The effect of generalized competition and strategy on the business value of information and communication technologies

Euripidis Loukis and Ioakim Sapounas
University of the Aegean, Karlovassi, Samos, Greece, and

Konstantinos Aivalis
ICAP, Athens, Greece

Abstract

Purpose – This paper aims to investigate the effect of two external factors – the "generalized" competition an organization faces, and the strategy it follows in response to its external environment – on the business value generated by its ICT investment.

Design/methodology/approach – For achieving these research objectives econometric models of output are constructed, using firm-level data from Greek companies, which have been collected through a survey through a structured questionnaire. These econometric models are based on the microeconomic production theory (Cobb Douglas production function). For operationalizing the "generalized competition" an organization faces are used the five dimensions of the generalized competition of M. Porter's "five forces framework".

Findings – Concerning the above generalized competition dimensions it is concluded that higher level of bargaining power of suppliers results in higher ICT business value generation. Also, concerning strategy it is concluded that in organizations following a strategy of frequent introduction of new innovative products and services is generated higher ICT business value.

Originality/value – This paper investigates the effect of external environment related factors on the business value generated by ICT investment. The conclusions constitute of first evidence that there are external conditions that result in higher business value from ICT investment by necessitating a more efficient and effective use of ICT.

Keywords Information systems, Communication technologies, Business performance, Management strategy, Greece

Paper type Research paper

1. Introduction

The business value generated by the high investments of organizations in information and communication technologies (ICT) has been a major research topic in the area of information systems (IS) for long time (for more than 20 years), due to its high significance for the ICT industry, the IS practitioners, the business managers and the public policy makers. In the first period of this research until the mid-1990s the results concerning the relation between ICT investment and business performance were mixed or inconclusive, posing many critical questions concerning the business value generated by the significant investments that organizations made in ICT, which are usually referred to as "ICT productivity paradox" (Solow, 1987; Brynjolfsson, 1993). However, subsequent research after the mid-1990s provided considerable empirical evidence of positive and statistically significant contribution of ICT investment to

some measures of business performance (e.g. Brynjolfsson and Hitt, 1996; Organisation for Economic Co-operation and Development, 2003; 2004; Loukis and Sapounas, 2004), even through there are still studies resulting in mixed or inconclusive results concerning the impact of ICT investment on business performance (e.g. Stiroh, 1998; Carr, 2003).

The extensive research conducted in this area has also concluded that the magnitude of the business value ICT generate for an organization is affected to a large extent by a number of "internal factors", which are related to the internal functions of the organization, such as the simultaneous development of new work practices, new business processes, new human skills, innovation, new IS management structures, etc. (e.g. Brynjolfsson *et al.*, 2000; Ramirez, 2003; Arvanitis, 2003, 2005; Loukis and Sapounas, 2004; Hempell, 2005). However, limited research has been conducted on the effect of "external factors", which are related to the external environment of the organization, on the business value generated by its ICT investment. Melville *et al.* (2004) in their literature review conclude that "we know very little about how industry characteristics moderate the degree of IT business value" and suggest that empirical research is required in this direction and especially for investigating the effects of competition on the efficiency gains achieved via ICT. Therefore it is necessary to investigate the effect of external factors as well on the business value generated by ICT, in order to find out whether there are external conditions resulting to systematically higher or lower ICT business value, and also to understand the underlying reasons, so that organizations can take them into account in planning their ICT investment.

In this direction our paper describes an empirical study of the effect of two external environment related factors, the "generalized" competition an organization faces, as it is conceptualized by the well established "five forces framework" of Porter (1980), and the strategies an organization follows in response to its external environment, on the business value generated by its ICT investment. In particular, the research objective of this study is to investigate whether the items in the following list affect systematically (positively or negatively) the business value generated by the ICT investment of the organization, which is quantified as the contribution of its ICT investment to output:

(1) The intensity of each of the Porter's "five forces framework" (bargaining power of suppliers, bargaining power of buyers, competitive rivalry from competitors, threat of new entrants and threat of substitute products or services), which constitute the basic dimensions of the generalized competition an organization faces.

(2) The degree of following each of the six fundamental strategies an organization can, according to the relevant literature, follow in response to its external environment (cost leadership, quality differentiation, specialized products/services, frequent introduction of new products/services, expansion to markets of other countries and expansion to new activities).

