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# A Business Value Complementary Framework of Electronic Commerce

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## ABSTRACT

*Many corporations are reluctant to adopt electronic commerce due to uncertainty in its profitability and business value. This article presents a theoretical framework that could be used as a methodology to increase the business value of electronic commerce to a corporation. This model argues that complementarities between the strategy, the activities of the value chain, corresponding business processes and supporting technologies should be explored to reach a better fit between strategy, business model and technology investments when entering the electronic commerce field.*

## BACKGROUND

Many studies from the early days of information technology (IT) have struggled to measure the business value of information technology (IT) in organizations (Barua and Mukhopadhyay, 2000). These studies show that productivity gains are small or not existent and that the effects of information technology and electronic commerce have to be looked upon from a competitive advantage point of view (Cronin 1995; Porter and Miller, 1985). A study by Hitt and Brynjolfsson (1996) identifies three sources of IT value to a corporation: productivity, consumer value and business profitability. The study also shows that information technology contributes to increases in the productivity and consumer value, but not business profitability, therefore the so much debated technology paradox. This article argues that to increase the business value of the adoption of electronic commerce it is important to take a radical approach to electronic commerce by reconsidering the business processes that have to go on-line in relation to the company's strategy.

There are many definitions of electronic commerce (e.g. Wigand, 1997; Zwass 1996). For our purposes, a definition by Kalakota and Whinston (1996:1) 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)". In our analysis we distinguish 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, that is can be produced and distributed electronically, can be paid for over digital networks (e.g. software, news, journal articles, etc.)

Electronic commerce can also be used for the reengineering of a corporation's business processes for the electronic marketplace (Kalakota and Whinston, 1996:1). The broad goals of re-engineering and e-commerce being remarkably similar: reduced costs, lower product cycle times, faster customer response, and improved service quality. Reengineering for electronic commerce is here defined as the redesign (or design) of a corporation's business processes (or part of them) in order to take place over the Internet. We are witnessing the virtualization of value-chain segments as business processes can be moved into the virtual, informational value chains (Zwass 1996; Rayport and Sviokla, 1995). Companies, especially those dealing with digital products or services that can be easily transmitted over Internet need to investigate which business processes to reengineer for electronic commerce and how best to do it in order to be successful and gain a competitive advantage.

The purpose of this article is to develop a theoretical framework that could be used to maximize the business value of electronic commerce to a corporation. The research question that this article attempts to answer is: "How can the business value of electronic commerce to a corporation be optimized?"

The article is theoretical in nature, based on existing literature on electronic commerce, strategies and complementarity.

The article is structured as follows: section 1 presents the article background, section 2 gives an overview of the theories used to build the business value complementarity model of electronic commerce, presented in section 3. Section 4 illustrates the implications of the model for technology strategy, and gives some concluding remarks and suggestions for further research.

## THEORETICAL FRAMEWORK

The theoretical framework is based on the value chain (Porter, 1980), the theory of business value complementarity (Barua, 1996; Barua and Mukhopadhyay, 2000) and the concept of strategy (Porter, 1982). The value chain separates the activities of a firm into two main categories: primary and secondary. Primary activities are those involved in the physical creation of the product, its marketing and delivery to buyers, and its support and servicing after sale; secondary activities provide the inputs and infrastructure that allow the primary activities to take place. Information technology affects all the activities (Porter and Miller, 1985). Here, the value chain framework is used to analyze how electronic commerce technologies can transform each of the primary activities of the value chain from the marketplace to the marketspace.

The business value complementarity theory (Barua, 1996) is based on the notion of complementarity in economics. Milgrom and Roberts (1990:108) say that 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 the exploration of which can lead to higher profitability. Milgrom and Roberts (1990) have applied the complementarity theory to the field of manufacturing, management and strategy. In the Management Information Systems (MIS) field, Barua (1996) develops a multi-layered business value complementarity model of reengineering. In this model it is argued that to maximize organizational payoff, complementary factors such as technology, decision authority, business processes and incentives must all be changed in a coordinated fashion in the right direction by the right magnitude, to move towards an optimal ideal design configuration. According to this theory, it is important to explore complementarities among organizational and technology variables in implementing new business processes or in designing new business models and to avoid considering only information technology variables. The failure to explore such complementarities and to consider all the variables at once is the reason why, Barua (1996) argues, many re-engineering projects fail.

