergence of new organizational forms stems also from the fact that technology no longer constitutes a mere link in the chain of businesses processes but rather the driving force behind this chain both in the internal and in the external business environment.

The aforementioned study concluded that all categories of SMEs (0-9, 10-49, 50-249) of the specific industry sections under investigation show a clear tendency towards a superior use of technology especially in the two larger categories of SMEs (10-49, 50-249). The reason for the intensified adoption-use of ICTs stems from the fact that information technology and the potential that is derived from its use constituted initially the main part (the basis) of the organizational architecture of businesses (Farbey et al. 1994). On the other hand, nowadays it is evident that ICTs do not merely constitute the basis but rather the guide of the organizational and strategic architecture of businesses even in micro firms (0-9) characterized as earlier adopters due to the lacking knowledge in formal planning, programming, methodology (Pollard and Hayne 1998), financing (OECD 2006).

From the conducted inspections, it was revealed that between the three ICT-Organizational Forms and the ICT investments, only the mean of superior use (ICT-Driven SMEs) is significantly different from the mean of Advance use (ICT-Based SMEs). The superior use has a significantly higher mean of ICT investments than does the advance use. This result shows us that in order for the SMEs to move from the 2nd ICT organizational level (Advance) to the 3rd level (Superior), greater investment in ICTs is required. This makes perfect sense because, if we observe the three ICT organizational forms, we will notice that

the 1st level (basic use of ICT) includes basic for our day and age technologies which can be acquired with minimum investment. The technologies of the 2nd level (advance use of ICT) demand greater investment and the technologies of the 3rd level (superior use of ICT) an even greater one. Moreover, the study showed that the investment required in order to move from the first level to the second is significantly lower than the investment required so as to move from the second level to the third. This difference is justified by the fact that the technologies of the third level are technologies which contribute to the integration of businesses processes both horizontally (between functional areas) and vertically (between different functional areas of the organization -operational, managerial & strategic levels). On the other hand, no statistically significant differences were revealed between ICT organizational forms and SMEs turnover and net profits. This conclusion gives rise to questions pertaining to the method of ICTs' use by the SMEs, because the basic concern of the business world is for the use of ICTs to produce, apart from intangible benefits, also tangible ones, which will translate in maximized profits.

As for the ICT organizational forms and the industrial sectors significant differences in ICT investment values among ICT organizational forms were found. More specifically, great fluctuations were observed between the three levels of ICT organizational forms and the enterprises (two-digit NACE code, K70, K72, K74, D15, D22, G52, H55) comprising the 4 industry sectors of our research. These results lead us to the conclusion that investment in ICTs differs from sector to sector due to the wide range of activites that the SMEs are called upon to conduct. At this point, we have to stress the fact that significant differences have been observed even in enterprises of the same sector with similar business activities. This happens because they are not a homogeneously set of businesses. They vary significantly in size, age, sector, motivation, mode of organization, ethnic background, location, knowledge base, power and control of resources, innovative capacity and so on (Taylor and Murphy 2004).

Finally, through this analysis, we came to the conclusion that the SMEs which have a specific ICT adoption and use strategy (figure 3) invest greater amounts of money as they move from the first level (Basic use of ICT) to the second (Advance use of ICT) and from the second level to the third (Superior use of ICT). The rate of increase of investment in ICTs is utterly justifiable due to the varying nature of technologies from one level to the next. A completely different picture is depicted in SMEs which have not developed a specific ICT adoption and use strategy. Investment in this case (figure 4) does not keep pace with the level of the respective technologies used, painting a picture of ICT investment being mostly the result of random choice rather than organizational planning.

In this paper, three new organizational forms based on the level of the adoption by SMEs were presented and the extent to which they affect some basic financial results of businesses was examined. Without a doubt, this particular study lends itself to further research, initially in more industrial sectors and sub sectors (two-digit NACE codes) so as to identify as many ICT factors affecting SMEs as possible, and secondly, to investigate the way (quality features) in which SMEs develop the strategy they will follow for the adoption-use of ICTs. Research is already in progress by the authors in the above directions.

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