Such an investigation has never been conducted before, since all previous relevant research dealt with the effect of "internal factors" on the business value that ICT investments generate; the above research questions (1) and (2) have not been addressed by the literature despite their significance for ICT planning in organizations. In the following sections initially the relevant literature is reviewed (section 2); then the

methodology and the data of this study are described (section 3), and the results are presented and discussed (section 4); the final section contains the conclusions and directions for future research.

2. Literature review

Extensive research has been conducted on the business value that ICT investment generates, aiming mainly at the assessment and understanding of the impact of ICT investment on business performance, and also at the identification of factors affecting the magnitude of this impact. This research can be broadly divided into two periods. The first period of this research, from the mid-1980s until the mid-1990s (Roach, 1987; Strassman, 1990; Yosri, 1992; Weill, 1992; Loveman, 1994; Barua et al., 1995; Hitt and Brynjolfsson, 1996; Rai et al., 1996, 1997; Strassman, 1997), contrary to theoretical arguments and professional beliefs, provided very little empirical evidence of a positive and statistically significant relation between ICT investment and business performance. These counter intuitive results posed to the academic and the management community many critical questions concerning the practical usefulness and the productivity of the ICT investments, which were collectively named as the "ICT productivity paradox" (Solow, 1987; Brynjolfsson, 1993). On the contrary, the second period of this research, from the mid-1990s until today, provided considerable empirical evidence of positive and statistically significant contribution of ICT investment to several measures of business performance, such as output, labor productivity, etc. (Lichtenberg, 1995; Brynjolfsson and Hitt, 1996; Dewan and Min, 1997; Stolarick, 1999; Lehr and Lichtenberg, 1999; Gilchrist et al., 2001; Devaraj and Kohli, 2000; Organisation for Economic Co-operation and Development, 2003; Sigala, 2003; Loukis and Sapounas, 2004). These positive results, according to Brynjolfsson and Hitt (1996), reflected improvements in the ways organizations used and managed ICT after the mid-1990s, and also the adjustment and the restructuring that had taken place at the firm level between the mid-1980s and the mid-1990s, which enabled a higher level of benefits from ICT; also they reflected improvements in the research methodology (e.g. in data collection and analysis methods). However, even in this second period there are still studies resulting in mixed or inconclusive evidence concerning the impact of ICT investment on business performance (e.g. Stiroh, 1998; Hartman, 2002; Carr, 2003).

Another important conclusion of the whole research that has been conducted on ICT business value is that the magnitude of the business value organizations get from their ICT investment varies considerably, depending to a large extent on several "internal" factors, i.e. to several factors related to the internal functions of the organization. For this reason since the late 1990s considerable research has been conducted in order to identify complementary actions and factors, which, in combination with ICT investment, can increase its positive impact on business performance. In this direction Devaraj and Kohli (2000) from an empirical study concluded that the combination of ICT investment with business processes reengineering increases its positive effect on output. Tallon et al. (2000), based on a survey of business executives, found that the strategic alignment of ICT investment with business strategy results in higher business value from the ICT investment. Bharadwaj (2000), adopting a resource-based view of the firm, found that it is not simply the investment in ICT infrastructure, but the creation of unique ICT-related capabilities, that leads to higher firm performance. Brynjolfsson et al. (2000) concluded that the combination of decentralization practices

with ICT has a disproportionately large positive effect on firm market value. Ramirez (2003), based on data from large US enterprises, concluded that there is complementarity between ICT investment and employee involvement: their combination results in additional output and labor productivity increase beyond the individual effects of each of these two factors; similar were his conclusions for the total quality management. Arvanitis (2003, 2005), based on data from Swiss firms, provides evidence of a similar complementarity between ICT capital and human capital with respect to labor productivity. Loukis and Sapounas (2004), based on data from Greek companies, found that there is complementarity between IS investment and a set of IS management factors with respect to firm output and labor productivity. Hempell (2005), based on firm-level panel data covering a five years' period, concluded that ICT investment is more productive in firms with experience in innovations. It should also be noted that most of the previous research on the business value of ICT investment and the factors affecting it has been conducted in a small number of highly developed countries (mainly in the US), so they reflect the economic, cultural and technological context of these countries; on the contrary limited research has been conducted on the above topics in other types of national contexts, which are characterized by quite different economic, cultural and technological context.

