Internet-Based Electronic Commerce and Changing Industrial and Corporate Structures:

The Case of Scientific, Technical and Medical Publishing

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Ada Scupola

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Summary

This Ph.D study, which has been possible thanks to the financial support of the Institute of Social Sciences at Roskilde University, gives some insight into the new field of Internet-based consumer oriented electronic commerce and how it can affect industry structures and transform value chains. Consumer-oriented electronic commerce is seen as a specific type of information and communication technology (ICT) innovation, since it has been possible only after the advent of the World Wide Web (WWW) in the spring of 1993. This type of e-commerce is still at the beginning of the life cycle, and consumer spending on the Internet is still limited, but it is forecasted to boom in the near future especially in the context of the development of the information society. The thesis tries to give an answer to the following questions:

1. What is the impact of Internet-based electronic commerce on the industry structure of Scientific, Technical and Medical (STM) publishing with focus on intermediation and disintermediation?
2. How is electronic commerce transforming from the marketplace to the marketspace the corporate value chains and the corresponding business processes of the Scientific, Technical and Medical (STM) publishing industry?
3. How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage terms?

This thesis gives an overview of consumer based electronic commerce, what is its business value to the corporations, and how it can impact industrial structures and corporate value chains, thus setting the basis for more focused studies to be conducted as future research. The empirical material, used

mainly in a descriptive/predictive way, is based on the Scientific, Technical and Medical (STM) publishing industry. Examples from other industries are also occasionally used to better clarify the concepts.
The main contribution of the thesis is the attempt to understand the implications of electronic commerce to the Scientific, Technical and Medical Publishing industry. More specifically, the main contribution of the thesis is represented by the following: the development of a business value complementarity model of electronic commerce; the impact of electronic commerce on the value chain of publishing, including a detailed analysis of the business processes of publishing in the marketspace; and finally the analysis of the potential impact of Internet-based electronic commerce on the industry structure of Scientific, Technical and Medical publishing. This thesis is an elaboration and more complete presentation of the content and background material of three articles that can be seen as a spin off of the project.

The first article, “The Impact of Electronic Commerce on the Publishing Industry: Towards a Business Value Model of Electronic Publishing”, has been published in the March 1999 Issue of the Journal of Information Science. The article derives the specific business processes corresponding to the on-line activities of the value chain, namely on-line production, on-line distribution, on-line marketing, on-line sales and on-line customer support and shows how they are transformed on the marketspace. Moreover, the article argues that complementarities between the different activities of the on-line value chain, the on-line business processes and the supporting technologies should be explored when a company wants to enter the field of electronic commerce.

The second article, “Electronic Commerce in Scientific, Technical and Medical (STM) Publishing: An Industry Analysis with Focus on Intermediation and Disintermediation”, has been published in the Proceedings of the IRIS 22 Conference, Turku, Finland, 7-10 August 1999, and it is under review in an international journal. The article analyzes how the advent of the World Wide Web (WWW) is changing the structure of the Scientific, Technical and Medical (STM) publishing industry. It is argued that this is due to many reasons, among which are: a) the introduction of new substitute products for the paper version of the journal, for example the electronic journal, on-line services and e-mail lists; b) the arrival of new entrants into the industry as for example universities starting publishing the electronic versions of the journals themselves; c) the new electronic intermediaries, that could lead to disintermediation especially of the physical distributors, printers and binders. The article concludes that some intermediaries of the marketplace, for example the sales agents, are starting re-engineering for electronic commerce, as a result of the potential threat from the electronic-only intermediaries, thus operating both in the marketplace and in the marketspace.

The third article, “What is the Business Value of Electronic Commerce? How can it be optimized?” has been presented at the MICT (Management of Information and Communication Technology) conference, Copenhagen, 14-17 September 1999, forthcoming in an international anthology entitled “e-commerce and Intelligent Management”, S. Junghagen, K. Friedman, J. Olaisen (Eds.). This article presents a business value complementarity model of electronic commerce, which is a generalization of the model developed in article 1. This model is based on the value chain analysis and the business value complementarity theory. It can be used as a methodology for strategy formulation in the adoption process of electronic

commerce in a corporation. The main idea of this model is that it is important to explore complementarities between different activities of the value chain, the corresponding business processes and the supporting technologies when re-engineering for on-line commerce. The exploration of these complementarities should lead to a "better" strategy formulation, to the maximization of the business value of electronic commerce to the corporation and to a "better" system design.

To conclude, I think that this thesis is only a small building block towards the understanding of consumer-oriented Internet-based electronic commerce as a technological innovation spreading into the social system, and its implications for industries and corporations. Further research should be conducted to study for example the implications of consumer-oriented electronic commerce for other industries producing digital products and for service industries. Interesting items for further research could also be in depth-case studies of corporations that have re-engineered some or, in the future, all the business processes for on-line commerce.

Part I: Introduction and Methodology

CHAPTER 1: Introduction and Structure of the Thesis

This chapter presents an overview of the scientific contribution of this thesis and an agenda to read the thesis and find the way through the chapters. Then it gives an overview of the research context, the research problem and the research questions. Finally, the last section gives an overview of the structure of the thesis, by summarizing the content of each specific chapter.

1.1 An agenda for reading the thesis and thesis contribution

The main contribution of this thesis is in understanding Internet-based consumer oriented electronic commerce as an innovation that in the diffusion process impacts industrial structure and corporate value chains. Furthermore, the thesis contributes to the strategy field by building a theoretical normative model that gives some suggestions for strategy formulation in the adoption phase of electronic commerce within a corporation. As already said in the summary, this Ph.D. thesis is an elaboration of three articles written during the three years of the Ph.D. studies. The thesis presents the background (both theories and empirical material) that are the basis for the three articles, as well as the content of the articles in a broader form than the one in which they have been published or submitted. Furthermore, this manuscript tries to explain the methodology and the data used to conduct the research.

This Ph.D. thesis could be seen as logically divided into the following two parts. The first part would be the background

material to conduct my own analysis. This part could be divided into a section illustrating the problem, a section on the research methodology and a section on the theories. The second part would be the analysis itself, which has led to the three articles published or under publication. This second part can be logically divided into three sections, each corresponding to an article. The following table 1-1 provides an overview for reading the thesis along these lines and find the way through the chapters by classifying which chapters correspond to these different logical parts and the different articles. However, the thesis has not been organized and structured along these lines, (that is background material and analysis), since it would lack causality. Instead the organization has been based on the methodology of diffusion-assimilation-strategy, described in section 2.3 and the real sequence of the thesis parts and chapters is presented in section 1.4.

