

Handbook of Research on Enterprise Systems

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Chapter XII

Enterprise Systems Strategic Alignment and Business Value

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ABSTRACT

This chapter is dealing with the alignment of enterprise systems with business strategy and its impact on the business value that enterprise systems generate. Initially the research on the strategic potential of ICT, which constitutes the basic theoretical foundation of the need for strategic alignment of enterprise systems, is analyzed. Then the previous research that has been conducted concerning enterprise systems strategic alignment is critically reviewed. It is grouped into three basic streams. The first of them is dealing with the conceptualization and basic understanding of enterprise systems strategic alignment. The second research stream aims at the development of models and frameworks for directing and assessing enterprise systems strategic alignment. The third research stream examines the impact of enterprise systems strategic alignment on business performance. Finally, an empirical investigation that has been conducted by the authors concerning the impact of enterprise systems strategic alignment on business performance as a guidance for future research on this topic is described. We expect that this chapter will sufficiently inform on strategic alignment, both researchers and practitioners in the area of enterprise systems, so that they can incorporate this highly important concept in their research and practice respectively.

INTRODUCTION

The strategic alignment of information systems (IS) has been ranked as the most important issue that IS managers face in the two most recent formal surveys conducted by the Society for Information Management (SIM) of USA (www.simnet.org) concerning the key IS management issues (Luftman & McLean, 2004; Luftman, 2005). Also, the strategic alignment of IS has been ranked in very high positions in most of the surveys of the key IS management issues that have been conducted in various countries (e.g. Palvia et al, 2002). Several definitions of IS strategic alignment have been proposed by the relevant literature. According to Broadbent & Weil (1993) as IS strategic alignment is defined the extent to which business strategies are enabled, supported and stimulated by information strategies. Luftman (2000) provides a more detailed definition stating that 'Business-IT alignment refers to applying Information Technology in an appropriate and timely way, in harmony with business strategies, goals and needs. This definition of alignment addresses: 1. how IT is aligned with the business and 2. how the business should or could be aligned with IT' (p.3). Duffy (2002) in an IDC Report states that IT technical people have criticized corporate general management for a lack of interest in the IS function; at the same time general management people have criticized the IT technical people for not understanding the business and for not being profit-oriented, being interested mainly in solving technical problems and not business problems. However, at the same time he remarks that 'However valid both of these criticisms may have been, there is evidence that the gap between the two groups is now narrowing' (p.2), and defines 'IT/Business Alignment' as 'the process and goal of achieving competitive advantage through developing and sustaining a symbiotic relationship between IT and Business' (p.4).

The strategic alignment of enterprise systems consists in the establishment of a bilateral rela-

tionship between the enterprise systems planning process and the business/strategy planning processes, which allows:

- The mission, goals, competitive strategy, future directions and action plan of the enterprise, and also the analysis of its external environment (e.g. competition, opportunities, threats) and the analysis of its internal environment (e.g. resources, capabilities, strengths, weaknesses), which are basic elements of its business/strategy plan, to be taken into account for the formulation of its enterprise systems plan,
- And also the capabilities, strengths and weaknesses of existing enterprise systems, the planned enterprise systems, the forms and the extent of information and communication technologies (ICT) usage in the industry and the capabilities offered by existing and emerging ICTs that may interest and influence the enterprise, which are basic elements of the enterprise systems plan, to be taken into account for the formulation of the business/strategy plan.

The basic objective of this bilateral relationship is to exploit ICT in the enterprise in the best possible manner for both supporting and enriching its business strategy, and to take advantage to the highest possible extent of the significant strategic potential of ICT.

This chapter is dealing with the alignment of enterprise systems with business strategy and its impact on the business value that enterprise systems generate. It aims to inform on this highly important issue both researchers and practitioners in the area of enterprise systems, so that they take it into account and incorporate it in their research and practice respectively. In this direction in the following second section of this chapter is reviewed briefly the research that has been conducted on the strategic potential of ICT, which constitutes the basic theoretical foundation

of the need for strategic alignment of enterprise systems. Then in the third section the previous research that has been conducted concerning enterprise systems strategic alignment is critically reviewed. In the fourth section is described an empirical investigation that has been conducted by the authors concerning the impact of enterprise systems strategic alignment on business performance, based on the construction of complete econometric models, which are founded on the well-established and validated Cobb-Douglas production function, and using objective measures of business performance and enterprise systems investment, and on. Finally the conclusions and the future trends concerning enterprise systems strategic alignment are discussed.