This paper focuses on the complementarity between the corporation strategy, the primary activities of the value chain, corresponding business processes and supporting technologies in order to maxi-

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mize the business value that electronic commerce can bring to a corporation.

## A BUSINESS VALUE COMPLEMENTARITY MODEL OF ELECTRONIC COMMERCE

In this section a business value complementarity model of electronic commerce is presented (Fig. 1), based on the theories and models illustrated in the previous section. Here the issues of complementarity between the different variables of the model are addressed in a qualitative way.

### Understanding the Variables of the Model

*Business value of electronic commerce*. The high level (performance) variable of the model is business value of electronic commerce. In this paper, the performance measures of the business value are: profitability, that is whether electronic commerce contribute to an increase in the profitability of the corporation; competitive advantage that could be measured in terms of customer satisfaction, improved company reputation or image, etc.; market share and shareholder value. The objective is to make the business value of electronic commerce as optimal as possible in terms of at least one of the performance measures. It is here hypotesized that 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.

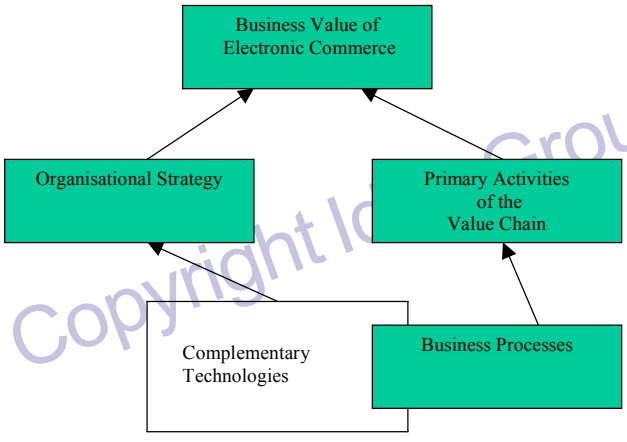
*Strategy*. Many definitions exist of strategy as for example "strategy as positioning" or "strategy as visioning". In this paper Porter's (1982) classification of strategy as cost leadership, differentiation or focus is adopted.

*Primary activities of the virtual value chain.* On-line production, on-line distribution, on-line marketing, on-line sales and on-line customer support are the primary activities of the value chain re-engineered or redefined for the electronic market space. The value chain of the market space or virtual value chain can be redefined as the use of computer and Internet-based technologies to organize the value chain completely on-line (Scupola, 1999).

*Business processes corresponding to each activity of the value chain*. The business processes corresponding to each activity of the value chain are the specific processes into which each primary activity of the virtual value chain can be decomposed. The value chain activities and business processes of on-line marketing, on-line sales and on-line customer service are the same for digital and not digital products. On-line distribution and on-line production can only be applied to digital products. Furthermore, the business processes of on-line production are specific to the product in question (service, software, journals, music, etc.). For example, in electronic publishing the business processes of on-line distribution are electronic search, electronic selection, electronic retrieval and transmission of the product. The business processes corresponding to on-line marketing are on-line advertising, on-line market research, on-line promotions and public relations, on-line pricing models or pricing models for on-line business. Those corresponding to on-line sales are information gathering/recognizing a need, negotiation/search for solutions and settlement/making a purchase. On-line customer support processes could be defined as customer inquiries and answers to customers (Scupola, 1999).

*Complementary technologies*. Complementary technologies are those that can be used for the transformation of business processes from the marketplace to the marketspace. Scupola (1999) divides them into three groups: networking and communication technology, database technology and Data Base Management Systems (DBMS), and application software. Each group includes some technology classes. For example networking and communication technologies might include Internet, the WWW, Client/Server computing, Web-Database integration, while Database technology and DBMS might include repositories, object-oriented databases, inverted file and relational databases, etc. Each activity of the value chain has as complementary technologies a subset of all the technology classes.