Thesis Part	Corresponding Chapters	Corresponding Article
Part illustrating the problem	Chapter 1 (Introduction), Chapter 4 (Electronic Commerce: Definitions and Theoretical Models) and Chapter 5 (The publishing Industry with focus on Scientific, Technical and Medical publishing).	
Methodology	Chapter 2	
Part illustrating the theories	Chapter 3 (Innovation, Strategic Management, Porter), and Chapter 6 (The Virtual Value Chain and A Business Value Model of Electronic Commerce) Chapter 8 (The Theory	

	of Business Value Complementarity), Chapter 11 (Critical Assessment of the Theories)	
First part of my own analysis of the problem and my contribution	Chapter 7 (An analysis of the Scientific, Technical and Medical publishing sector with focus on intermediation and disintermediation)	Article 2: Electronic com-merce in Science Technology and Medical Publishing: an industry analysis with focus on intermediation and dis-intermediation
Second part of my analysis and my own contribution	Chapter 9 (A business value complementarity framework of electronic commerce)	Article 3: What is the business value of electronic commerce? How can it be optimized?
Third part of my analysis and my contribution	Chapter 10 (Towards a business value complementarity framework of electronic publishing)	Article 1: The impact of electronic commerce on the publishing industry: Towards a business value complementarity framework of electronic publishing
Conclusions and suggestions for further research	Chapter 12	
Description of the technologies supporting electronic commerce and specifically electronic publishing	Appendices I, II, III and IV	

Table 1-1: An agenda for reading the thesis and find the way through the chapters

1.2 The research context

Technological innovation and change and its impact on society and industry have been the focus of economic theory during the second half of this century. Information technology innovations are responsible for many changes and innovations both at society and firm level. For example, in a Danish survey on service innovation, it has been found that many service innovations are based on information technology (Fuglsang and Fussing, 1998). Dutton (1996) states that the advent of Internet will bring societal changes comparable to those brought by the telephone. Dosi (1988) also recognizes the importance of information technologies due to their pervasiveness in the society and the scope of the transformations that they are inducing in the contemporary economic system. Finally, speaking specifically about electronic commerce, Zwass (1996, p.4) states that the technology of global, accessible, and nonproprietary connectivity offered by the Internet, changes many aspects of our life in the public and private domains. It is within this broad context of understanding the impact of technological innovations that this thesis has to be positioned as the purpose of the analysis is twofold:

1. Understand how electronic commerce as an instance of technological innovation can change the structure of industries and corporate value chains;
2. Develop a methodology to help firms formulate strategic choices, the main focus being to maximize the business value that the adoption of electronic commerce brings to a corporation.

In this thesis, Internet-based consumer oriented electronic commerce (as opposed to business-to-business electronic

commerce or (EDI)[1]) is seen as a particular instance of information and communication technologies (ICTs) innovations, that is fast spreading in the societal system, forcing many companies to adopt it.

This thesis, therefore, indirectly adheres to the strategic paradigm of innovation theory (see section 3.2) which acknowledges the importance of strategic management as a change agent in the diffusion of an innovation within an industry and a corporation (Sundbo, 1995). The thesis argues, in fact, that the exploration of complementarities between the company strategy, the value chain activities and supporting technologies could lead to a more efficient way of re-organizing for technological innovation such as electronic commerce. The adopted technological innovation can then be the basis of numerous innovations, both radical and incremental, within the company and the industry and it might be necessary to make numerous organizational changes, if such technology has to lead to a competitive advantage or profitability increase. It is these changes required to be made in an organization during the adoption process of an innovation, which are the main reason why technological change and especially information technology (IT) diffusion is usually slow and industrial enterprises are reluctant to adopt new information technology (IT).

In the specific case of Scientific, Technical and Medical (STM) publishing, the adoption of the Internet for business purposes can bring changes in the production process, in the distribution,

[1] See for example Viborg Andersen (1998) for an overview of the EDI status in Denmark and Viborg Andersen (1997) for an overview of the EDI in the public sector in a more international perspective.

in the marketing and sales of a scientific journal. For example, in the production of a journal, the use of SGML as an authoring tool allows easy publication of the journal in electronic format, paper version or on CD-ROM. By writing the article in SGML environment, therefore, the processes of writing an article into a low-level mark-up language, retyping it into the specific mark up language of the company, scanning through the optical scanner, etc. can be avoided. Internet distribution is instantaneous and can be seen as a substitute for the traditional way which relies mainly on transportation systems such as air, road, railway etc. and which is much slower, especially in those countries where the distribution system is not very reliable. However, these innovations require organizational changes, experimenting with new business models, new investments in resources such as equipment and human capital and bring with them much uncertainty about the return on investments (ROI). Consequently, the diffusion process is very slow as publishers try to deal with all these issues, while minimizing the investments in an innovation with uncertain outcome and try to find out how to maximize the benefits from its adoption.

1.3 The research problem

Consumer-based electronic commerce is becoming part of our daily life as more and more consumers are starting at least looking for information on products on the Internet and possibly ordering and paying online. The goods that can be ordered and delivered over the Internet are different and vary from physical products such as wine, flowers and toys over digital goods such as software, music and journals to services such as making airline reservations, booking hotel rooms etc. Approximately 20% of the population are connected to the Internet (Kannan, 1998) and it is estimated that worldwide electronic commerce

will be between 2-4 % of today's world commerce by year 2000 (Erhvervsministeriet, 1997).

On the other hand most corporations are also starting to have at least a presence on the World Wide Web (WWW). The level of sophistication of the home page varies from company to company. Some companies use the Internet mainly as an advertising tool, others offer the possibility of ordering the product on-line, still others give the option to deliver the product on the Internet and to pay on-line for the goods bought through the Internet.

The Internet might be a threat and an opportunity for many industries, especially those producing products that can be transformed into digital products. The Scientific, Technical and Medical (STM) publisher is particularly vulnerable to the new Internet-based electronic commerce. Some of the reasons are the easiness of Internet publishing (in the sense of putting information widely available on the Internet) allowing almost anybody to start publishing on Internet and the nature of the industry product that can easily be transformed into a digital product and transmitted over Internet. This implies for example that many editors could bypass the publisher and start publishing on Internet themselves, or new entrants could easily contract with editors and universities to publish the electronic articles directly on Internet. Therefore, the Scientific, Technical and Medical (STM) publishers are being threatened by new start-ups and by their own suppliers (universities). Consequently, they should start repositioning themselves to offer electronic versions of the journals. On the other hand, if the Scientific, Technical and Medical (STM) publisher starts publishing on Internet, then companies such as binders, printers and distributors and the present subscription agents would not be necessary anymore. Therefore these groups of companies also need to reposition

themselves in order to survive, thus leading to many changes in the industry structure of Scientific, Technical and Medical (STM) publishing.

Internet is also transforming the business processes of many corporations. Kalakota and Whinston (1996) state that electronic commerce can be used for the reengineering of business processes, and already many companies are starting to shift some of their activities on Internet or at least perform them both on Internet and in a more traditional way in the market place. The Scientific, Technical and Medical (STM) publisher, producing a digital product (the research journal) can especially use electronic commerce to conduct many of the business processes in the marketspace. Therefore the need for publishers to plan and manage the transition to the electronic marketplace, to avoid being left behind when the new competitive rules are established. Given this scenario my research questions can be formulated as follows:

What is the impact of Internet-based electronic commerce on the industry structure of Scientific, Technical and Medical (STM) publishing with focus on intermediation and disintermediation?

How is electronic commerce transforming the corporate value chain and the corresponding business processes from the marketplace to the marketspace in the Scientific, Technical and Medical (STM) publishing?

