

EFFECTS OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) ON BUSINESS MODELS AND STRUCTURES: LITERATURE REVIEW AND LESSONS

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Abstract

The key objective of this paper is to review research done in the areas of the impact of ICT on business models and structures of firms and their operating environment. Recommendations and areas for further research have been done as a way of adding value to existing literature. Some of the conclusions and recommendations made are that organizations need to; document lessons learnt as a step towards knowledge management, learn to cope with miscalculations risks regarding the return on investments in ICT and there should be ICT solutions specific to micro and small enterprises. Further research can be done on the risks posed by the new business models that are being generated by adoption of various forms of ICT.

Key words: ICT, business models, risks, adoption, benefits

1 Introduction

Business model has been defined from various aspects: from one point of view business model tells a logical story explaining who your customers are, what they value and how you'll make money providing them that value (Keen and Qureshi, 2006). From another viewpoint business models are described as spelling out how money is made (Keen and Qureshi, 2006). Recently business model has been defined as the way to exploit a business opportunity by creating value for the parties involved, i.e. to fulfill customers' needs and create customer surplus while generating a profit for focal firm and its partners (Nenonen and Storbacka, 2009).

Companies all over the world have been making for long time considerable investment in information and communication technologies (ICT), aiming to increase the efficiency of both their internal processes (e.g. through the adoption of enterprise resource planning (ERP) systems) and their transactions with their customers, suppliers and business partners (e.g. through the adoption of e-business systems) (OECD 2003, 2004, 2008). Previous research in this area has revealed that the benefits from ICT investment vary significantly among firms, depending to a large extent on the combination of 'hard' ICT investments (i.e. in computers' hardware, software and networks) with appropriate 'soft investments' in new organizational practices and skills, business process reengineering, innovation, etc. (OECD, 2003; OECD, 2004; Melville, Kraemer, and Gurbaxani, 2004; Arvanitis & Loukis, 2009). Putting specialization into practice with the right operating model requires executives to think differently, not only about the construct of the company but also about the interrelationships of the assets they rely on to provide value to the marketplace (IBM, 2012).

2 Objective & Methodology

The key objective of this paper is to review research done in the areas of the impact of ICT on business models and structures of firms and their operating environment. Recommendations and areas for further research will be done as a way of adding value to existing literature. The method used is basically survey of literature from various scholarly sources.

3 Literature Review

According to Avgerou (2001), ICT is an absolute necessity for taking part in today's global economy and as such the role of ICT in the emerging global market cannot be overemphasized. ICT has also been credited with the potential to integrate world economies thus demolishing the barriers created by time and distance. It equally makes easier the trade in goods and services and encourages investment as well as the creation of new sectors of enterprise, new revenue streams and ultimately new jobs (Carayannis & Popescu, 2005).

According to internet work statistics (2011), 2.3 billion users have been using internet by December 31st 2011. Since internet is a main basis of ICT, these facts and figures that show 528 percent increase from 2000 to 2011 in World Internet Users and Population Stats, indicate the growing role of ICT in human life. In the field of business and commerce, information and communication technology (ICT) has emerged as E-business, E-commerce, E-sourcing and E-fulfillment (van der Vorst, Van Dongen, Nougier and Hilhorst, 2002). Virtual organizations (VOs) were also born in management literature as a result of ICT development in business. First traces of Virtual Organizations can be found in late 1970s as an analogy between operations of global companies and virtual memory in computer system; thus, VO is feasible by the aid of advanced of ICT (Mowshowitz, 2002).

ICT has also helped in developing and creating new types of software that enhance business activities and configuration. Some of these kinds of software have mutual relation with e business, such as "e-business suit" which is a total solution approach including the social configuration management (SCM), enterprise resource planning (ERP), customer resources management (CRM), and enables enterprises to improve their efficiency, agility, and responsiveness to the changing world (Lee-Kelley, Gilbert and Mannicom, 2003).

