Electronic Commerce:
Concepts, Methodologies, Tools, and Applications

S. Ann Becker
Florida Institute of Technology, USA

Volume III

INFORMATION SCIENCE REFERENCE
Hershey · New York

Acquisitions Editor: Kristin Klinger
Development Editor: Kristin Roth
Senior Managing Editor: Jennifer Neidig
Managing Editor: Sara Reed
Typesetter: Jennifer Neidig, Sara Reed
Cover Design: Lisa Tosheff
Printed at: Yurchak Printing Inc.

Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue, Suite 200
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com/reference

and in the United Kingdom by
Information Science Reference (an imprint of IGI Global)
3 Henrietta Street
Covent Garden
London WC2E 8LU
Tel: 44 20 7240 0856
Fax: 44 20 7379 0609
Web site: http://www.eurospanonline.com

Library of Congress Cataloging-in-Publication Data

Electronic commerce : concepts, methodologies, tools and applications / Annie Becker, editor.
p. cm.
Summary: "This collection compiles a critical mass of top research--nearly 300 chapters from upwards of 400 of the world's leading experts--to provide libraries with a landmark, four-volume reference to meet research needs in the many disciplines impacted by these far-reaching topics. This collection covers topics including mobile commerce, virtual enterprises, business-to-business applications, Web services, and enterprise methodologies"--Provided by publisher.
Includes bibliographical references and index.
ISBN 978-1-59904-943-4 (hbk.) -- ISBN 978-1-59904-944-1 (e-books)
1. Electronic commerce. I. Becker, Annie.
HF5548.32.E356 2008
658.8'72--dc22
2007039618

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Chapter 5.5
Strategies of E-Commerce Business Value Optimization

Ada Scupola
Roskilde University, Denmark

INTRODUCTION

The Internet economy is becoming an integral part of many countries' economies, creating new jobs, giving rise to new companies like the dot coms and transforming traditional jobs and traditional companies. The Internet is increasingly becoming a part of the basic business model for many companies as organizations around the world are adopting new e-business models, integrated solutions to explore new ways of dealing with customers and business partners, new organizational structures and adaptable business strategies (Singh & Waddell, 2004). There are many definitions of electronic commerce (e.g., Wigand, 1997). Here, a classic definition by Kalakota and Whinston (1996) is adopted, where e-commerce is "the buying and selling of information, products and services via computer networks today and in the future via any one of the myriad of networks that make up the 'Information Superhighway (I-way)'" (p.1). A distinction between physical and digital products can be made. 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 America Online. 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 using electronic commerce are distinguished into "bricks and mortar" companies, hybrid "clicks and mortar" companies (such as Amazon.com) and pure dot coms (Barua & Mukhopadhyay, 2000).

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 & Mukhopadhyay, 2000). Many of these studies have showed that productivity gains are small or non existent and that the effects of information technology and electronic 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 increasing 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, Konana, Whinston, & Yin, 2001). This can be achieved by exploring complementary relationships between electronic commerce, strategies and complementarity (Scupola, 2002, 2003).

BACKGROUND

Since the early days of IT use in commercial organizations, researchers and professionals have struggled with the problem of measuring the bottom line contribution of IT investments (Scupola, 2003). 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 & Mukhopadhyay, 2000).