How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage terms?

Chapter 2 on methodology gives a description of how these questions have been answered.

1.4 The structure of the thesis

In accordance to the overall thesis methodology of diffusion—assimilation—strategy (see chapter 2, section 2.3), the structure of the thesis is divided into four parts.

Part I: Introduction and Methodology. This part includes chapter 1 on introduction and chapter 2 on methodology. Its purpose is to give an overview of the research context and the research problem, the architecture of the thesis, the research design and research method as well as a description of the data sources.

Part II: Diffusion of Innovations and Electronic Commerce. This part includes the first part of chapter 3 dealing with innovation and diffusion models and all of chapter 4 presenting electronic commerce as an innovation. The purpose of this part is to introduce the concept of innovation and the most used models of diffusion of innovation. Finally, this part introduces consumer-based electronic commerce and shows that it can be seen as an innovation that is spreading in the social system.

Part III: Assimilation of technological innovations. To the assimilation stage correspond the end of chapter 3 on strategies and Porter's frameworks, chapter 5 on the Science, Technology, Medical publishing sector as an industry in transition, chapter 6 on the impact of electronic commerce on the value chain and the five-force framework of competitive advantage. Finally the assimilation stage includes also chapter 7, showing how electronic commerce is impacting the industry structure of Science, Technology, Medical publishing and the last part of chapter 10, showing how electronic commerce is impacting the value chain of this industry. This part starts with a brief

historical overview of strategic management and presents a literature survey of strategic models focusing on the impact of information technology innovations on industrial structures and corporations, thus positioning the thesis within Porter's frameworks. Finally, this part also shows how electronic commerce is impacting the industry structure and the value chain in general and how this is taking place in the Scientific, Technical and Medical (STM) publishing sector in particular.

Part IV: Strategy. This part includes chapters 8, 9 and first part of chapter 10. This part argues that strategy is an important tool in the assimilation stage of an innovation within a company and tries to give some suggestions for strategy formulation based on the complementarity theory by building a normative model.

Part V: Critical Assessment of Theories and Conclusions. This part includes chapters 11 and 12 and presents a critical assessment of the theories used in the analysis and some concluding remarks.

The detailed content of the chapters is as follows:

Chapter 1: Introduction and Structure of the Thesis. This first chapter presents the scientific results and sets an agenda for reading the different chapters. The research context, the research problem and the research questions are presented. Finally the structure of the thesis is summarized.

Chapter 2: Methodology. This chapter first presents the research conducted in the thesis as descriptive and argues why this kind of research is appropriate to answer the research questions, then the research method is described and it is argued for being the most appropriate in this thesis. The chapter also includes a discussion of the empirical data and data sources as well as a

report on the actual interviews conducted and the expert presentations attended. Finally the level of analysis is briefly touched upon.

Chapter 3: Innovation and Strategic Management. This chapter gives an introduction to innovations and diffusion models of innovations. A brief discussion of Porter's contribution to the innovation field is included. This chapter also gives a brief review of strategic management and a survey of frameworks used to study the strategic impact of information technology (IT). Finally, the strategic frameworks that are the pillars of the thesis, Porter's (1980) framework of the five competitive forces and Porter's (1982) framework of the value chain, are presented.

Chapter 4: Electronic Commerce-Definition and Theoretical Models. This chapter gives a definition of electronic commerce, presents different e-commerce models and shows why Internet-based electronic commerce can be considered as a specific instance of Information and Communication Technology (ICTs) innovation. Further it shows that electronic commerce can be used to reengineer the business processes of the corporation for the marketspace.

Chapter 5: The Scientific, Technical and Medical Publishing Industry. This chapter introduces the publishing industry and specifically Scientific, Technical and Medical (STM) publishing, by illustrating the journal flow and the actors involved in its production and distribution. This industry is used as a descriptive/predictive case study in the analysis of chapter 7. Examples from the Scientific, Technical and Medical (STM) publishing industry are also used to illustrate the transformation of the business processes in chapter 10 and throughout the whole thesis.

Chapter 6: The Virtual Value Chain and A Business Value of Electronic Commerce. This chapter introduces the concept of the virtual value chain and a business value model of electronic commerce. The first part of this model contains some propositions showing the business value of consumer based electronic commerce to a corporation. The second part shows the impact of electronic commerce on the five forces of the framework of competitive advantage and on the three competitive strategies.

Chapter 7: The Impact of Electronic Commerce on the Industrial Structure of Scientific, Technical and Medical (STM) publishing. This chapter presents an analysis of Scientific, Technical and Medical (STM) publishing conducted by applying Bloch (1996) model to show how this industry is changing as a consequence of the diffusion and assimilation of electronic commerce. The emphasis in this chapter is on intermediation and disintermediation. This chapter also shows that right now many companies are reengineering for electronic commerce in order to compete with the new electronic intermediaries, thus operating both in the marketplace and the marketspace. Springer Verlag and Elsevier Science are given as examples of publishers reengineering for electronic commerce, while Ovid Tech. is presented as an example of an Internet-based intermediary.

Chapter 8: The Business Value Complementarity Theory. This chapter presents the business value complementarity model and discusses the concept of complementarity and its application in the field of manufacturing and reengineering. Moreover, since the thesis also discusses reengineering of business processes for electronic commerce (See Chapter 4), a short presentation of Business Process Reengineering (BPR) is given.

Chapter 9: A Business Value Complementarity Model of Electronic Commerce. This chapter develops a business value complementarity model of electronic commerce. This framework can be seen as a methodology to explore complementarities between the company overall strategy, the value chain activities that have to go on-line, the business processes that have to be reengineered for electronic commerce and the technologies available to implement the system. The overall objective being to maximize the business value of electronic commerce to a corporation either in profitability or competitive advantage terms.

Chapter 10: Towards a Business Value Complementarity Framework of Electronic Publishing. This chapter applies the model developed in Chapter 9 above to Scientific, Technical and Medical (STM) publishing by showing how each primary activity of the value chain can be transformed for the marketspace. The discussion is mainly theoretical for those activities that are not strictly related to Scientific, Technical and Medical (STM) publishing such as marketing, customer support and online sales. It is more specific to Scientific, Technical and Medical (STM) publishing when production and distribution are discussed since such activities depend on the particular product in question. The distinction between digital and not digital products is also considered in this chapter.

Chapter 11: Critical Assessment of the Theories used in the Thesis. The main purpose of this chapter is to evaluate the theories and models applied in the thesis in relation to the research problem. This is done by comparing them to other theories that could have been used to address the research questions and by addressing their limitations in relation to the research problem. Among the alternative theories mentioned there is the resource-based view of strategic management and

transaction costs economics. This chapter also summarizes the framework of diffusion—assimilation—strategy and includes a discussion about whether the models applied in the thesis are normative or descriptive.

Chapter 12: Conclusions. This chapter presents some concluding remarks and directions for further research. Among the future research, in-depth case studies of corporations that have embraced electronic commerce in their business model, the theoretical need to further investigate the hypothesis of disintermediation and electronic intermediation and the way electronic commerce will impact the five forces framework of competitive advantage have been pointed out.