THE STRATEGIC POTENTIAL OF ICT

There has been for more than two decades a high level of interest of both researchers and practitioners in the alignment between enterprise systems and business strategy, which is founded on the recognition that ICT have a significant strategic potential, i.e. if properly exploited they can have a significant strategic impact on the enterprise and provide valuable competitive advantages. The initial research on this strategic potential of ICT has been based on the work of M. Porter (1980) on competitive strategy, which identifies three generic business strategies: differentiation, cost leadership and focus; also it concludes that organizations use these generic strategies in order to control five basic industry forces, which determine their competitive position and profitability: rivalry among existing competitors, bargaining power of suppliers, bargaining power of buyers, threat of substitute products/services and threat of new entrants. Parsons (1983) applied the above work of M. Porter to the ICT and reached the conclusion that IS can have a significant strategic impact if they are used to change the products,

services, markets or production economics of an industry, to affect the buyers and suppliers of the enterprise, to prevent customers from buying products and services from competitors, to preclude new competitors, to alter the degree of rivalry, or to support one of the abovementioned M. Porter's generic strategies. McFarlan (1984) applied the above work of M. Porter to the ICT and concluded that they can have a strategic impact, if they are used in order to build barriers against new entrants, build switching costs, change the basis of the competition, generate new products and services and change the balance of power in supplier relationships. Building on these conclusions Benjamin et al (1984) enriched the perspective of the strategic potential of ICT by concluding that it is not only IS affecting customers or supporting new products and services that can have a strategic impact, but also IS affecting internal operations and supporting traditional products and services can be of high strategic importance as well and provide competitive advantages. Ives and Learnmonth (1984) applied the concept of value chain to the interaction of a customer with an enterprise and concluded that an IS that fits into customer lifecycle and differentiates products or services from those of the competitors can be of high strategic importance. Wiseman (1985) concludes that IS supporting the internal operations or the traditional products and services of an enterprise can have strategic impact if they support its 'strategic thrusts', such as M. Porter's generic strategies, innovation, growth or alliances, in a manner that influences relationships with customers, suppliers or competitors. Important is the contribution of Porter & Millar (1985) on this topic, who identify three basic ways that ICT can affect competition: by altering industry structures, supporting differentiation and cost leadership strategies, and also by spawning entirely new businesses; they also argue that ICT have strategic potential if they can add value to a product or service in at least one of the primary activities (inbound logistics, operations, outbound logistics,

marketing and sales, after-sales support and services) or one of the support activities (human resources management, technology development, infrastructure management, procurement) of the value chain. At the same time been many case studies have been published on this topic describing and analyzing 'real-life' IS that have provided valuable competitive advantage (e.g. Earl, 1989; Hopper, 1990; Robson, 1997; Pemberton et al, 2001; Picolli & Applegate, 2003), which validate and prove the practical applicability of the above research conclusions.

Subsequent research on this topic emphasizes the need for combining ICT with other resources of the enterprise in order to have a strategic impact. In this direction Carr (2003) argues that a narrow and exclusively technological focus cannot result in competitive advantages ('IT Doesn't Matter'). Powell and Dent-Micallef (1997) from an empirical study in the retail industry found that ICT alone cannot produce sustainable performance advantages, but such advantages can be gained only by using ICT in order to leverage intangible, complementary human and business resources. Miller (2003) found that sometimes these complimentary resources can be of low value, or even considered as liabilities, until they are they are incorporated in a new ICT-based 'engine of value creation'; therefore ICT can be instrumental in leveraging existing enterprise resources of low value, or even liabilities, into valuable resources that offer (in combination with other resources and ICT) competitive advantage. Another important dimension of the strategic potential of ICT as enablers of 'strategic agility' is proposed by Sambamurthy et al (2003), who argue that the capabilities of ICT can create new strategic 'digital options' for the enterprise and enable it to launch new competitive initiatives and respond quickly and effectively to changes in its environment.

Also, research has been conducted concerning the sustainability of the competitive advantages provided by ICT. Mata et al (1995), based on a

resource-based view of the firm, conclude that 'managerial ICT skills' (defined as the ability of ICT management to understand the business needs of other functional units, customers and suppliers, and in cooperation with them to develop IS that cover these needs) is the only ICT attribute of an enterprise that can provide a sustainable competitive advantage. Bharadwaj (2000) adopting also a resource-based perspective and using a matched-sample comparison group methodology found that superior firm-specific ICT resources (ICT infrastructure, human ICT resources and ICT-enabled intangibles) result in superior financial performance. Picolli & Ives (2005) from an extensive literature review identified four basic barriers to the erosion of the competitive advantages provided by 'IT-dependent strategic initiatives': IT resources barrier, complementary resources barrier, IT project barrier and preemption barrier; they conclude that the existence of one or more of these barriers can make the competitive advantages offered by 'IT-dependent strategic initiatives' sustainable for long time.