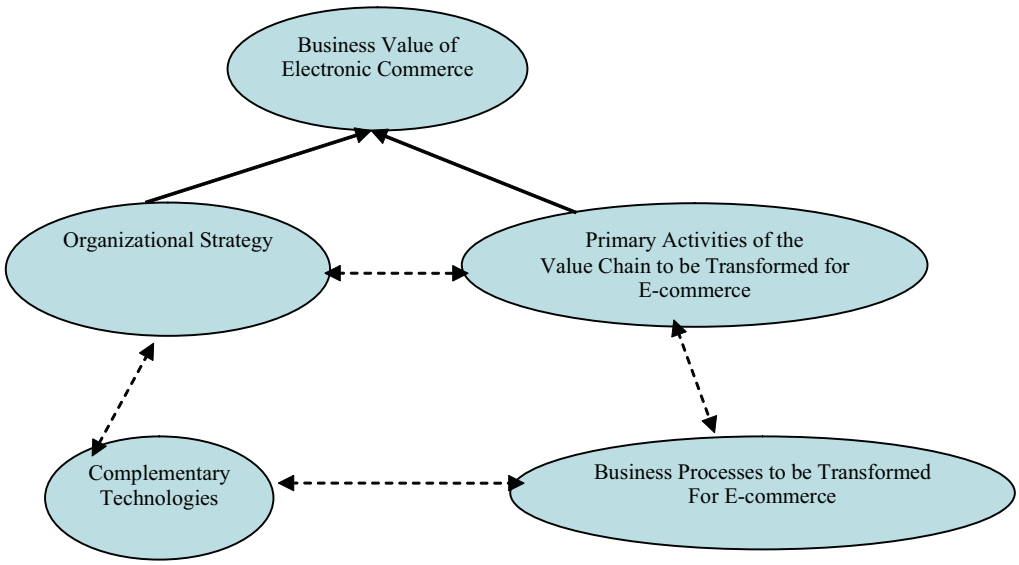
In the early 1980s, a stream of research emerges focusing on assessing the contribution of IT investments to performance measures such as return on investment and market share (Barua, Konana, Whinston, & Yin, 2001; Barua & Mukhopadhyay, 2000). The majority of these studies did not find much positive correlation between IT investments and firm performance metrics up to the early 1990s. The lack of correlation between IT investments and productivity made Roach (1988, 1989) to coin the term "IT productivity paradox".

In the 1990s, research on measuring the economic and performance contributions 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, 1993, 1996) finally started finding signs of productivity gains from IT. For example, Brynjolfsson and Hitt (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, Konana, Whinston, & Yin, 2000, 2001; Barua, Lee, & Whinston, 1996; Barua & Mukhopadhyay, 2000). 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 and Mukhopadhyay (2000) 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 & Mukhopadhyay, 2000; Barua, Konana, Whinston, & Yin, 2001; Scupola, 2003).

The advent of the Internet, based on open standards and a universal Web browser, raises the question of whether investing more in Internet

Figure 1. Business value complementarity model of electronic commerce



technology lead to a better financial performance in electronic commerce. This calls for more attention to the specific business processes that have to be reengineered for online commerce and the way they should support the company strategy (Scupola, 1999, 2003).

MAIN THRUST OF THE ARTICLE

A business value complementarity (BVC) model of electronic commerce could be used as a methodology to optimize e-commerce initiatives when entering the e-commerce arena (Scupola, 2003). The BVC model presented here is based on the value chain (Porter, 1980), the theory of BVC (Barua, Lee, & Whinston, 1996; Barua & Mukhopadhyay, 2000; Barua et al., 2002; Milgrom & Roberts, 1990) and the concept of strategy (Porter, 1982). In this model, it is hypothesized that complementarity (represented in Figure 1) exists between the variables of the same level and different levels of the model. It is furthermore hypothesized that the exploration of complementarities and possible synergies between the company strategy, the primary activities of the value chain, corresponding business processes and supporting technologies should: 1) maximize the business value of electronic commerce to a corporation and 2) lead to a better fit between the overall organizational strategy, the business processes that have to be transformed for the online market place, and the information system that should be designed and implemented to support these strategies. The exploration of complementarities, it is hypothesized, can also contribute both to avoid investments into an information system that could not be used at a later point if new e-business processes should be added to the system and avoid the implementation of a business model that does not correspond to the corporation's strategy. It is argued that to succeed in electronic commerce it is important to reengineer the parts of the value chain and the corresponding business processes relevant to the product in question and the company strategy.

The main objective of the model is to make the business value of electronic commerce as close to optimal as possible in terms of one of the performance measures, such as company profitability, competitive advantage, increase in market share, shareholder value or customer satisfaction. This can be done by exploring complementarities among the dependent variables of the model: the company strategy, the activities of the value chain, the corresponding business processes, and the technologies available to transform these activities and processes for the marketspace.

Furthermore, to succeed in electronic commerce, it is important to reengineer the parts of the value chain and the corresponding business processes relevant to the product in question and the company strategy. For example, the strategy or combination of strategies a company wants to pursue is relevant for the primary activities of the value chain, and the corresponding business processes that have to be implemented online. The strategy is also relevant to the classes of technologies that have to be chosen to enter the electronic marketplace. For example, a company can use electronic commerce to implement a cost leadership strategy, or to become the low cost producer in the industry. Once decided upon the strategy, it is important to explore complementarities between the strategy and the value chain activities in order to implement online all those activities that would support an optimal implementation of the strategy chosen.