Appendix I: gives an overview of the technologies that play a role in the transformation of the production activity from the marketplace to the marketspace.

Appendix II: gives an overview of the technologies that are important in the transformation of the distribution activity from the marketplace to the marketspace.

Appendix III: illustrates the technologies that support the emerging on-line marketing paradigm.

Appendix IV: gives an overview of the technologies that are important in transforming the sale activity from the marketplace to the marketspace.

CHAPTER 2: Methodology

This chapter gives a brief description of the research method and argues why this method is relevant to solve the problem of the thesis. This chapter also presents the overall thesis architecture, describes the empirical material, the data sources and the data collection techniques as well as it gives a report on the actual interviews conducted. Finally it briefly touches upon the level of analysis.

2.1 The research methodology

The research conducted in this thesis comes closer to what Bickman (1998) defines as descriptive research. Descriptive research in this case means the attempt to qualitatively describe the relationship between two or more variables. As Bickman (1998) states

"Descriptive research can be designed to answer questions of a univariate, normative, or correlative nature-that is describing only one variable, comparing the variable to a particular standard, or summarizing the relationship between two or more variables (Bickman, 1998, p. 14)".

This type of research has been considered appropriate in this thesis since the variables of interest have been Internet-based electronic commerce, the industrial structure of Scientific, Technical and Medical publishing and the value chain of the publisher in this field. The purpose has been to investigate how the advent of Internet-based electronic commerce is affecting the industrial structure and the value chain of the Scientific, Technical and Medical publisher and to develop a theoretical framework to deal with such changes. This could, maybe, make

us think about a cause-effect relationship, and therefore come into the type of research that Bickman (1998) describes as experimental and quasi-experimental. However, in the descriptive research the ”relationship” between two or more variables is just qualitatively described. This is in opposition to the other two types of research, where the casual relationship between different variables is tested by systematically varying or manipulating a variable (the independent variable) and by measuring its effects on the other variables, the dependent variables (Bickman, 1998). Given therefore the intention to only explore and describe what is started happening in Scientific, Technical and Medical Publishing as a result of the diffusion of Internet-based electronic commerce, the descriptive research has been considered more appropriate. Finally, as stated by Bickman (1998) this kind of research is also appropriate for questions of normative nature, which is what the third research question is all about (See section 2.2).

The descriptive research conducted in this thesis has followed a simultaneous process of induction and deduction, where the data collected have been influencing the choice of the theory and simultaneously the theory has been determining, even though to a certain extent, the kind of data to be collected. To describe it, a statement by Carlsson (1989) could be used:

“…The main aim is to join together inductive and deductive analysis in order to lay the foundation necessary for empirical analysis (Carlsson, 1989, p.180)”.

This is in many ways also similar to and reconfirm what Teubal (1976) says:

“The research is a combination of both empirical and theoretical research: there is no formal theoretical model to

determine from the outset the nature of the empirical test. The empirical and theoretical aspects continuously influence each other and are both output of the project (Teubal, 1976, p. 354)".

The research design of the thesis is therefore different from other classical models of qualitative research, which present research as a logical progression of stages or tasks, from problem formulation to the generalization of conclusions or theory that are necessary in planning or carrying out a study. In this thesis, as Maxwell (1998, p. 70) says, the activities of collecting and analyzing data, developing and modifying theory, elaborating and refocusing the research questions, and identifying and dealing with validity threats have been going on more or less simultaneously, each influencing all of the others.

2.2 The research method

The thesis research has been initially guided by the "meta posture" (Yin, 1998) of

"Understanding the implications of Internet for Scientific, Technical and Medical publishing".

After an exploratory investigation of the diffusion of Internet-based electronic commerce, and its impact on industrial structure and value chains, the conceptual framework of diffusion---assimilation---strategy described in section 2.3 below and the following three research questions had been developed:

What is the impact of Internet-based electronic commerce on the industry structure of Scientific, Technical and Medical (STM) publishing with focus on intermediation and disintermediation?

How is electronic commerce transforming the corporate value chain and the corresponding business processes from the marketplace to the marketspace in Scientific, Technical and Medical (STM) publishing?

How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage terms?

The previous questions have been answered by using a method that comes closer to what Yin (1994) defines as a descriptive case study. According to Yin (1994) a case study is a research strategy that

"Investigates a contemporary phenomenon within its real-life context,… relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, …and benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 1994, p. 13)".

This method has been considered more appropriate here (in opposition to survey, experiment, archival analysis, and history) given the purpose of the thesis. That is to provide a picture of how the Scientific, Technical and Medical publishing industry and the specific business processes of publishing are changing as a result of the diffusion of electronic commerce. The research questions of this project, in fact, focus on describing how Internet-based electronic commerce is changing industrial structures and value chains. This kind of questions can be answered by descriptive case studies since these research methods can be very useful among other things to describe events, and discover key phenomena (Yin, 1994). Other types of questions focusing for example on "how many", "how much", "where", "why", would have required different methods such as

archival analysis, experiment, etc. Finally, this method has been considered appropriate since the research tries to describe a phenomenon that is contemporary and still in developing phase and does not require any control on behavioral events typical instead of other research methods such as those mentioned above.

2. 3. Thesis architecture

As already said, after an exploratory investigation of the diffusion of Internet-based electronic commerce and its implications for industrial structures and value chains, the thesis architecture of diffusion--assimilation--strategy of an innovation had been developed. The innovation in question is electronic commerce and the industry in which it is diffusing is Scientific, Technical and Medical (STM) publishing. This industry has been chosen because it produces a product that can easily be transformed into a digital product and because there are few companies that are starting producing, distributing and selling electronic versions of journals or articles on Internet. In fact, at this point, it was clear that consumer-oriented electronic commerce might affect and transform the whole business cycle of procurement-production-distribution and sale of research journal. I thought that it could be interesting to exploit all the activities of the value chain, even though I could have focused just on one as for example marketing or distribution.

The framework of diffusion—assimilation--strategy was a natural way to organize the research, due to the need to understand consumer-oriented electronic commerce and to give some theoretical foundations to it. It seemed that looking upon it from the point of view of an innovation that is widely spreading in the society, thus impacting industry structures, was a very

interesting angle to look at this phenomenon. In order to adopt the new technological innovations, firms have themselves to innovate through the introduction of new products, new organizational structures, etc., thus in turn changing the structure of the industry in which they operate. Therefore the necessity to understand the Scientific, Technical and Medical Publishing industry as an industry in transition and the consequent need to conduct an industry analysis. Moreover, in the diffusion stage many new firms might step into the market also contributing to changing the industry structure (Rogers, 1996).