In conclusion, from the above research considerable theoretical support and empirical evidence has been produced that ICT can provide (usually in combination with other resources of the enterprise) significant competitive advantages, which under specific conditions can be sustainable; it has also been concluded that the realization of this strategic potential is not an easy task and necessitates the establishment of a connection between ICT and the overall strategy of the enterprise.

REVIEW OF RESEARCH ON ENTERPRISE SYSTEMS STRATEGIC ALIGNMENT

The above conclusions gave rise to considerable research in the last twenty years concerning various dimensions of enterprise systems strategic alignment. This research can be grouped into three basic streams: i) conceptualization and basic un-

derstanding of enterprise systems strategic alignment, ii) development of models and frameworks for assessing and directing enterprise systems strategic alignment, and iii) investigation of the impact of enterprise systems strategic alignment on the business performance. These three research streams are briefly reviewed next.

Conceptualization and Basic Understanding of Enterprise Systems Strategic Alignment

The main objective of this research stream is to conceptualize and understand the strategic alignment of enterprise systems, focusing on the identification of its basic processes, barriers, critical success factors and benefits (King, 1978; Lederer & Mendelow, 1988; Earl, 1989; Jarvenpaa & Ives, 1990; Zviran, 1990; Chan, 1992; Earl, 1993; Luftman, 1996; Reich & Benbasat, 1996; Armstrong & Sambamurthy, 1999; Luftman, Papp & Brier 1999; Luftman & Brier, 1999; Kearns & Lederer, 2000; Reich & Benbasat, 2000; Allen & Wilson, 2003; Campbell et al, 2005; Rantham et al, 2005). Due to space limitations we are going to outline briefly only the most representative publications of this research stream. Lederer and Mendelow (1988) argue that one of the most important barriers of enterprise systems strategic alignment is the difficulty of convincing top management of the strategic potential of ICT, because the top management usually lacks sufficient awareness on ICT strategic potential, regards the use of computers as a strictly operational support tool, perceives a credibility gap, does not view information as a resource, demands financial justification and also is action-oriented; for overcoming these difficulties the authors propose a number of techniques: educate top management, market IS department accomplishments to the top management, have users to do this 'selling', promote the business image of the IS department, respond to 'outside forces' influencing top managers, capitalize on changes in management and perform highly sophisticated

IS planning that necessitate top management involvement. Jarvenpaa & Ives (1991) conclude that the 'involvement' of executives in IS activities (i.e. the 'psychological state') is more strongly associated with the progressive use of ICT in the enterprise than the 'participation' of executives in IS activities (i.e. their 'actual behaviors'); also executive involvement is influenced by a CEO's participation, prevailing organizational conditions, and the executive's functional background. Earl (1993) identified five basic approaches that are adopted by businesses for achieving enterprise systems strategic alignment: the business-led approach, the method-led approach, the administrative approach, the technological approach and the organizational approach; each of these approaches has different characteristics and therefore different likelihood of success, the organizational approach appearing to be more effective. Luftman, Papp and Brier (1999) identified a number of enablers of alignment between business and ICT strategies: senior-executive support for IT, IT involvement in strategy development, IT understanding the business, partnership between IT and non-IT units, well-prioritized IT projects and IT demonstrating leadership). Reich & Benbasat (2000) investigated the influence of four factors on the 'social dimension' of enterprise systems strategic alignment (defined as the extent to which business and IT executives mutually understand and are committed to both the business and the IT mission, objectives, and plans): shared domain knowledge between business and IT executives, IT implementation success, communication between business and IT executives, and connections between business and IT planning processes; they found that all these four factors influence 'short-term alignment', while only the shared domain knowledge influences 'long-term alignment'. Campbell et al (2005), based on a review of the previous research on enterprise systems strategic alignment, identify two basic approaches in it: the 'social' (focusing primarily on the people involved in achieving alignment) and the 'intel-

lectual' (investigating mainly the relevant plans and planning methodologies); also, they remark that most of the research on enterprise systems strategic alignment adopts the intellectual approach, and recommend a combination of these two approaches as the optimal approach. Also adopting such a combined approach and based on the analysis of the content from a number of interviews with senior ICT managers they concluded that all of them believed that strategic alignment generally depends upon communication, collaboration, development of trust and shared domain knowledge, as suggested in the relevant literature; however, it was practically problematic to achieve these prerequisites, due to the prevalent culture in their organizations that promoted competition between departments.