*FIgure 1: Business value complementarity model of e-commerce*




### Explanation of the Model

In the business value complementarity model (fig.1), it is hypothesized that the exploration of complementarity 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 and 2. lead to a better fit between the organizational strategy, the business processes that have to be transformed, and the ICTs system that should be designed and implemented to support these strategies. The exploration of complementarities 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.

*Complementarity at strategy level*. It is hypothesized that the strategy or combination of strategies a company wants to pursue is relevant for and complementary with the primary activities of the value chain, and the corresponding business processes that have to be implemented on-line. The strategy is also relevant to the classes of technologies that have to be chosen to enter the electronic market place. A company should therefore decide on the three fundamental strategies of cost leadership, differentiation and focus (Porter, 1982) or any combination of them and explore how electronic commerce can support such strategy. For example, electronic commerce can help a company wanting to implement a cost leadership strategy, or to become the low cost producer in the industry. Electronic commerce can contribute to lower costs for example by promoting the products directly to the customer (thus saving promotion costs), sending the product over Internet thus saving distribution costs, and by lowering marketing costs through on-line marketing and one-to-one marketing. Electronic commerce can be used to create new substitute products, enhance some product attributes, or give different customized versions of the same product, thus supporting a product differentiation strategy. Companies can use e-commerce to implement a focus strategy. For instance electronic commerce gives the possibility to offer the customer highly tailored one-to-one marketing campaigns, or products highly customized to the taste, needs and preferences of the single user (Bloch 1996).

*Complementarity at value chain activity level*. Once decided upon the strategy, it is important to explore complementarities between the strategy and the value chain activities in order to implement on-line all those activities that would support an optimal strategy implemen-

tation. It is argued, in fact, that it is important to take into consideration complementarities among the different activities of the value chain when reengineering for electronic commerce. This is because it is hypothesized that the more activities of the value chain are simultaneously conducted on-line, the more likely it is that the business value of electronic commerce will be optimized. This article suggests that the adoption of a holistic approach in redesigning the primary activities for electronic commerce would 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 leads to a better performance in one if the others are also reengineered for on-line commerce. Teece (1988) provides a similar argument by showing the importance of exploring complementary relationships among different assets when a company wants to start marketing an innovation in the marketplace.

*Complementarity at business process level*. Cheoretically, each business process corresponding to any activity of the value chain could be reorganized for e-commerce independently on the others. It is hypotesized that the exploration of complementary relationships among these processes and the simultaneous reengineering of all the complementary processes of a particular activity for on-line business would lead to an increase in the business value than if only some of the processes were reorganized on-line. In distribution, for example, a company that provides for search, retrieval, selection and physical transmission of a product over a network will be better off than a company that, for example, delivers only through conventional distribution channels, even though it allows to search and order the product on the Internet. In marketing, the complete implementation of an on-line marketing program from advertising to market research, to promotions, public relations and ad-hoc on-line pricing models will increase the net benefit to the company compared to a program that only has reengineered some of these processes for electronic commerce. For example, market research data collected at the company web site combined with data from more conventional market research channels would contribute to a more effective on-line advertising program then data gathered only in the marketplace. This is because the data collected on-line can give more accurate customer profiles then only data gathered in the marketplace. In on-line sales, providing for electronic payment/settlement in addition to information searching and gathering on the company's product selection would make the shopping process easier and decrease the chance that the customer closes the Internet connection without having downloaded or bought the product (Scupola, 1999).

*Complementarity between business processes and supporting technologies*. In the design phase, it is important to consider potential complementarities between the business processes that have to be redesigned for on-line commerce and the supporting technologies. This should lead to an optimal system design, that also offers possibilities for further expansion if other business processes are going to 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. Consequently, it is important to decide on the database system by taking simultaneously into consideration the structure and nature of the product to be stored and the level of granularity desired (in turn depending on the company strategy).

*Complementarity at technology level*. Complementarities between the different technologies used to implement the system for electronic commerce should also be explored before deciding on the system design. For example it is hypothesized that 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. In on-line distribution, a system with both advanced search engines and user-friendly search forms, would be much more effective then a system where the user interfaces are not so friendly or the search engine is not so powerful. Finally, the total value of a system using both a repository supporting a very high level of granularity and a sophisticated micro-payment system would be much higher than that of a system not providing for micro-payments, where the user has to use the credit card even for small transactions. Generally, advancements in security, networking technologies and software developments are still required to be able to offer effective Internet shopping, as well as good and informative home pages from the side of the company (Jarvanpaa and Todd, 1996/1997).