In the diffusion process, firms try to adopt and assimilate the technological innovation in question and in so doing the organizational structure and business processes often change as a result. Therefore the need to address this point in this thesis by showing how the business processes of Scientific, Technical and Medical publishing are being transformed by the advent of consumer-oriented electronic commerce. Finally, given the numerous changes that the assimilation of a technology brings to a corporation, it is necessary to develop a strategy to plan and manage this process and to find a fit between the organizational structure and the technological innovation in question. This often leads not only to a modification of the original innovation, but also to a redefinition/restructuration of the organizational structure itself (Rogers, 1995), which in turn contributes to change the industry structure by changing the rules of competition. To address this point, this project develops a framework (See Chapter 9) that gives some suggestions for strategy formulation based on the complementarity concept. Fig. 2-1 shows the architecture of the thesis and table 2-1 summarizes what theories have been used to answer which question and the corresponding stage of the overall framework of diffusion—assimilation—strategy.

Part I: Introduction and Methodology

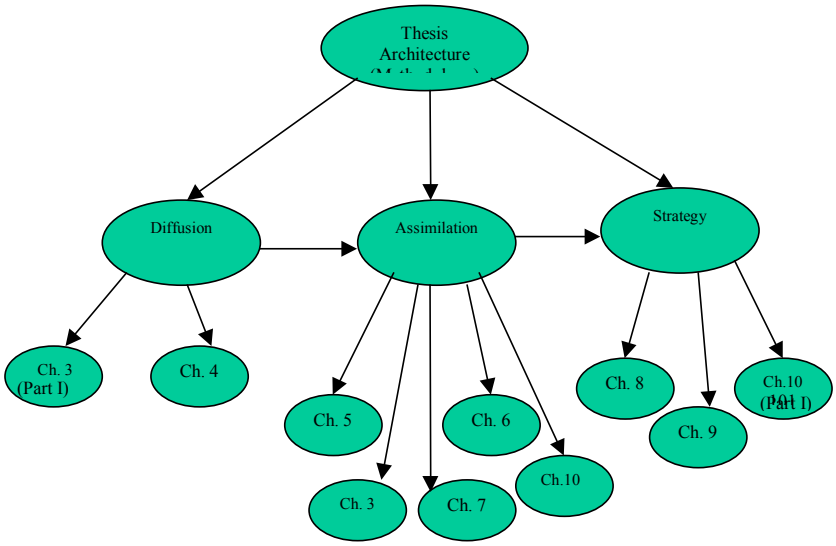

Fig. 2-1: Architecture (Methodology) of the thesis

Question	Theoretical Frameworks/Concepts	Stage of Thesis Methodology
What is the impact of Internet-based electronic commerce on the industry structure of Scientific, Technical and Medical (STM) publishing with focus on intermediation/disintermediation?	Innovation /Diffusion II Part of Bloch (1996) model of business value of electronic commerce Porter (1980) framework of the five competitive forces	Diffusion—Assimilation (at industry level)
How is electronic commerce transforming from the marketplace to the marketspace the corporate value chain and the corresponding business processes of the Scientific, Technical and Medical publishing industry?	Innovation/Diffusion Porter (1982) framework of value chain; Rayport and Sviokla (1995) framework of virtual value chain;	Diffusion—Assimilation (At corporation level)
How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage terms?	I Part of Bloch (1996) model of business value of electronic commerce Barua (1996) business value complementarity framework	Strategy

Table 2-1: Research questions, theoretical concepts and thesis methodology

2. 4. Data collection methods

The data used in the research have been collected with the following techniques:

- Use of pre-existing documents
- Elite Interviewing and Expert Statements
- Observation of Internet Web sites

The corporations' web sites that have been used as examples of electronic publishing pioneers in this thesis have been selected after having verified through the use of at least three different sources that these companies are indeed the leaders in electronic publishing. The triangulation method has therefore been applied in order to select such companies.

2. 4. 1 Use of pre-existing documents

Five types of documents have been used in the analysis of the research problem:

- Documents retrieved in the library catalogs. These documents have been limited to books and journal articles on the topic of electronic commerce, electronic publishing, journal publishing as well as books and articles on theoretical models that could be used in the project.

- First-hand reports from corporations and international organizations such as the Scientific, Technical and Medical (STM) Publishers Association located in the Netherlands, the European Community and UNESCO. These reports include annual reports, sales brochure and reports about electronic publishing in general.

- Documents retrieved on CD-ROMs such as ABI-Inform and EconLit. Electronic information retrieval and storage tools such as CD-ROMs and on-line services have been existing

since the 1970s as bibliographical databases became accessible on-line through the telephone networks. In the 1980's most of the databases available on-line became also available on CD-ROMs and became accessible without the inconvenience of the on-line connection. Therefore the use of the computer and network services in the social science research has been there for some time. CD-ROM or databases usually contain two categories of items: abstracts of articles in academic journals and Ph.D. dissertations and full text of articles of non-academic journals such as The Economist and many specialist journals of interest to the social science (Thomas, 1995). The major database used in this project has been ABI-Inform, which contains abstracts and indexes and recently also full versions of selected articles from circa 900 business journals.

- References, articles and discussions on electronic commerce and journal publishing from the e-mail list ISWorld, one of the mail lists for the researchers in information technology and management. This e-mail list can be seen as a type of computer mediated communication tool (CMC) that enables the social scientists to exchange information, to interact, to send request for information or references or to discuss specific topics. This type of communication is becoming more and more popular and is strongly influencing the work of the social scientist (Thomas, 1995) and can be seen almost as a substitute for the classical journal publication.

- Documents retrieved on Internet through the use of search engines such as Explore, Yahoo, etc. In this case Internet could be considered as a huge database.

2.4.1.1.Validity and reliability of library and Internet documents

Generally the use of documents or journal articles created by others presents the problem of reliability in the sense of determining how reliable is the document. This usually turns upon the truthfulness of the informant and the problem of validity, which is the problem of the correctness of the interpretation of the data and of current validity (Angell and Freedman, 1953). When dealing with Internet sources, the same problems as for documents retrieved in the library catalogs exist. In addition there is the problem of screening the documents that can be of any value among the huge amount of information on Internet.

In fact, while in databases such as ABI Inform, the articles have already been selected and screened for quality, accuracy and reliability from the database publisher, the quality of the information retrieved on Internet can vary from very low to very good depending on the particular site and author of the document. Therefore criteria for evaluating the information retrieved on Internet need to be established. These criteria can be seen in many ways similar to the ones used to judge any type of information.

Credibility	Trustworthy source, author's credentials, evidence of quality control, known or respected authority, organizational support. Goal: an authoritative source, a source that supplies some good evidence that allow you to trust it.
Accuracy	Up to date, factual, detailed, exact, comprehensive, audience and purpose reflect intentions of completeness and accuracy. Goal: a source that is correct today (not yesterday), a source that gives the whole truth.
Reasonabless	Fair, balanced, objective, reasoned, no conflict of interest, absence of fallacies or slanted tone. Goal: a source that engages the subject thoughtfully and reasonably concerned with the truth.
Support	Listed sources, contact information, available corroboration, claims supported, documentation supplied. Goal: a source that provides convincing evidence for the claims made, a source that you can triangulate (find at least two other sources that support it)

Table 2-2: Criteria for Internet Research Sources Evaluation (Source: Harris, 1997)

Harris (1997) has elaborated some principles that should be applied to a document retrieved on Internet before using it, briefly summarized in table 2-2. These principles are useful to screen any type of information on Internet, since this information can exist in the form of facts, opinions, stories, interpretation and statistics and is created for many purposes among which to inform, to sell, to present a view point and to create or change an attitude or belief. For a research purpose, the three following criteria might be also useful:

- Authority: What do you know about the author's credentials or level of expertise? Does the web site have the name of the

individual or organization and contact information clearly visible?