On the other hand quite limited research has been conducted about the effect of factors related to the external environment of the organization on the business value generated by its ICT investment. One of the most important factors of the external environment of an organization is the competition it faces. The economic literature has been emphasizing for long time (e.g. Primeaux, 1977) that higher competition results in more efficient utilization of resources; so we can expect that higher competition might result in more efficient utilization of ICT resources and therefore higher levels of ICT business value. On the contrary, Brynjolfsson and Hitt (1996) argue that higher competition may "compete away" part of the business value generated by ICT, by putting pressure on the organization to transfer part of this business value to the consumers of its products/services (e.g. as increased quality of products and/or services at the same price, or even at a lower price, etc.) and increase consumer surplus, but at the same time decreasing the business value the organization gets from its ICT investment; so, based on this argument, we can expect that higher competition might reduce the magnitude of the business value an organization finally gets from its ICT investment. These mixed expectations are also stressed by Melville *et al.* (2004) in their literature review of the ICT business value research, who mention that "although in highly competitive markets firms may apply IT more efficiently, profitability may suffer as gains to IT application are competed away" and suggest that empirical research is required in this direction. It is also worth noting that even this limited literature on this topic focuses on only one of the dimensions of the competition an organization faces: the competitive rivalry from its competitors. However, strategic management literature (e.g. Porter, 1980, 1985; Wheelen and Hunger, 2004; Johnson and Scholes, 2005) has emphasized long time ago the need to adopt a wider and multidimensional view of competition. According to Porter's "five forces framework" for the analysis of competition and profitability potential of an industry or sector (Porter, 1980), there are five different competitive forces an organization faces, which all in combination determine its competitive position and profitability potential: bargaining power of suppliers, bargaining power of buyers, competitive rivalry from

competitors, threat of new entrants and threat of substitute products or services. Therefore empirical research is required, based on "real-life" data, in order to investigate the effects of all the above five dimensions of the "generalized competition" organizations face on the business value they get from their ICT investment.

Also, limited is the research that has been conducted on the effect of the strategies an organization follows, in order to respond to pressures from its external environment, on the business value generated by its ICT investment. According to strategic management literature (e.g. Porter, 1980, 1985; Wheelen and Hunger, 2004; Johnson and Scholes, 2005) there are some fundamental strategies that an organization can to follow in order to respond to pressures of its external environment: cost leadership, quality differentiation, specialized products/services, frequent introduction of new products/services, expansion to markets of other countries and expansion to new activities. Each of these strategies necessitates a different way of using ICT, with different objectives and focus; for example a cost leadership strategy necessitates a quite different way of using ICT, with quite different objectives and focus (e.g. cost monitoring, cost minimization, etc.), than a quality differentiation strategy (in which the focus of ICT use may be on improved customer service, designing better and highly specialized products and services, etc.). It should be noted that the mutual relation between strategy and ICT has been extensively emphasized by the relevant literature (e.g. Porter and Millar, 1985; Kearns and Lederer, 2000; Galliers, 2004; Byrd *et al.*, 2006), which concludes that ICT can be of critical importance both for supporting the strategy of an organization, and also for redefining and enriching it with new ICT-based ways of generating revenue and achieving competitive advantages. Therefore it is quite interesting to investigate empirically, based on "real-life" data, the effect of following each of the above fundamental strategies on the business value organizations get from their ICT investment.

3. Methodology
Taking into account the conclusions of the above literature review we defined the research objective of this study to be the investigation of the effect of the following on the business value organizations get from their ICT investment, and in particular on the contribution of ICT to output:

- Each of the five dimensions of the "generalized competition" an organization faces according to Porter's "five forces framework" (Porter, 1980), namely of the bargaining power of suppliers, the bargaining power of buyers, the competitive rivalry from competitors, the threat of new entrants and the threat of substitute products or services.

- Following each of the abovementioned six fundamental strategies, namely cost leadership, quality differentiation, specialized products/services, frequent introduction of new products/services, expansion to markets of other countries and expansion to new activities.

