

# Leveraging Complementarity in Creating Business Value for E-Business

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## INTRODUCTION

The rapid developments of Internet and Web-based applications has shaped the era of the digital economy and changed the way enterprises operate. Internet is increasingly becoming part of the basic business model for many companies as organizations around the world are adopting new e-business models and integrated solutions to explore new ways of dealing with customers and business partners, new organizational structures, and adaptable business strategies (Singh & Waddell, 2004). According to Kalakota and Robinson (1999), e-business is the complex fusion of business processes, enterprise applications, and organizational structure necessary to create a high performance business model. E-business is therefore more than just having an Internet presence or conducting e-commerce transactions, it is a new business design that emphasizes a finely tuned integration of customer needs, technology, and processes (Kalakota et al., 1999). When discussing e-business, it is important to make a distinction between physical and digital products. A digital product is defined as a product whose complete value chain can be implemented with the use of electronic networks, for example it can be produced and distributed electronically, and be paid for over digital networks. Examples of digital products are software, news, and journal articles. The companies selling these products are usually Internet-based “digital dot coms” such as Yahoo and Google. On the contrary, a physical product cannot be distributed over electronic networks (e.g., a book, CDs, toys). These products can also be sold on Internet by “physical dot coms,” but they are shipped to the consumers. The corporations adopting e-business are distinguished into “bricks and mortar” companies, hybrid “clicks and mortar” companies (such as Amazon.com) and pure dot coms (Barua & Mukhopadhyay, 2000a).

Many studies from the early days of deployment of information technology (IT) in organizations have struggled to measure the business value and profitability of information technology (Barua et al., 2000a). Many of these studies have showed that productivity gains are small or not existent and that the effects of information technology and e-commerce have to be often looked upon from a competitive advantage point of view (Barua, Konana, Whinston, & Yin, 2001; Porter & Miller, 1985; Scupola, 2003). Recent research has argued that to increase the business value of

electronic commerce to a corporation is important to shift the focus from whether electronic commerce creates value to a company to “how to create value” and “how to optimize such value” (Barua et al., 2001). This can be achieved by exploring complementary relationships between electronic commerce, strategies and value chain activities (Scupola, 2002, 2003). Here this argument is taken further to show the importance of complementary relationships for the business value of e-business.

## BACKGROUND

Since the early days of IT, use in commercial organizations, researchers, and professionals have struggled to understand how and to what extent the application of IT within firms leads to improved organizational performance. The research on IT business value has been characterized by diverse conceptual, theoretical, and analytic approaches as well as has adopted different research methodologies (Melville, Krämer, & Gurbaxani, 2004). Six main areas of IT business value research can be distinguished: information economics-based studies, early IT impact studies, production economics studies that did not find positive impacts, microeconomics studies that found positive impacts of IT, business value studies and studies involving complementarity between IT and non-IT factors. The information economics-based studies date back to the 1960s and though relevant to the economic contribution of IT investments, they mainly focus on the changes in information due to IT use and their impact on the single decision-maker. Therefore, while the information economics approach is theoretically sound and rigorous, its unit of analysis, which is either the individual or team decision, makes it difficult to obtain meaningful and insightful results in broader organizational contexts (Barua et al., 2000a).

In the early 1980s, a stream of research emerges focusing on assessing the contribution of IT investments to performance measures such as return on investment and market share (Barua et al., 2000a, Barua et al., 2001). The majority of these studies did not find much positive correlation between IT investments and firm performance metrics up to the early 1990s. The lack of correlation between IT investments and firm productivity made Roach (1999) to coin the term “IT productivity paradox.”