Studies have shown that industries that engage in intensive use of ICT tend to have a larger contribution to labor productivity growth than ICT producing industries, most especially in the service industry with their intensive adoption of ICT in their business models (Van, 2002; Colecchia & Schreyer, 2002). ICT enhances the capability of firms to transfer, collect and manage a great amount of information. This result in a substantial reduction in costs associated

with information gathering and utilization activities within a firm (Carbonara, 2005; Buiter, 2005; Steenkamp & Walt, 2004).

Melville, Kraemer and Gurbaxani 2004 and Arvanitis & Loukis (2009) argue that firms all over the world make significant investments in information and communication technologies (ICT) aiming to increase their efficiency and effectiveness. It is of critical importance to investigate the impact of these investments on firms' performance in various contexts, and also identify 'soft factors' that can increase this impact. The demand for quick, efficient and secure service delivery to clients as well as other stakeholders' expectations has made the administration of social security schemes and governments adopt new business models that embrace the use of ICT. Economic, social and political reforms, deregulation, technological developments, innovations and globalization are creating new relationships, new institutions and new ways of doing business. Pension funds, insurance firms and banks are now merely "financial services providers", together with a host of other entities from supermarkets, cable TV companies to telecommunication service providers. All these are made possible through the use of various converging technologies in the name of ICT.

Public sector reforms encourage the adoption of public-private partnerships in operations, similar to outsourcing a now common practice in business/private sectors. ICT convergence together with new business models tend to influence what type of organization structure is to adopt. Engineering consultancies are growing in size and are becoming more internationalized. In addition the building process involves a large number of different actors. These factors lead to a growing need for communication and dissemination of knowledge between different departments and organizations. In this respect the codification enabled by the use of ICT based tools are making these processes a lot easier. The use of 3D-modelling tools embodies large potentials with regard to productivity gains. These are especially related to re-use of data within project as well as in other projects with similar technical challenges (Falch & Nicolajsen, 2009).

However, the most visible impact of the use of 3D-modelling tools is not on costs, despite the fact that the production process is becoming cheaper. Instead these cost reductions in combination with the possibilities of more advanced production has enabled design of more

complex solutions and higher quality. The use of modeling tools is black boxing parts of the design process. This implies that much of the expertise needed for carrying out building projects is being codified and embodied in the tools applied. As these tools are becoming more standardized, engineering firms must ensure that they possess additional competencies in order to stay competitive. Codification of knowledge and the use of modeling tools have enabled exchange of knowledge in standardized formats. At the same time some of the former key competences are built into various types of software tools. This leads to a more flexible structure, where close interaction between shifting partners is made possible. In combination with the ongoing concentration and internationalization, this creates a market, where companies expand their market reach, and least some companies focus on special competences (Falch & Nicolajsen, 2009).

In a study on the empirical investigation of the effect of ICT investments on 237 Greek firms' business performance, measured through value added and labor productivity, Loukis, Sapounas & Milionis, (2009) concluded that ICT investments in Greece made a positive and statistically significant contribution to both firm output and labor productivity, so there is no 'ICT Productivity Paradox' in Greece. Additionally, it has been found that this contribution can be increased considerably, in the firms for which a very high degree of bilateral relationship between the ICT Plan and the Overall Business/Strategy Plan exists.

Adam & Mayingu (2004) in a study conducted on pension funds in Tanzania concluded that automation of business operations generally tends to improve processing speed, accuracy and reduced cost per transaction. It also enables organizations to systematically identify, acquire, store, analyze, distribute and re-use information and knowledge from all sources in order to enhance organizational productivity and competitiveness. Automation of businesses now takes a combination of various equipment completely integrated at both hardware and software level. A typical organization will have mainframes, workstations, handheld devices, PDAs, mobile phone, smart cards, self-service kiosks, Web-TV, video devices all integrated in one infrastructure. This hardware is used to support Enterprise Resource Planning Software, CRM, browser based linkages, normal legacy back office systems and Extranets. Furthermore these systems operate on on-line real-time mode and some with straight through processing. This

cocktail of hardware, software and operating systems require different skills and knowledge to use them effectively.