- Reliability: Does the site have an academic, governmental or commercial affiliation, or is source of a newsgroup? Has the site been updated recently to reflect the changes in the kind of information you are looking for? (Medical information for example should be updated recently as opposed to historical information). Does the site appear to be stable and is there any indication that it will continue to be maintained?
- Structure and content: Is there a statement about the purpose and coverage of site's information? Is the site a collection of links to other sites or does it actually have files of potential useful information? Is the organization of the site logical and easy to use? (Tiller, 1996)

The criteria of authority and reliability and structure and content have mainly been used in this manuscript in selecting articles of theoretical nature from Internet. That is the journal articles and working papers used have been retrieved and either downloaded or read on-line from web sites of institutions with high reputation. Some of these institutions are the Fisher Center of Information Technology, the University of California at Berkeley, the OCLC On-line Computer Library Center, Harvard Business Press Online catalogue of abstracts, MCB Inc.'s web site. Information retrieved from web sites of electronic publishing pioneers (selected according to the triangulation method) such as Elsevier Science, Springer Verlag, Ovid Tech., Munksgaard Publishing have been used as empirical material. Given the high reputation of such companies and their commitment to electronic publishing (confirmed by other sources according to triangulation) it has been assumed that the information published in their web sites is valid and reliable.

Please refer to section 2.5.4 below for a list of the most important home pages used.

2.4.2 Elite interviewing and expert statements

Since the objective of the thesis is to understand and describe the impact of Internet-based electronic commerce on Scientific, Technical and Medical publishing, and given that there are only few established companies that are pioneering the field of Internet-based electronic publishing, a natural data collection technique has been elite interviews. Elite interviewing, in fact, implies that few key people in the field are selected and interviewed to understand the trends, in opposition to an in-depth interview data collection strategy, that involves the interviewing of many people. The people interviewed in this thesis, occupying key positions in their organizations (See section 2.5.1), have been considered to know more about the industry and its future trends then other employees in the companies. Librarians have been interviewed because as customers of the Scientific, Technical and Medical (STM) publishers can also give an idea of what is happening in the electronic publishing field. Elite interviewing has many advantages since it might get valuable information because of the positions held by the elite people. The main disadvantage of elite interviewing is the accessibility to elite since these are usually busy people operating under time constraints and therefore often difficult to reach (Marshall and Rossman, 1989).

At the beginning of the research, the interviews have had mainly the purpose to find out about the state of the art of Internet-based electronic commerce in the publishing industry. Later the interviews have been more focused on electronic publishing in general and the impact of electronic commerce on the forces of

competitive advantage (Porter, 1980) with special focus on substitute products, new entrants, electronic intermediation and disintermediation of subscription agents. Furthermore information about reengineering the different activities of the value chain (production, distribution, marketing, sales and customer support) for electronic commerce has also been collected during the interviews, with main focus on production and distribution.

Expert statements are another way to gather information about a phenomenon that is still under development. This consists mainly in attending seminars, conferences, etc. where experts in the field of interest express their opinions about what is going on. Please refer to section 2.5.2 for a list of experts whose presentations have been attended.

2.4.3 Observations of Internet web sites

At the beginning of the research, the Internet searches were finalized to find articles on electronic commerce and some ideas about what corporations in general and Scientific, Technical and Medical (STM) publishers in particular are doing on Internet. Later, the purpose of the Internet searches has been to specifically observe the web sites of some Scientific, Technical and Medical (STM) publishers or some electronic research journals in order to describe how this industry and the specific publishing processes are changing. This has been done by evaluating and analyzing the web sites according to the variables of the theoretical models used in the research. Moreover once opened the web site, the information available and of interest has been read and downloaded for future reference.

The selection of the web sites of the Internet publishers and electronic intermediaries to be considered in the thesis has been the result of a triangulation process. In fact, the Web sites of the publishers or journals used as examples in the thesis have been found and checked in all of the following sources: 1) Internet, 2) elite interviews, 3) secondary documents such as the Scientific, Technical and Medical publishing association newsletter. Web sites found first on Internet have been checked with elite interviews and secondary documents. Viceversa, references to electronic publishers in secondary documents and elite interviews have been checked out on Internet to verify what they were actually doing. Once identified and selected the publishing companies (or journals) operating in the marketspace and the electronic intermediaries to be considered in the analysis, the following Yes/No questions have been applied in observing and analyzing a web site. These questions are based on the variables of the model developed in chapters 9 and 10, and first of all the value chain:

1. Is this company (or journal) using Internet in the production phase of electronic journals? Yes or No? To what extent?
2. Does the company provide for Internet-based electronic distribution of some journals or journal articles? (Yes/No) Which business processes of on-line distribution (See chapter 10) does this company offer? The company is then used as an example or empirical material in the section that discusses these specific business processes.
3. Can the home page of this company be seen as a marketing tool? Yes/No. Which business processes of marketing does the company support on-line? The company is then used as example or empirical material in the section that discusses these specific business processes.
4. Does this home page offer the possibility to pay for the documents on-line? Yes/No. If yes, what kind of payment

method is used? (Payment by credit card, electronic cash, etc.) The company is then used as example or empirical material in the section that discusses these specific business processes.

5. Does the home page offer any kind of on-line customer support? (Yes/No) If yes the company is used as an example in the discussion of this activity in chapter 10.

Please note that the information gathered with these observations has also often been complemented with information from secondary sources such as journal articles.
One problem of observing Internet web sites is that they are not very reliable as they can be closed or moved to a different URL without giving information about it, therefore making it difficult for future researchers to go and check them out. Another problem is that it is becoming more and more common to have restricted access to the home page unless the visitor is a registered user. The third problem is, as in any kind of observation, the validity of the observation itself in the sense of fully understanding the nature and the meaning of the process being observed (Peak, 1953).

2.5 Report on actual collection of data

Simultaneously to a thorough literature survey on electronic commerce and electronic publishing, I have also done some empirical investigation. The purpose of this investigation was first to gather information about the state of the art of electronic commerce in the publishing industry and later to get a more precise idea of the transformation taking place. This section describes the people contacted and the information gathered.

2.5.1 Elite interviews

The interviews were conducted to find out what was going on in the field of electronic commerce and electronic publishing on Internet as well as to investigate how the publishing processes were being transformed for the marketspace. Furthermore the interviews purpose has been to find out which were the companies stepping into the field of electronic publishing, what were the challenges for management, what kind of technologies and competencies were required to enter the field of electronic publishing, etc. Since I did not make any a priori agreement about the disclosure of the names of the people interviewed, the present report includes only their titles and positions.

April 1996, Ex-Director of Gyldendals, Copenhagen, Denmark. (This was an open-ended interview to find out what was going on in Denmark in the electronic publishing field in general and electronic publishing on Internet in particular, which ones were the major Danish companies entering the electronic publishing field, etc.)