## IMPLICATIONS, CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Many companies are very skeptical about electronic commerce due to the lack of profitability and business value that until now has characterized the investments in IT and electronic commerce. This article has presented a framework (methodology) to analyze organizational strategies and technology choices in reengineering for electronic commerce. This article has argued that 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. In organizing a business for electronic commerce, a number of choices have to be made at every step of the process. It is important to decide what strategy to adopt, what are the activities and corresponding business processes that have to be organized on-line and it has to be decided what electronic commerce technologies to use in order to implement such a strategy successfully. Finally it has also to be decided how to go to acquire the competencies and the technologies necessary to establish an online presence, therefore formulate a technology strategy. Such strategy should include not only what kind of computer hardware, software and networks to use, but also decisions regarding how to go about to acquire such resources and competencies. Should the system be developed in-house or bought on the market? Should the company outsource the resources necessary to the building, operation and maintenance of the system? Should the company form alliances or partnerships with corporations that have complementary technology assets and skills (Teece, 1988)? The business value complementarity model of electronic commerce presented here could be used in this process to explore potential complementarities between the different independent variables.

However this model is very theoretical and its discussion is very general. Suggestions for further research could for example include the development of hypothesis or propositions regarding complementarity for each set of independent variables. Such propositions could also take into consideration the difference between digital and non-digital companies and tested empirically. In fact, as many more companies are embracing electronic commerce, there is the need to research the contribution of electronic commerce and complementary factors such as strategies, business processes, etc. to the productivity and business value of bricks-and-mortar, clicks-and-mortar and dot.com organizations.

## REFERENCES

Barua A., Lee, S. C.H., Whinston A. B. (1995). The Calculus of Reengineering, *Information Systems Research*, Vol. 7., No. 4, 409-428.

Barua, A., Mukhopadhyay, T., Information Technology and Business Performance: Past, Present, and Future, in *Framing the Domains of IT Management, Projecting the Future Through the Past,* Zmud, R. (Ed.), 2000.

Bloch, M., Pigneur, Y., Segev, A. (1996). On the Road of Electronic Commerce: A Business Value Framework. Working Paper 96-WP-1013, University of California at Berkeley.

Cronin, M. (1995*). Doing More Business on the Internet: How the Electronic Highway Is Transforming American Companies*, New York.

Hitt, L.M., Brynjolfsson, E. (1997). Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology, *MIS Quarterly*, 20 (2), 121-142.

Jarvanpaa, S., Todd, P.A. (1996/1997). Consumer Reactions to Electronic Shopping on the World Wide Web, *International Journal of Electronic Commerce,* 1(2), 60-88.

Kalakota, R., Whinston, A. B. *(1996). Frontiers of Electronic Commerce*, Addison-Wesley Publishing Company, Inc.

Milgrom, P., Roberts, J., (1990). The Economics of Modern Manufacturing: Technology, Strategy and Organization, *American Economic Review*, 511-528.

Porter, M., Miller, V. (1985). How Information Gives You Competitive Advantage, *Harvard Business Review*.

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

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

Rayport J. F., Sviokla J. (1995). Exploiting the Virtual Value Chain, *Harvard Business Review*, 75-85.

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*, Vol. 25(2).

Teece, D. (1988). Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, Policy Journal*.

Zwass, V. (1996). Electronic Commerce: Structures and Issues*, International Journal of Electronic Commerce*, 1(1), pp.3-23.

Wigand, R.T. (1997). Electronic Commerce, Definition, Theory and Context, *The Information Society,* Vol. 13, 1-16.

Integrated Digital Health Systems Design: A Service-Oriented Soft Systems Methodology
Wullianallur Raghupathiand Amjad Umar (2009). *International Journal of Information Technologies and Systems Approach (pp. 15-33).*
www.irma-international.org/article/integrated-digital-health-systems-design/4024