This research stream has provided a basic conceptualization and understanding of the strategic alignment of enterprise systems, concerning mainly its basic processes, barriers, critical success factors and benefits. However, more in-depth research is required on these topics, in various types and sizes of enterprises, in various industries and national and cultural contexts, and for various types of ICT, in order to get a deeper and more complete understanding of them.

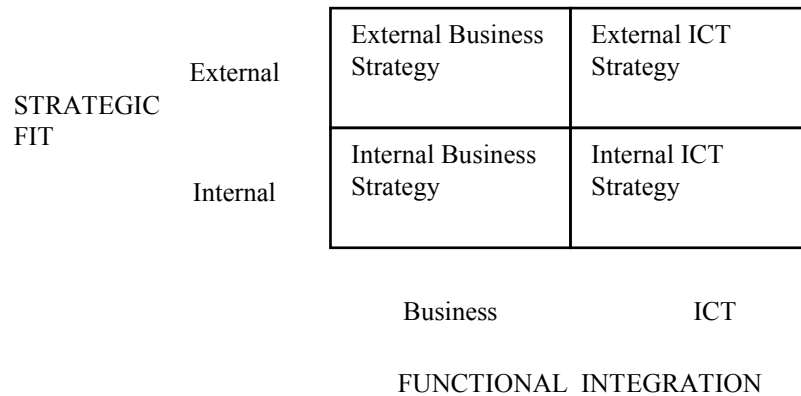
Development of Models/Frameworks for Directing/assessing Enterprise Systems Strategic Alignment

This research stream aims to support the practical application in 'real-life' of the ICT strategic alignment concept by developing models/frameworks for assisting the technical and the business management in directing and assessing enterprise systems strategic alignment. The most widely used of the models/frameworks that have been developed for directing strategic alignment is the 'Strategic Alignment Model' (SAM) developed by Henderson and Venkatraman (1999). As we can see in Figure 1 it is based on two basic dimensions of required linkage: i) the 'strategic

fit' (=linkage between 'external components' (concerning the external environment of the enterprise) and 'internal components' (concerning the internal environment of the enterprise)) and ii) the 'functional integration' (=linkage between the 'business domain' and the 'IS domain'). In the strategic fit dimension the model views strategy as consisting of two components, the 'external' and the 'internal' one, which should be well integrated. In particular, it views ICT strategy as consisting of one component concerning the 'external domain' (=decisions on how the enterprise is positioned in the ICT marketplace, e.g. which of the existing ICT in the marketplace it is going to use, which are their required performance and cost attributes, what kind of relations it has with their vendors, such as outsourcing, strategic alliances, etc.) and one component concerning the 'internal domain' (=decisions on how the internal ICT infrastructure of the enterprise will be configured and managed: ICT architecture, processes and skills), which should be well integrated. Similarly it views business strategy as consisting of two components which should be also well integrated: one component concerning the 'external domain' (= decisions about business scope, distinctive competencies and business relations with other organizations) and one component concerning the 'internal domain' (= decisions about its administrative infrastructure/architecture, business processes and human resources skills). In the functional integration dimension the model views two domains, the business domain and the IS/ICT domain, and proposes integration between them at two levels: 'strategic integration' (=integration between their external domain components) and 'operational integration' (=integration between their internal domain components).

Based on the above dimensions the SAM proposes that the complete enterprise systems strategic alignment consists in the integration between these four domains of strategic choice: business external strategy, ICT external strategy, business internal strategy and ICT internal

Figure 1. The 'Strategic Alignment Model' (SAM)



strategy. Also using this model the authors propose and describe four alignment perspectives: business strategy execution (external business strategy → internal business strategy → internal ICT strategy), technology-based transformation (external business strategy → external ICT strategy → internal ICT strategy), exploitation of ICT competitive potential (external ICT strategy → external business strategy → internal business strategy) and service level improvement (external ICT strategy → internal ICT strategy → internal business strategy).