May 1996, Director, Munksgaard Publishing, Copenhagen, Denmark. (This was an open-ended interview with focus on electronic publishing, Internet, Munksgaard Publishing commitment to electronic publishing etc).

May 1996, Director of Journals, Munksgaard Publishing, Copenhagen, Denmark and also member of the Innovation Committee of the Scientific, Technical and Medical Publishing Association. (The focus of this open-ended interview was on journal publishing on Internet, European Unions directives on

electronic publishing, First Monday, which is an electronic journal that Munksgaard had just started, etc.)

May 1996, Editor, Ingeniøren, Copenhagen, Denmark. (The focus of this open ended interview was on the Internet version of the journal ”Ingeniøren”, on the differences between publishing the paper version and the Internet version, on the technologies necessary to publish on Internet, the advantages and disadvantages of such new publishing methods, etc.)

April 1997, Secretary of the Scientific, Technical and Medical Publishing Association (On the telephone). The interview was mainly on data and information on electronic publishing and scientific, technical and medical publishing in general, which companies were starting to publish electronically, etc. She also sent me a lot of reports on electronic publishing and the Scientific, Technical and Medical Publishing Newsletters with information on electronic publishing.

January-August 1997, Associate director of the Center for Electronic Commerce and architect of Electronic Commerce World and the Decision Support Systems Journals on Online, University of Texas at Austin, Austin, Texas. (The focus of these interviews was on the changing processes of publishing into electronic publishing, the features that electronic publishing offers such as interactivity among the authors and the editors, the reviewers and the editor, the readers, etc.)

April 1997, Director, IdeaMarket, an Internet-based electronic intermediary based in Austin, Texas, gone bankruptcy in summer 1997 (on the telephone). (Mainly talked about my research, what they were doing, what an electronic intermediary was, how they could be used as a case study in my research, the possibility of conducting field research in their company, etc.

Agreed to make a case study of the company, but the company went bankruptcy before the data collection started).

January -August 1997, Director of a start-up electronic publishing business to sell posters on-line, Austin, Texas, USA. (The focus of the discussion was on electronic commerce, the problems of starting an electronic publishing business, the immaturity of electronic commerce technologies especially in the fields of payment systems and encryption/decryption, the cost/benefits of electronic publishing, etc.)

April 1997, Manager, IBM, Austin, Texas, USA. (The discussion was mainly on what IBM was doing in the field of electronic commerce, and on IBM's electronic commerce web site).

March 1998, Librarian, Roskilde University Center Library, Roskilde, Denmark. (The focus was on the transformation of publishers and distributors/intermediaries into electronic publishers/distributors and the implication for the competencies/role/technologies/costs of the library).

April 1998, Director of Journals, Munksgaard Publishing, Copenhagen, Denmark. (The focus of this semi-structured interview was on new electronic intermediaries, disintermediation, the changing role of the publisher and the subscription agent and the consequent necessity to reengineer, the new technologies and new competencies required to enter electronic publishing, the need for strategy formulation, outsourcing versus developing in-house, etc.).

April 1998, Responsible for the electronic version of RUCNyt, Roskilde University, Roskilde, Denmark. (The focus of the interview was on publishing the paper version of RUCNyt

versus publishing the electronic version. What are the differences in the process, what are the differences in the technologies, the limits of the electronic publishing technologies, etc.).

August 1999, Secretary of the Scientific, Technical and Medical Publishing Association (On the telephone). (The discussion was mainly on the lack of data and information on electronic publishing and the Scientific, Technical and Medical publishing industry in general, e.g. markets size, number of journals and electronic journals, etc. Some hints to some other potential sources were given).

August 1999, Director of Journals, Munksgaard Publishing (On the telephone). (The discussion was again about the lack of data on the Scientific, Technical and Medical publishing sector, and electronic publishing. Few references were given about intermediaries that were reengineering for the marketspace).

August 1999, Den Danske Forlag Forening (On the telephone). The interview focused on the lack of data on the Scientific, Technical and Medical Publishing sector and on electronic publishing.

2.5.2 Expert statements

Many information have also been gained by attending presentations at conferences and seminars on electronic commerce and electronic publishing, where many experts have presented their opinions about the state of the art and the future of electronic commerce and electronic publishing. This section summarizes the most important presentations:

January-May 1997, Director, Center for Electronic Commerce Research, University of Texas at Austin, Austin, Texas. (This was a graduate level course in electronic commerce).

March 1997, Director, Arthur Andersen Consulting, Electronic Commerce Department (located in Boston, Massachusetts,) University of Austin, Austin, Texas. (The presentation mainly focused on consumer-oriented electronic commerce, on corporate strategies to deal with this new type of electronic markets, examples of home pages of successful pioneers in different sectors, etc.).

February 1997, President, Matrix Corporation, University of Austin, Austin, Texas. (This is a small company collecting and selling data on Internet located in Austin. The presentation focused on Internet, Internet Growth, characteristics of the Internet user, etc.).

March 1997, Director, Idea Market, University of Austin, Austin, Texas. (This company was an electronic-intermediary based in Austin. Gone bankruptcy in summer 1997. The presentation focused on electronic publishing of journals on Internet, the role of a fully electronic intermediary, electronic disintermediation, the difference between the traditional paper publishing processes and the Internet-based processes, etc.).

May 1999, Librarian, Denmark Technical University Library, Annual Conference of the Center for Tele-information, Denmark Technical University, Denmark. (The focus was on the electronic publishing system developed at this library, its advantages, disadvantages, its implications for the traditional publisher, the traditional intermediary, the traditional library, etc.).

June 1999, Panel discussion on the future of electronic publishing, European Conference on Information Systems (ECIS), Copenhagen, Denmark. (The implicit conclusion was that the future is electronic publishing).

Spring 1999, On-line discussion on the future of paper and electronic publishing and the traditional review process in the field of Management Information Systems, ISWorld e-mail list (http://www.isworld).

2.5.3 Original documents

The following are some of the original documents that I have used in the analysis:

Newsletters, Scientific, Technical and Medical Publishing Association, 1996-1998.
Annual Reports, Munksgaard Publishing, 1997-1998.
Annual Reports, Elsevier Science, 1997-1998.
Annual Reports, Springer Verlag, 1997-1998.
Information Brochure on some electronic journals, Munksgaard Publishing, 1997-1998.
Report on the Link System, the electronic publishing system of Springer Verlag, (http://link.springer.de/doi/online-first.htm)
The Tulip Report, Elsevier Science, (http://link.springer-ny.com/tutorial/service.html)
Report, Electronic Publishing, Opportunities and Trends, European Commission, 1996.
Report, Evolution of the Internet and the WWW in Europe, European Commission, 1997.