In order to accomplish this research objective we formulated and tested quantitatively with "real-life" data the 11 research *H1* to *H11*. The first five of them (*H1* to *H5*) concern the effect of the above five dimensions of the "generalized competition" on the contribution of ICT to output; the theoretical foundations of these five hypotheses are outlined in the penultimate paragraph of the previous "literature review" section. The

other six research *H6* to *H11* concern the effect of following the abovementioned six fundamental strategies on the contribution of ICT to output; their theoretical foundations are outlined in the last paragraph of the previous "literature review" section. In particular, our research hypotheses were:

H1. The level of bargaining power of suppliers affects the contribution of ICT to firm output.

H2. The level of bargaining power of buyers affects the contribution of ICT to firm output.

H3. The level of competitive rivalry from competitors affects the contribution of ICT to firm output.

H4. The level of threat of new entrants affects the contribution of ICT to firm output.

H5. The level of threat of substitute products or services affects the contribution of ICT to firm output.

H6. The degree of following a cost leadership strategy affects the contribution of ICT to firm output.

H7. The degree of following a quality differentiation strategy affects the contribution of ICT to firm output.

H8. The degree of following a specialized product/services strategy affects the contribution of ICT to firm output.

H9. The degree of following a strategy of frequent introduction of new products/services affects the contribution of ICT to firm output.

H10. The degree of following a strategy of expansion to markets of other countries affects the contribution of ICT to firm output.

H11. The degree of following a strategy of expansion to new activities affects the contribution of ICT to firm output.

For testing the above 11 hypotheses (*H1* to *H11*) econometric models for firm output were constructed, based on the microeconomic production theory, and in particular on the Cobb Douglas production function, which has been extensively used in the past in economic studies as a basis for the estimation of the contribution to firm output of various firm inputs, including ICT investment (e.g. Brynjolfsson and Hitt, 1996; Stolarick, 1999; Organisation for Economic Co-operation and Development, 2003, 2004; Ramirez, 2003). In particular, we used as our basis the following extended form of the Cobb Douglas production function, in which the capital is divided into computer capital and non-computer capital:

$$VA = e^{\beta_0} L^{\beta_1} K^{\beta_2} CK^{\beta_3} \qquad (1)$$

where VA is the yearly firm value added (which is equal to yearly sales revenue minus yearly expenses for buying materials and services), L is the yearly labor expenses, K is the non-computer capital and CK is the computer capital, while the $\beta_1 - \beta_3$ are the

corresponding output elasticities with respect to these three inputs (L, K and CK). By log-transforming this model, we obtain the following linear model:

$$\ln VA = \beta_0 + \beta_1 \ln(L) + \beta_2 \ln(K) + \beta_3 \ln(CK) \qquad (2)$$

In order to investigate the effect of each of the above eleven factors of *H1* to *H11* (level of bargaining power of suppliers, level of bargaining power of buyers, etc.) on the contribution of ICT to output, we added to the above model one more "interaction term", which is equal to the product of the corresponding factor F to the $\ln(CK)$:

$$\ln VA = \beta_0 + \beta_1 \ln(L) + \beta_2 \ln(K) + \beta_3 \ln(CK) + \beta_4 \ln(CK) \cdot F \qquad (3)$$

In all the models we constructed according to the above equations (2) and (3) using "real-life" data we performed a number of tests concerning the basic assumptions of the "classical" linear regression model according to the recommendations of the relevant econometrics literature (Gujarati, 2003; Greene, 2003). In particular, the assumptions of error normality (normal distribution of error values) and homoscediasticity (constant error variance across observations) were tested by plotting and inspecting the residuals' histograms. The existence of error autocorrelation was tested through the Durbin-Watson test. Finally the existence of multicollinearity (high levels of correlation among independent variables) was tested by calculating and examining the independent variables correlation matrix, the condition index (CI), and also the tolerance (TOL) and the variance inflation factor (VIF) of each independent variable.