In the 1990s, the research on measuring the economic and performance contributions of IT can be divided into two main streams: one based on production economics and one based on “process oriented” models of IT value creation. The IT production studies based on production economics hypothesize that IT investments are inputs to a firm’s production function. These studies (e.g., Brynjolfsson & Hitt, 1996) finally started finding signs of productivity gains from IT. For example, Brynjolfsson et al. (1996) identify three sources of IT value to a corporation: productivity, consumer value, and business profitability. The study shows that information technology contributes to increases in the productivity and consumer value, but not business profitability. Simultaneously, process-oriented studies started hypothesizing relationships between IT and other input factors to performance measures at various levels of aggregation. These studies (e.g., Kauffman & Kriebel, 1988) have laid the foundation of the business value approach to the impact of IT on firm performance. This approach on the contrary of the production function-based approach might have the explanatory power to point out where and how IT impacts are created and where management should act to increase the payoff from IT investments. These explanations are more difficult to get with production function-based approaches since they operate at a very high level of aggregation, thus making it difficult to distinguish between different types of IT investments and their impacts on specific areas of business. After having dispelled the productivity paradox, new refinements to existing approaches are emerging to measure the contribution of IT to business performance. An important stream of research is pointing to complementarity theory to investigate the interactions between IT and other organizational factors (e.g., Barua, Lee, & Whinston, 1996; Barua et al., 2000a; Barua et al., 2000b; Barua et al., 2001). In fact, production economics and business value approaches have mostly ignored the synergy between IT and other related factors such as the level of fit with business strategies, employee empowerment, and team orientation of business processes. Barua et al. (2000a) present a generalized business value complementarity model that explores the synergies among such factors. The basic idea of their business value complementarity model (BVC) suggests that investments in IT should be first related to intermediate performance measures such as time to market, customer service, response time and extent of product mass customization to be able to see any positive results from such investments. In a second moment, the intermediate performance measures can be related to high-level performance metrics such as profitability, return on investment (ROI), market share. The focal point of a business value complementarity model is the complementarity that potentially exists at each level of the model (Barua et al., 2000a; Barua et al., 2001; Scupola, 2003).

More recent studies are also investigating the impact of information technology on the financial performance of

diversified firms (e.g., Shin, 2006), multi-business firms (e.g., Tanriverdi, 2006), and often take their starting point in the resource-based view of the firm as for example the theoretical study conducted by Melville et al. (2004).

The advent of the Internet, based on open standards and a universal Web browser, raises the question of whether investing more in Internet technology lead to a better financial performance in electronic commerce and e-business. In this regard, Zhu (2004) shows that there is a positive interaction between IT infrastructure and e-commerce capabilities suggesting that their complementarity positively contributes to firm performance in terms of sales per employee, inventory turnover, and cost reduction. Further Zhu (2004) provides “empirical evidence to the complementary synergy between front-end e-commerce capability and back-end IT infrastructure (Zhu, 2004, p. 167).” Yang, Yang, and Wu (2005) investigate the relationship between enterprise information portals (EIP) and e-business performance by conducting a survey of companies. Their results show that the implementation of enterprise information portals influence e-business performance. Barua et al. (2004) investigate the processes through which business value is created by Internet-enabled value chain activities. Their analysis suggests that “while most firms are lagging in their supplier-side initiatives relative to the customer side, supplier-side digitization has a strong positive impact on customer-side digitization, which in turn, leads to better financial performance. Further, both customer and supplier readiness to engage in digital interactions are shown to be as important as a firm’s internal digitization initiatives, implying that a firm’s transformation-related decisions include its customers’ and suppliers’ resources and incentives” (Barua et al., 2004, p. 585).

These studies point out the need of more attention to the specific business processes that have to be reengineered for e-business and the way they should support the company strategy (Scupola, 1999, 2003). In fact, as Pepper and Ward (2005) say IT has no inherent business value unless this value is unlocked and this process of unlocking business value from IT investments is a journey and not a destination and this journey requires careful planning.

## A BUSINESS VALUE COMPLEMENTARITY MODEL OF E-BUSINESS

A business value complementarity model of e-business could be used as a methodology to optimize e-business initiatives when entering the e-business arena (Scupola, 2003). The business value complementarity (BVC) model presented here is based on the value chain (Porter, 1980), the theory of business value complementarity (Barua et al., 1996; Barua et al., 2000a; Barua et al., 2002; Milgrom & Roberts, 1990) and the concept of strategy (Porter, 1982).

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