The number of primary activities and corresponding business processes that should be transformed for the marketspace depends also on the company's type of product and strategy. It is important to take into consideration complementarities among the different activities of the value chain when reengineering for electronic commerce. The more activities of the value chain are simultaneously conducted online, the more likely it is that the business value of electronic

commerce will be optimized. The adoption of a holistic approach in redesigning the primary activities for electronic commerce would, thus, be a more successful strategy than reengineering only one or some at a time. This is due to potential complementarities between the different activities, which lead to a better performance in one if the others are also reengineered for online commerce.

Furthermore, each business process of each activity of the value chain could be reengineered for e-commerce. This model argues that the exploration of complementarities among the different business processes and the simultaneous transformation of all the complementary processes of a particular activity for online commerce would lead to a higher business value than if only one or a casual numbers of processes were reorganized online (Scupola, 1999).

In the design phase, it is important to consider potential complementarities between the business processes that have to be redesigned for online commerce and the supporting technologies. The exploration of this complementarity should lead to an optimal system design that also offers possibilities for further expansion if other online business processes should be added in the future. For example, electronic search of the company's information will give more accurate and quicker results, the faster and more advanced the search engine is and the better built are the user interface and the repository systems.

Finally, the exploration of complementarities between the different technologies used to implement the system for electronic commerce could bring to a more robust and flexible computer system than a system built without the exploration of complementary relationships between the different component technologies. For example, end user interfaces and repositories are complementary technologies in the sense that the better designed the repository system, the simpler the user interface can be.

FUTURE TRENDS

The studies on IT productivity and business value conducted over the last decade have showed positive impacts of IT investments on firms' productivity both with respect to labor and other non-IT capital used by organizations (Barua & Mukhopadhyay, 2000). However, Internet-based technologies, with their open standards and wide applicability, raise again the issue of profitability and business value of investing in such technologies. Furthermore, the fact that Internet is giving rise to a "new economy", raises a number of questions among which: How productive are the players in this new economy? Does e-commerce increase the profitability and business value of brick and mortars and hybrid click and mortars companies? For dot coms, do more investments in Internet commerce technologies necessarily lead to a better performance of the company? And especially, if all companies have equal access to Internet-based technologies, what are the factors that differentiate their performance in e-commerce?

Recent literature investigating the business value and profitability of electronic commerce is focusing on the exploration of complementary relationships between electronic commerce technologies and other factors in order to see positive returns from investments in these technologies (Barua, Konana, Whinston, & Yin, 2000, 2001; Barua & Mukhopadhyay, 2000; Scupola, 2003). For example, Barua, Konana, Whinston, and Yin (2001) develop a framework of electronic commerce business value that identifies linkages between performance drivers such as Internet applications, processes and electronic business readiness of customers and suppliers and operational excellence and financial metrics. They argue that "firms engaged in electronic business transformation must make synergistic investments and commit resources not only in information technology, but also must align processes and

customer and supplier readiness to maximize the benefits" (p.1).

Similarly, an empirical investigation of the business value of e-commerce in small, medium and large companies across Europe and USA (Barua, Konana, Whinston, & Yin, 2000) identifies a set of key e-drivers such as system integration, customer orientation of IT, supplier's orientation of IT, and internal orientation of IT. The study concludes that high performance companies have invested more effort and resources in these e-business drivers than companies who have not benefited from e-business.

To conclude, these studies show that ignoring complementarities in research on business value measurement might lead to misleading results. On the other hand, from a managerial point of view, the non exploration of complementary relationships between IT and related factors such as strategy, business processes, business models, incentives, and so forth, might lead to failure of investments in sophisticated electronic commerce systems and ventures. These considerations point to the need for more empirical as well as normative, prescriptive research on complementarity and business value of IT in general and electronic commerce technologies in particular.

CONCLUSION

Many companies are very skeptical about investing into electronic commerce technologies due to the lack of profitability, (or at least the difficulties to show positive return on IT investments) that until now has characterized the investments in IT and electronic commerce. Here, a framework that can be used as a methodology to analyze organizational strategies and technology choices in reengineering for electronic commerce has been presented. Companies should explore the potential complementarities existing between strategy, value chain activities, business processes and supporting technologies when entering the field of electronic commerce. This should lead to investments in electronic commerce systems that best support the company strategy, thus minimizing failures. This is a future challenge for corporations, industries and researchers.

REFERENCES

Barua, A., & Mukhopadhyay, T. (2000). Information technology and business performance: Past, present, and future. In R. Zmud (Ed.), *Framing the domains of IT management, projecting the future through the past.*

Barua, A., Konana, P., Whinston, A.B., & Yin, F. (2000, November-December). Making e-business pay: Eight key drivers for operational success. *IT Pro.* IEEE Publisher.