The data we used in this study for constructing the econometric models were collected through a survey among Greek companies, titled "Usage of information and communication technologies, modern organization forms and innovation in the Greek companies", in cooperation with ICAP, one of the largest business information and consulting companies of Greece. This survey was based on a structured questionnaire, which included questions about the basic financial data of the company for the year 2004 (sales revenue, expenses for materials and services, labor expenses, value of capital (assets), value of computer capital, etc.), and also questions asking them to assess in a five level scale: how intensive is for them each of the abovementioned five forces of M. Porter's model, and to what degree they follow each of six abovementioned strategies; these survey questions (translated from Greek into English) appear in the appendix; from each of them a corresponding variable was created. Additionally, this questionnaire included many other questions concerning innovative activity, adoption of new forms of work organization, adoption of new forms of human resources management, redesign of processes and organizational practices, quality and usage of various kinds of IS and IS management practices and processes; the processing and analysis of the responses to these questions is in progress, and the results will be presented in other papers. In order to assess the content validity of the questions of this questionnaire (i.e. whether they really measure the content they are intended to measure) it was reviewed by six experts; three of them were from ICAP and had extensive experience in such surveys and questionnaires, while the other three were from the University of Aegean and had extensive experience in information systems research. Based on their comments and recommendations a final version of the questionnaire was developed.

The sample of the survey was randomly selected from the database of ICAP, which includes financial and other business information for approximately 135,000 Greek

firms. For the determination of the sample size were taken into account both the requirement for covering all the important sectors of Greek economy and all company sizes, and also our time and resources limitations, resulting finally in a sample consisting of 304 Greek companies from the 27 most important sectors of Greek economy. In this sample there was equal representation of the small, the medium and the large companies (according to the relevant definitions of the European Union): in particular, 103 of the companies of the sample were small (with more than ten and less than 50 employees), 103 were medium (with more than or equal to 50 and less than 250 employees) and 98 were large (with more than or equal to 250 employees). The questionnaire was sent by mail to the managing directors of these 304 companies; the recipients were asked to fill in the questionnaire and return it by fax or mail within one month. After one month all the recipients who had not responded were contacted by phone again and reminded of the questionnaire. For most of the companies of the sample several phone calls were required, in order to have the questionnaire filled in completely and correctly; in general there are big difficulties in collecting such data, because many companies regard them as confidential. Finally were received answered questionnaires from 176 companies (64 small, 65 medium and 47 large ones), so the response rate was 57.9 percent; their average number of employees is 493 and their average sales revenue in 2004 was €183.7 million. We also examined if there is any non-response bias. According to the relevant literature (Armstrong and Overton, 1977; Chapman, 1992; Kearns and Lederer, 2000) the best and desirable method for assessing non-response bias is to gather data (i.e. receive answered questionnaires) from a significantly large and random sample of non-respondents and compare them with the corresponding data provided by the respondents, but this method is rarely feasible; so a good alternative method, which according to the relevant literature gives reliable results, is to compare variables' means of the early respondents with the ones of the late respondents; if there are not significant differences, then it is highly likely that non-response bias does not exist (since the assumption of this method is that late respondents are similar to non-respondents). Following this method we divided the answered questionnaires we received into two groups: the ones we received within the first month (first group), and the ones we received later (second group). Then we tested for all variables whether there are statistically significant differences between the means of these two groups. Since we did not find any statistically significant differences it is highly likely that non-response bias does not exist.

4. Research findings

Initially we estimated the model of equation (2) of the previous section, and the results are shown in Table I. We remark that the coefficients of labor, non-computer capital and computer capital are all positive and statistically significant, so we conclude that all these three inputs make a positive contribution to firm output. These results confirm the relevant conclusion we had drawn in our previous study (Loukis and Sapounas, 2004), which was based on a different dataset collected in a survey among Greek companies, that ICT investments of Greek companies make a positive and statistically significant contribution to their output.

Proceeding to the basic research questions of this study, in order to examine the effect of each of the abovementioned five dimensions of the generalized competition on the contribution of ICT to output, we estimated the model of equation (3) for each of the

five factors of the research hypotheses *H1* to *H5*: level of bargaining power of suppliers (SP), level of bargaining power of buyers (BP), level of competitive rivalry from competitors (CR), level of threat of new entrants (NE) and level of threat of substitute products or services (SPS). From these five models, only the model for the bargaining power of suppliers (factor SP), which is shown in Table II, had an interaction term with a statistically significant coefficient; in the other four models the coefficient of the interaction term was not statistically significant. These findings support *H1*, but provide no support for *H2* to *H5*. From the positive and statistically significant value of the interaction term in the model of Table II it is concluded that higher levels of bargaining power of suppliers result in higher contribution of ICT to output. These results can be explained taking into account the basic characteristics of the Greek economy, which is characterized by small markets and small numbers of competitors in most sectors (since the total population of Greece is 10.9 million people). For this reason the competitive rivalry, the threat of new entrants, the threat of substitute products or services and the bargaining power of buyers are not so intensive as to create big pressures on the Greek companies for a more efficient utilization of their ICT resources and finally result in higher levels of contribution of ICT to output. However, in such small markets very often the number of potential suppliers of basic inputs in some sectors is limited (in many cases we have practically monopolies or oligopolies), resulting in high levels of bargaining power of these suppliers and therefore in high levels of prices for basic inputs, putting quite big pressures on the Greek companies for a more efficient utilization of their ICT resources for supporting an efficient management of these expensive inputs; for this purpose they have to develop mainly "efficiency-oriented" applications, which support the efficient planning and monitoring