Smaczny (2001) argues that a major disadvantage of the SAM is that its basic alignment approach is the sequential development of strategies; he states that this approach was the appropriate one for the period in which SAM was developed (characterized by a more stable business environment), but latter, due to major market changes and also due to the increased reliance of organizations on ICT, it has become slow and insufficient (at least for some industries and business contexts). For this reason he proposes a 'fusion' approach instead, which allows business and ICT strategies to be developed and implemented simultaneously. On the contrary Avison et al (2004) used successfully and validated this SAM in a financial services firm, and finally concluded that it has a good conceptual and practical value; also they developed

a framework for its practical application, which enables the technology and business management to determine the current level of alignment and to monitor and change it in the future as required. Furthermore, it is worth mentioning another approach that developed by Van Der Zee & De Jong (1999) for planning and setting goals for ICT and evaluating its results based on the business context, which is founded on the concepts of the Balanced Business Scorecard.

Also, a number of models/frameworks have been developed for assisting technical and business management in assessing the level of enterprise systems strategic alignment in their organization. The most widely used of them is the 'Strategic Alignment Maturity Model' (SAMM) developed by Luftman (2000); it is based on six criteria of ICT strategic alignment maturity (Communications Maturity, Competency/Value Measurement Maturity, Governance Maturity, Partnership Maturity, Scope & Architecture Maturity, Skills Maturity), each of them consisting of a number of attributes (sub-criteria), which are evaluated in a five-levels scale (Initial/Ad-hoc Process, Committed Process, Established Focused Process, Improved/Managed Process, Optimised Process). The SAMM enables the evaluation of ICT alignment practices in an organization and also the design of improvements of them. Another

IT alignment maturity model has been developed by the IT Governance Institute (ITGI) (www.itgi.org) as part of the CobiT (Control objectives for IT and related Technologies) framework (ITGI, 2005). In particular, CobiT includes a process named 'Define a Strategic Information Technology Plan', which aims to satisfy 'the business requirement to strike an optimum balance of Information Technology opportunities and IT business requirements'; this process includes a strategic alignment maturity model consisting of six levels (0:Non-existent, 1:Initial/AdHoc, 2:Repeatable and Intuitive, 3:Defined Process, 4:Managed and Measurable, 5:Optimized) and also guidance for using it in order to assess the maturity level of an organization. Bleistein et al (2006a, 2006b) argue that ICT strategic alignment is necessary not only at the executive level, but also at the level of the individual IT projects as well; in this direction they propose a requirements engineering framework that addresses the business strategy and the alignment of IT projects' requirements with business strategy.

In conclusion, the research of this stream has produced some first 'high-level' models/frameworks for directing and assessing enterprise systems strategic alignment, which offer some basic guidance, but in general they require further elaboration, evolution and adaptation to the new ICT that are continuously emerging and the new models of their exploitation by modern organizations. Therefore further research is required for the development of 'lower-level' and more practically applicable models/frameworks, which offer a more specific and complete guidance for directing and assessing enterprise systems strategic alignment, and also are adapted to the technological advances and the new globalized and highly competitive business environment; moreover, further research is required for validating such models/frameworks in 'real-life' conditions and situations.

Impact of Enterprise Systems Strategic Alignment on the Business Performance

This third research stream aims to investigate the impact of enterprise systems strategic alignment on business performance or on the contribution of enterprise systems to business performance. In this stream, despite its significance, has been conducted less research work than in the other two. In the following we review the main empirical studies that have been conducted in this direction. King & Teo examined empirically the impact of four types of integration between the business plan (BP) and the information systems plan (ISP) (administrative, sequential, reciprocal and full integration) on the perceived contribution of enterprise systems to various measures of organizational performance and on the perceived extent of various types of ISP problems (organization problems, implementation problems, database problems, hardware problems and cost problems) (Teo and King, 1996; King and Teo, 2000); using data from 157 large USA firms from the Corporate 1000 Book and performing independent sample t-tests and calculating correlations they found that the extent of BP-ISP integration and also its proactive orientation has a statistically significant positive relation with the perceived enterprise systems contribution to organizational performance, and also a statistically significant negative relation with the perceived extent of ISP problems. Chan et al (1997) investigated empirically the impact of enterprise systems strategic alignment on perceived enterprise systems effectiveness and perceived business performance; using data from 164 North-American financial services and manufacturing firms (from USA and Canada) with more than 100 employees from the Dun and Bradstreet directories they constructed a structural equations model (SEM), from which it was concluded that enterprise systems strategic alignment has statistically significant positive contributions to