Barua, A., Konana, P., Whinston, A.B., & Yin, F. (2001, Fall). Driving e-business excellence. *Sloan Management Review*, *43*(1), 36-44.

Barua, A., Lee, S.C.H., & Whinston, A.B. (1996). The calculus of reengineering. *Information Systems Research, 7*(4), 409-428.

Barua, A., Pinnell, J., Shutter, J., Wilson, B., & Whinston, A.B. (1999). The Internet economy indicators part II. Retrieved on June 19, 2002 from *http://www.internetindicators.com*

Brynjolfsson, E., & Hitt L.M. (1993). Information Technology and the Productivity Paradox: Review and Assessment. *Communication of the ACM,* 35, December, 66-77.

Kalakota, R., & Whinston, A.B. (1996). *Frontiers of electronic commerce.* Addison-Wesley.

Kauffman, R.J., & Kriebel, C.H. (1988). Modeling and measuring the business value of information technologies. In P.A. Strassman, P. Berger, E.B. Swanson, C.H. Kriebel, & R.J. Kauffman (Eds.), *Measuring the business value of information technologies.* Washington, DC: ICIT Press.

Milgrom, P., & Roberts, J. (1990). The economics of modern manufacturing: Technology, strategy and organization. *American Economic Review*, 511-528.

Porter, M. (1980). *Competitive advantage.* The Free Press.

Porter, M. (1982). *Competitive strategy.* The Free Press.

Porter, M., & Miller, V. (1985). How information gives you competitive advantage. *Harvard Business Review.*

Roach, S.S. (1988). Stop the Dice on Technology Spending, interview with G. Harrar, editor. *Computerworld Extra*, June 20.

Roach, S.S. (1989). *The case of the missing technology payback*. Presentation at the 10th International Conference on Information Systems, Boston, MA.

Scupola, A. (1999). The impact of electronic commerce on the publishing industry: Towards a business value complementarity framework of electronic publishing. *Journal of Information Science, 25*(2).

Scupola, A. (2002). A business value complementarity framework of electronic commerce. In M. Khosrow-Pour (Ed.), *Issues and trends of information technology management in contemporary organizations*. Hershey, PA: Idea Group Publishing.

Scupola, A. (2003). Organization, strategy and business value of electronic commerce: The importance of complementarities. In J. Mariga (Ed.), *Managing e-commerce and mobile computing technologies* (pp. 147-162). Hershey, PA: Idea Group Publishing.

Singh, M., & Waddell, D. (2004). *E-business innovation and change management*. Hershey, PA: Idea Group Publishing.

Wigand, R.T. (1997). Electronic commerce, definition, theory and context. *The Information Society, 13*, 1-16.

KEY TERMS

Business Processes: The specific processes into which each primary activity of the value chain can be decomposed.

Business Value: The overall value that an investment brings to a corporation. Examples of performance measures of the business value of electronic commerce can be: (1) profitability, that is, whether electronic commerce contributes to an increase in the profitability of the corporation; (2) competitive advantage that could be measured as an increase in market share, shareholder value or customer satisfaction.

Complementarity: Several activities are mutually complementary if doing more of any one activity increases (or at least does not decrease) the marginal profitability of each other activity in the group. Complementarities among activities imply mutual relationships and dependence among various activities whose exploration can lead to higher profitability.

E-Commerce: The buying and selling of information, products and services via computer networks and especially the Internet.

Internet Economy: A large collection of global networks, applications, electronic markets, producers, consumers and intermediaries.

Re-Engineering: The redesign of a corporation's business processes (or part of them) to take place over the Internet. The main goal is reduced costs, lower product cycle times, faster customer response, and improved service quality.

Strategy: A planning, rational process through which the company chooses a certain mode of

development, among all of the possible ones, and maintains that direction through a well-defined period (design view). In the process view, strategy is a process that might change on the way, giving rise to an emergent strategy. The realized strategy might be different then the original intended strategy.

Value Chain: The activities of a corporation such as procurement, production, marketing and sales, and customer support.

This work was previously published in Encyclopedia of Information Science and Technology, Vol. 5, edited by M. Khosrow-Pour, pp. 2653-2657, copyright 2005 by Information Science Reference, formerly known as Idea Group Reference (an imprint of IGI Global).