| Dependent variable: ln (*VA*) | | |
Independent variable	Coefficient	Significance
Constant	2.677	0.003
ln (*L*)	0.558	0.000
ln (*K*)	0.155	0.030
ln (*CK*)	0.219	0.009

Table I.
Regression results for the impact of labor, non-computer capital and computer capital on output

Note: *R*-squared: 0.60

| Dependent variable: ln (*LP = VA*) | | |
Independent variable	Coefficient	Significance
Constant	2.348	0.010
ln (*L*)	0.569	0.000
ln (*K*)	0.158	0.025
ln (*CK*)	0.167	0.049
ln (*CK*)*SP	0.019	0.014

Table II.
Regression results for the impact of labor, non-computer capital, computer capital and interaction between computer capital and bargaining power of suppliers on output

Note: *R*-squared: 0.63

of their operations and of the consumption and transformation of their inputs (e.g. inventory and warehouse management systems, master production planning/ monitoring systems, material requirements planning/monitoring systems, etc.). These critical applications increase the contribution of ICT investment to output, and in general the business value it creates.

In order to examine the effect of following each of the six fundamental strategies mentioned in the previous section on the contribution of ICT to output, we estimated the model of equation (3) for each of the six factors of the research hypotheses $H6$ to $H11$: degree of following a cost leadership strategy (CL), degree of following a quality differentiation strategy (QD), degree of following a specialized products/services strategy (SPE), degree of following a strategy of frequent introduction of new products/services (NPS), degree of following a strategy of expansion to markets of other countries (ENC) and degree of following a strategy of expansion to new activities (ENA). From these six models, only the one corresponding to the strategy of frequent introduction of new products/services (factor NPS), which is shown in Table III, had an interaction term with a statistically significant coefficient (at the 10 percent significance level); in the other five models the coefficient of the interaction term was not statistically significant. These findings support $H9$, but provide no support for $H6$, $H7$, $H8$, $H10$ and $H11$. From the positive and statistically significant value of the interaction term in this model it is concluded that following to a high degree a strategy of frequent introduction of new products/services results in higher levels of contribution of ICT to output. This conclusion can be explained taking into account that such a strategy necessitates both "innovation-oriented" applications (for supporting the analysis of market research data, the design of new products/services and of their production and delivery processes, marketing plans, etc.) and "efficiency-oriented" applications (for supporting the efficient planning and monitoring of the production and delivery processes of many new products/services, which usually have to share production and delivery resources with many older products/services, creating high levels of complexity, which can be efficiently managed only using ICT). Such innovation-oriented and efficiency-oriented applications increase the contribution of ICT investment to output, and in general the business value it creates. Moreover, following a strategy of frequent introduction of new products/services often necessitates devising innovative ways of using ICT, which further increase their contribution to output and in general the business value they create.

Dependent variable: ln $(LP = VA)$ Independent variable	Coefficient	Significance
Constant	2.603	0.004
ln (L)	0.554	0.000
ln (K)	0.182	0.013
ln (CK)	0.153	0.092
ln (CK)*NPS	0.013	0.082
Note: R-squared: 0.63		

Table III.
Regression results for the impact of labor, non-computer capital, computer capital and interaction between computer capital and strategy of frequent introduction of new products/services on output