The information and communication technologies (ICTs) have a profound impact on economy and environment. The performance improvements in ICT lead to increased consumption of ICT products and services, which has numerous environmental implications on different levels. There are two levels of environmental impacts from ICT: first, related to the life cycle of ICT hardware and second, related to the way the ICT applications are being used. By presenting examples from different literature, Plepys (2002) illustrates the complexity of the environmental impacts of ICT and stresses the decisive role of human behavior in determining their significance. Huge investments are being made into the sector with large expectations for economic growth and environmental improvements, but neglecting the issue of rebound effect causes a risk of misallocation of funds. The study also guides that the society should not be too optimistic about the positive role of ICT in economy without accounting ICT's environmental impacts.

Due to the fragmented nature of the private sector, micro and small retail firms in particular lag behind medium-sized and large firms in almost all indicators of ICT and e-business use. However, micro and small firms have been increasing their ICT adoption in recent years. A previous study conducted in European Union (EU) on e-business and ICT in the retail sector carried out in 2003 found that the use of e-business in the retail sector was far from being a pervasive reality and below the average adoption rates in other sectors. In 2007 in contrast, ICT and e-business had become more prevalent in retail firms of all size classes. The 2003 study argued the main opportunities for e-business stem from efficiency and productivity gains and, thus, cost savings. This was found to be still the same for 2007. For most indicators studied, EU-7 retailers are lagging behind the US: in some cases the differences are large, for example for placing online advertisements on other companies' website (43% in the US versus 16% in the EU) and for options offered to pay online (higher percentages in the US for all options). Exceptions include the share of firms with Internet access, the average share of employees with internet access, and the use of internal systems for which the levels are similar or even higher in the EU. Surprisingly, the overall importance of e-business stated by the firms is very similar

between EU-7 and US retailers. The reason may be that US retailers answered the question about e-business importance with a higher reference level in mind (Woerndl, 2008).

Consequences for firms' innovativeness include creating communication infrastructures, facilitating production networks or enabling partners to align the incentives of multiple players by creating joint business units or teams managing the same tasks (McAfee, 2006). Rather than e-commerce, it is the use of electronic networks that leads to a higher probability of firms collaborating in innovative activities and increases the amount of collaborative relations they have (European Commission, 2007). ICT diffusion may impact on a company's organization, i.e. the structure of and the relationships between departments within an enterprise. Organisational changes may relate to a rearrangement of functions, workflows and importance of departments and employees working in them. ICT has transformed the process of replicating business innovations across organizations (Brynjolfsson, 2006).

4 Recommendations & Conclusions

Information and communication technology (ICT) researches have demonstrated positive performance results from business and ICT alignment in three fields of process, structure and practice (Cumps, Viaene, Dedene and Vandenbulcke, 2006). Organizations will therefore need to be keen with the improvements being made in the business environment due to adoption of ICT based solutions. Where possible documentation of lessons learnt should be done as a step towards knowledge management. Therefore, the issue of potential rebound effects attributable to ICT is worthy of attention from policy-makers and organizational management. To extend the ICT versus productivity nexus or paradox, it is important for business entrepreneurs and managers to cater for miscalculations risks regarding the return on investments in ICT. Many companies are spending millions of dollars with excessive expectations of the benefits to be achieved on later to just receive just a handful of benefits and hence realized an extended payback period on the investment.

Many ICT investments have been concentrated in large and medium sized organizations and relegating micro and small enterprises in the periphery of ICT adoption. It is recommended that ICT developers and promoters and even the government consider development of ICT products

and services to serve the needs of micro and small enterprises with an objective to bolstering their productivity and overall contribution to the economic growth and development of the economy.

5 Areas for further research

New business models and structures have evolved due to adoption of ICT hardware and software. There are economic and social risks being posed by the evolution of new business models and hence the need to dedicate a study to review and appreciate the risks being posed the new business models arising from ICT adoption.

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