both perceived enterprise systems effectiveness and perceived business performance. Using the same data Sabherwal and Chan (2001) addressed the same research question, but in regard to the business strategy the enterprise follows; they considered three different business strategies: 'defenders', 'prospectors' and 'analyzers' and found that the strategic alignment of enterprise systems affects perceived business performance, only in enterprises following a 'prospector' or 'analyzer' business strategy, but not in the ones following a 'defender' business strategy. Cragg et al (2002) examined the link between enterprise systems strategic alignment and four measures of perceived firm performance (long term profitability, sales growth, financial resources availability and public image & customer loyalty) in the context of small firms; using data from 250 small UK manufacturing firms and performing analysis of variance (ANOVA) they found that the subgroup of firms having higher levels of alignment had also higher levels of all these four measures of perceived firm performance than the ones with lower levels of alignment. Bergeron et al (2003), based on data collected through a mail survey from 110 Canadian small and medium firms, and using cluster analysis found that low-performance firms exhibited a conflictual coalignment pattern of business strategy, business structure, IT strategy and IT structure.

It should be mentioned that all the above empirical studies have used subjective (perceived) measures of business performance and/or enterprise systems contribution to business performance. The only empirical investigation of the impact of enterprise systems alignment on business performance that uses objective measures of business performance has been the one conducted by Byrd et al (2005); based on data from 275 fabricated metal products manufacturing companies from South-eastern USA they constructed econometric models with sales revenue per employee and profit per employee as dependent variables, while as independent variables they used the IT

expenditure per employee, a measure of enterprise systems strategic alignment and an interaction term equal to the product of the above two variables. In these econometric models the coefficient of this interaction term was found to be positive and statistically significant, so it is concluded that there is a synergistic coupling (positive interaction) between IT strategic alignment and IT investment with respect to both these measures of firm performance. However, the econometric models constructed in this study did not include some fundamental independent variables, such as non-IT capital and labour, which constitute basic determinants of firm output according to production economics (Nicholson, 2004).

In conclusion, from the research of this stream has been produced some first evidence of a positive contribution of enterprise systems strategic alignment to business performance. However, further research is required in order to understand better the contribution of different types of strategic alignment of enterprise systems to various dimensions of business performance, in various types and sizes of enterprises and in various sectoral, national and cultural contexts, based on objective business performance measures and also on sound theoretical foundations from the area of production economics. Also it is necessary to investigate the dependence of the contribution of enterprise systems strategic alignment to business performance on various external and internal environment factors (e.g. business strategy, competition, etc.) and to identify its main moderators.

AN EMPIRICAL INVESTIGATION

In this section are presented briefly the main results of an empirical study conducted by the authors, which contributes to the third of the above research streams, investigating the effect of enterprise systems strategic alignment on the contribution of enterprise systems investment to

business performance. It aims to overcome the two main deficiencies of the previous research on this issue, which have been mentioned in the previous section: use of subjective (perceived) measures of business performance and/or enterprise systems contribution to business performance, and construction of models that do not include all fundamental independent variables.

In this direction our study is based on two objective measures of business performance as basic dependent variables, the value added (=yearly sales revenue minus yearly expenses for buying materials and services) and the labour productivity (=value added per employee), and also on an objective measure of enterprise systems investment. We constructed theoretically sound econometric models for both these business performance measures, which are based on the theory developed in the area of production economics, and in particular on the Cobb-Douglas production function (Nicholson, 2004), and include all fundamental variables. The Cobb-Douglas production function has been successfully used in the past for estimating the contribution to firm output of various firm inputs, including ICT investment (e.g. Brynjolfsson & Hitt, 1996; Stolarick, 1999; OECD, 2003; OECD, 2004). As recommended by this literature we used an extended form of the Cobb-Douglas production function, in which the capital is divided into ICT capital and non-ICT capital:

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

where VA is the yearly firm value added, and L, K and ICK are the yearly labour expenses, the non-ICT capital and the ICT capital respectively, while the $\beta_1 - \beta_3$ are the corresponding output elasticities with respect to these inputs. By log-transforming equation (1) we obtain the following linear model:

$$\ln VA = \beta_0 + \beta_1 \ln(L) + \beta_2 \ln(K) + \beta_3 \ln(ICK) \quad (2)$$

In order to investigate the effect of enterprise systems strategic alignment on the contribution of the ICT capital to firm value added we added to this model one 'interaction term' (Greene, 2003; Gujarati, 2003), which is equal to the product of a 'strategic alignment factor' F (=degree of bilateral relationship between the ICT Plan and the Overall Business/Strategy Plan) and the $\ln(ICK)$:

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

Similar models have been also been constructed for the second business performance measure (dependent variable), the value added per employee, but with all the above independent variables (L, K, ICK) normalised (divided by the number of firm employees N).