5. Conclusions and further suggestions

In this paper is presented an empirical study of the effect of the "generalized" competition, which is measured in accordance with M. Porter's "five forces framework", and also of six fundamental strategies organizations follow in response to their external environment, on the business value generated by ICT investment, and in particular on the contribution of the ICT investment to output. Such an investigation has never been conducted before, since all previous relevant research dealt with the effect of "internal factors" on the business value generated by ICT investment. It has been concluded that from the "five forces' of Porter's framework, only the bargaining power of suppliers affects ICT business value; in particular, it has been concluded that higher levels of bargaining power of suppliers create big pressures for the development of mainly "efficiency-oriented" applications, and in general for a more efficient utilization of ICT resources, increasing the contribution of ICT investment to output. These findings can be explained taking into account the basic characteristics of the Greek economy, which is characterized by small markets and small numbers of competitors in most sectors, resulting in low levels of competitive rivalry, threat of new entrants, threat of substitute products or services and bargaining power of buyers; however, in many sectors there are small numbers of potential suppliers of basic inputs, so these suppliers have very high levels of bargaining power, which results in high prices for basic inputs, creating big pressures for developing valuable "efficiency-oriented" applications and in general for a more efficient utilization of ICT resources. Also it has been concluded that following a strategy of frequent introduction of new products/services creates big pressures for the development of both "innovation-oriented" and "efficiency-oriented" applications, and in general for more innovative and more efficient utilization of ICT resources, resulting in an increase of the contribution of ICT investment to output.

The central conclusion drawn from this study, based on "real-life" data, is that there the business value generated by ICT depends not only on "internal factors" but also on "external factors" as well; in particular, there are external environment conditions that result in higher business value from ICT investment by necessitating a more efficient and effective use of ICT; such a conclusion is quite useful for ICT planning in organizations. Also it would be useful to examine and analyze the best practices concerning IS usage and management of these highly efficient and effective ICT users and then attempt to transfer them to other organizations (e.g. in other industries or sectors). Another important conclusion drawn from this study, based on "real-life" data, is that there are specific strategies for responding to the external environment, which are characterized by frequent products/services innovations, leading systematically to higher business value from ICT investment; in such innovation strategies the relation between strategy and ICT seems to be much stronger than in the other types of strategies: ICT are much more important both for enabling and enriching innovations strategies, and also for supporting their implementation.

The conclusions of this study open up new directions of research:

(1) For testing the above conclusions both in similar national contexts (characterized by small markets and similar levels of economic development) and in different national contexts (characterized by bigger markets and different levels of economic development).

(2) For investigating the effect of other external environment related factors, e.g. environmental complexity, uncertainty, etc., and also various sectoral characteristics, such as degree of technological change, regulation, workforce composition, etc., on the business value that ICT generate for organizations.

(3) For investigating "how" these external factors affect ICT business value (e.g. by affecting some internal factors or variables).

(4) For investigating in general the interrelation between external and internal factors affecting ICT business value and the direct and indirect effects of them on ICT business value.

For the above research directions (3) and (4) the construction of structural equation models (SEM) based on sound theoretical foundations and their testing with "real-life" data might be quite useful. Research is already in progress by the authors in the above directions.

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(Appendix appears over page.)

Appendix. Survey questions (used in this study)

- Yearly total sales revenue (without VAT) : _____ Euro

- Yearly total expenses for buying materials and services (without VAT) : _____ Euro

- Yearly total labour (personnel) expenses (without VAT) : _____ Euro

- Value of assets at the end of the year (without VAT) : _____Euro

- Value of computer equipment (hardware, software and networks) at the end of the year (without VAT) : _____ Euro

Answer the following questions in a scale of 1 to 5, where 5 = to a very high degree, 4 = to a high degree, 3 = to a moderate degree, 2 = to a small degree, 1 = to a very small degree or not at all

- To what degree the business environment of your company has the following characteristics?

High bargaining power of suppliers	1	2	3	4	5
High bargaining power of buyers	1	2	3	4	5
High competitive rivalry from competitors	1	2	3	4	5
High threat of new entrants	1	2	3	4	5
High threat of substitute products or services	1	2	3	4	5

- To what degree your company follows each of the following strategies?

Cost leadership	1	2	3	4	5
Quality differentiation	1	2	3	4	5
Specialised products/services	1	2	3	4	5
Frequent introduction of new products/services	1	2	3	4	5
Expansion to markets of other countries	1	2	3	4	5
Expansion to new activities	1	2	3	4	5

Figure A1.
Survey questions

Corresponding author
Euripidis Loukis can be contacted at: eloukis@aegean.gr