For constructing the above econometric models we used data that have been collected through a survey among Greek companies, which has been conducted 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 (yearly sales revenue, expenses for materials and services, labour expenses, value of capital, value of ICT capital, etc.) and also about enterprise systems strategic alignment. We received completed questionnaires from 281 companies (99 small, 98 medium and 84 large ones) from the 27 most important sectors of Greek economy. Their average yearly sales revenue was 183.7 million Euro and their average number of employees was 493.

Initially for the value added (VA) we estimated the two models of the above equations (2) (basic model) and (3) (model with interaction term) and the results are shown in Tables 1 and 2 respectively.

In the estimated basic model of Table 1 we remark that the coefficients of labour, non-ICT capital and ICT capital are all positive and statistically significant, so we conclude that all these

Table 1. Regression model for the impact of labour, non-ICT capital and ICT capital on firm value added

Dependent variable : ln (VA)			
Independent variable	Coefficient	Standardized Coefficient	Significance
constant	2.313		0.000
ln (L)	0.608	0.581	0.000
ln (K)	0.122	0.140	0.002
ln (ICK)	0.235	0.233	0.000
R-squared : 0.723			

Table 2. Regression model for the impact of labour, non-ICT capital, ICT capital and interaction between ICT capital and strategic alignment factor on firm value added

Dependent variable : ln (VA)			
Independent variable	Coefficient	Standardized Coefficient	Significance
constant	2.739		0.000
ln (L)	0.607	0.580	0.000
ln (K)	0.122	0.128	0.004
ln (ICK)	0.196	0.195	0.000
ln(ICK)* STR_ALIGN	0.113	0.112	0.003
R-squared : 0.733			

three inputs make a positive contribution to firm value added. These results confirm the conclusion of our previous study (Loukis & Sapounas, 2005), which had been based on a different data set, that ICT investments of Greek companies make a positive and statistically significant contribution to their output, so there is no evidence for ‘ICT Productivity Paradox’ in the Greek context. Also, we can see that the standardised coefficient of the ICT capital is higher than the one of the non-ICT capital, so we can conclude that the investment on enterprise systems contributes to value added more than the investment on ‘traditional capital’. In the model of Table 2 we can see that the coefficients of labour, non-ICT capital and ICT capital remain all positive and statistically significant, and that the coefficient of the interaction term is positive and statistically significant as well and

also of considerable magnitude; therefore it is concluded the strategic alignment of enterprise systems increases considerably their contribution to value added.

Next we estimated similar models for the labour productivity ($=VA/N$), but with all the independent variables divided by the number of firm employees N , and the results are shown in Tables 3 (basic model) and 4 (model with interaction term) respectively.

In the model of Table 3 we can see that the coefficients of normalised labour, non-ICT capital and ICT capital are all positive and statistically significant, so we conclude that all these three inputs make a positive contribution to labour productivity as well. The comparison of their standardised coefficient leads to a conclusion similar to the one drawn from the model of Table 1: the

Table 3. Regression model for the impact of normalised labour, non-ICT capital and ICT capital on labour productivity

Dependent variable : $\ln(LP=VA/N)$			
Independent variable	Coefficient	Standardized Coefficient	Significance
constant	3.194		0.000
$\ln(L/N)$	0.551	0.495	0.000
$\ln(K/N)$	0.097	0.126	0.018
$\ln(ICK/N)$	0.201	0.208	0.000
R-squared : 0.376			

Table 4. Regression model for the impact of normalised labour, non-ICT capital, ICT capital and interaction between normalised ICT capital and strategic alignment factor on labour productivity

Dependent variable : $\ln(LP=VA/N)$			
Independent variable	Coefficient	Standardized Coefficient	Significance
constant	3.339		0.000
$\ln(L/N)$	0.551	0.494	0.000
$\ln(K/N)$	0.088	0.113	0.030
$\ln(CK/N)$	0.170	0.176	0.001
$\ln(CK/N)*STR_ALIGN$	0.101	0.151	0.004
R-squared : 0.398			

investment per employee on enterprise systems contributes to labour productivity more than the investment per employee on ‘traditional capital’. Finally from the model of Table 4 we can see that the coefficients of normalised labour, non-ICT capital and ICT capital remain all positive and statistically significant and also that the coefficient of the interaction term is positive, statistically significant and also of considerable magnitude; therefore it is concluded that the strategic alignment of enterprise systems increases considerably their contribution to labour productivity.

In conclusion, this empirical investigation contributes to the third of the research streams mentioned in the third section of this chapter and provides sound evidence that the strategic alignment of enterprise systems increases considerably

their contribution to both these objective measures of business performance (value added and labour productivity). This evidence is theoretically sound and reliable, since it has been produced based on the construction of econometric models including all fundamental variables founded on the production economics theory (Cobb-Douglas production function), and also using objective measures of business performance and enterprise systems investment. Further research is in progress by the authors for investigating the impact of various types of enterprise systems strategic alignment at different hierarchical levels on the contribution of enterprise systems to business performance, and also on its dependence from various external and internal environment factors.

CONCLUSION AND FUTURE TRENDS

This chapter dealt with the alignment of enterprise systems with business strategy and its impact on the business value that enterprise systems generate. The research that has been conducted on the strategic potential of ICT (reviewed in the second section of this chapter), has generated considerable theoretical support and empirical evidence that ICT can provide (usually in combination with other enterprise resources) competitive advantages, which under specific conditions can be sustainable. This strategic potential of ICT has given rise to considerable research in the last twenty years concerning the strategic alignment of enterprise systems. This research (reviewed in the third section of this chapter) has produced a basic body of knowledge concerning various dimensions of the strategic alignment of enterprise systems, which can be quite useful for both researchers and practitioners in the area of enterprise systems. In particular, it has produced a basic conceptualization and understanding of enterprise systems strategic alignment, and some first ‘high-level’ models/frameworks for directing and assessing enterprise systems strategic alignment; also it has been produced some first evidence of a positive contribution of enterprise systems strategic alignment to business performance.

However, further research is required in this area and also further practical exploitation by practitioners of the knowledge produced in this research. In particular, further research should be conducted first concerning the strategic potential of ICT and ways of exploiting them strategically in enterprises and combining them with other enterprise resources for achieving sustainable ICT-based competitive advantages. Also, further research is required for understanding better and in more depth the basic processes, barriers, critical success factors and benefits of enterprise systems strategic alignment, and for developing practically applicable models/frameworks, which can offer

clear and complete guidance for directing and assessing the strategic alignment of enterprise systems. Finally, extensive research should be conducted concerning the ‘value’ generated by the strategic alignment of enterprise systems, in order to understand better the contribution of different types of strategic alignment of enterprise systems at different hierarchical levels to various dimensions of business performance; this research, in order to give reliable and practically useful results, and also to allow meaningful comparisons between different types of strategic alignment applied in different in various sectoral, national and cultural contexts, etc., should be based on objective business performance measures and also on sound theoretical foundations from the domain of production economics, such as the Cobb-Douglas production function. In the fourth section of this chapter is described an empirical investigation conducted by the authors that follows these principles, as a guidance for future research on this topic. Also it is necessary to investigate the dependence of the value generated by strategic alignment of the enterprise systems from various external and internal environment factors (e.g. business strategy, competition, etc.) and to identify its main moderators.

At the same time it is highly important that this knowledge on the basic concepts, methods and value of enterprise systems strategic alignment be practically exploited to a larger extent and be incorporated much more in the practice and processes of enterprises.

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KEY TERMS

Business/Strategy Plan: A document describing the mission, goals, competitive strategy, future directions and action plan of the enterprise, which are based on the analysis of its external environment (e.g. competition, opportunities, threats) and its internal environment (e.g. resources, capabilities, strengths, weaknesses).

Cobb-Douglas Production Function: A particular widely used form of production function, which posits that firm output in a particular time period is an exponential function of the capital and the labour employed in this period.

Enterprise Systems Plan: A document with the capabilities, strengths and weaknesses of existing enterprise systems, the forms and the extent of information and communication technologies (ICT) usage in the industry, the capabilities offered by existing and emerging ICTs that may interest and influence the enterprise and also the planned enterprise systems.

ICT Strategic Potential: Capability of ICT to provide valuable competitive advantages and make a significant strategic impact on the enterprise, if properly exploited.

Information Systems Strategic Alignment: The extent to which business strategies are enabled, supported and stimulated by information strategies

Production Function: A function that connects the output produced by an enterprise during a particular time period (dependent variable) with the quantities of the inputs it has used in the same period (independent variables).

Strategic Alignment Maturity Model: A model that aims at assisting technical and business management in assessing the level of enterprise systems strategic alignment in their organization, based on a number of proposed criteria/sub-criteria.

Strategic Alignment Model: A model that aims at directing and assisting strategic alignment in an organization by proposing and describing required steps.