2.5.4 Home pages of electronic publishers or electronic journals

After having used the triangulation method to verify the importance and the validity of the Internet addresses that I could find on electronic publishing, for the analysis I have chosen to concentrate on the following home pages, because they had been mentioned at least by three sources. These sources were generally an Internet search engine, the librarians/field experts and secondary documents such as the newsletter from the Scientific, Technical and Medical Publishing (STM) Association. The following home pages have been used as sources of information, as a base for the analysis of how the publishing processes are transformed for the electronic marketplace, as examples of companies (or journals) that are reengineering for electronic commerce as well as to confirm the hypothesis of intermediation and disintermediation.

http://science-direct.com
http://www.ideamarket.com (Not existent anymore).
http://www.faxon.com
http://www.elsevier.nl/
http://www.ovid-tech
http://www.springer-verlag
http://www.swets.nl.
http://www.yama.utexas.bus.edu/dss
http://www.firstmonday.dk
http://www.clickshare.com
http://www.infi.net/pressrelease
http://www.acm-transaction/
http://www.stm.springer.de/members
http://desktop.isinet.com

Other Home Pages used for retrieval of articles mainly of theoretical nature on electronic commerce, electronic publishing, reengineering, diffusion, information technology, etc. are as follows:

http://www.berkeley
http://www.stanford
http://www.mit.
http://www.@brint
http://www.vanderbuilt

2.5.5 Main databases used for articles and information retrieval

The main databases used for articles and information retrieval have been:

1. ABI Inform at the Copenhagen Business School Library, Copenhagen, Denmark.
2. EconLit at Roskilde University Library, Roskilde, Denmark.

2. 6. On the level of analysis

After an exploration of Internet and how to conduct business on Internet, it was realized that this technological innovation had importance in changing the structure of industries, mainly through the introduction of substitute products, new entrants and through intermediation and disintermediation (Pedersen, 1997; Wigand and Benjamin, 1995; Bloch 1996). Moreover, it was also clear that Internet was contributing to change the business processes of a corporation and that the development of a strategy was necessary. The relevant levels of analysis for the study became therefore both the industry and the value chain of

a corporation with a special attention to the corresponding business processes and strategy as a connecting link between these two levels. The link between industry level, corporation and strategy is further supported by the fact that the framework of the five competitive forces (Porter, 1980) looks at the environmental forces as the basis for strategy formulation. Strategy formulation, in turn, involves the different activities of a corporation and its value chain (Porter, 1982). Finally, Barua (1996) also implicitly states that some strategic tools are necessary to manage the changes in the corporation and business processes required as a response to an external stimulus that can be technological in nature. As already said, in our case the environmental force and external stimulus is electronic commerce.

2.7 Conclusions

This chapter has presented the architecture or methodology of the thesis, the research method, the research questions as well the type of data and the data sources. It could be argued that the data used in the projects are a little deficient, missing those data such as in depth field interviews and field notes that are typical of qualitative research. By doing research on electronic commerce, in my opinion however, enough data and information can be gathered by visiting the web sites of companies and using pre-existing documents such as corporate annual reports. As Glaser and Strauss (1967) say while discussing the main advantages of the library research (as for example accessibility) and disadvantages (data can be misleading and deficient) as opposed to field interviews (very detailed, accurate and updated, on the other hand time consuming and sometimes difficult to get),

"These then, are some of the respective advantages and disadvantages of library research versus field or interview research. In weighing these, perhaps we have emphasized unduly the potential advantages of library research, in a conscious attempt to focus sociologist attention upon the central issue. Not which source is ideally most important, but on the need for assessing realistically which maybe best used, alone or in combination in a particular study (Glaser and Strauss, 1967, p.101").

Part II: Diffusion of Technological Innovations

CHAPTER 3: Innovation and Strategic Management

This and the following chapter deal with the diffusion of innovation in the socio-economic system. Chapter 4 explains the innovation under consideration: Internet-based consumer oriented electronic commerce as a specific instance of information and communication technology innovation. In this chapter, definitions of innovation and models to describe it and its diffusion are presented in order to understand the concept and be able to apply it to electronic commerce. In this chapter, a brief review of the field of strategic management is also given and the contribution of Porter (1980; 1982) to the strategy and innovation fields is discussed. This is considered necessary since the fourth part of the thesis tries to give some suggestions for strategy formulation based on the complementarity concept. Finally, the model of the five competitive forces and the model of the value chain are presented. These models are briefly illustrated here because they are the basis of the business value model of electronic commerce illustrated in chapter 6, the business value complementarity framework of electronic commerce of chapter 9 and the analysis of chapter 7 and 10.

3.1 Definition of innovation

" All schools of thought in economics have always recognized the central importance of technological innovations and of organizational innovations for the competitive performance of firms and of nations and for the long-term growth of the world economy (Freeman, 1990, p.1)"

In this way Freeman (1990) begins his book ”The Economics of Innovation”, but even though studies of innovation and technological change can be found as far back as the end of the 19th century, Schumpeter (1939) was the first leading economist to make innovation and technological change the focus of his theory. However, innovation and technological change grew in importance only in the second half of this century (Freeman, 1990; Elster, 1983; Heertje, 1994). The major breakthrough in economics was made when it was argued that most economic growth cannot be explained by the three traditional economic factors of land, labor and capital, but there was a residual factor that was the base for the majority of economic growth called “technology” (Sundbo, 1995).

There is much confusion about the definition of the term innovation, that usually means a new product, but according to Kline and Rosenberg (1986) more recently also includes:

- A new process of production;
- The substitution of a cheaper material, newly developed for a given task, in an essentially unaltered product;
- The reorganization of production, internal functions, or a distribution arrangement leading to increased efficiency, better support for a given product or lower costs;
- An improvement in instruments or methods of doing innovation.

According to OECD (1992, p.16), this change in the concept of innovation is also due to a recent shift in the focus from the single act philosophy of innovation to the complex social mechanisms that underlie new production processes and the production of new products. Schumpeter (1939) divided technological change into the three stages of invention,

innovation and diffusion. In his definition, invention is the creation of a new idea or element that in the innovation stage becomes translated into a commercially useful element which in turn becomes wide spread in the social system (being a firm or a society) during the diffusion process.

Innovations are normally divided into radical and incremental innovations.[2] Radical innovations are discontinuous events typically as a result of R&D. Incremental innovations are continuous small changes often resulting from learning by doing/using rather than deliberate effort. The definition of innovation itself implies that dealing with innovation means dealing with management and reduction of uncertainty. Generally, the greater the changes introduced, the greater the uncertainty about technical performance, the market response and the ability of the organization to absorb and utilize the requisite changes effectively (Rosenberg and Kline, 1998).

Finally, innovation has no obvious form or dimensions. This gives rise to many problems of measurement, even though some studies such as the ones conducted by OECD (1992a; 1995) give some guidelines on how to measure innovation mainly in the manufacturing sector. The same guidelines, with few modifications, are being adopted to measure innovation also in the service sector (Evangelista and Sirilli, 1995) as more and more interest has lately arisen about service innovation (Sundbo, 1997; 1998(b); Fuglsang, 1997).

[2] For other taxonomies see for example Freeman and Perez (1998), Pavitt (1984).

3.2 Models for describing innovation and its diffusion

There have been many attempts in recent years to make order in the way the process of innovation unfolds, with the purpose of understanding it better. This has given rise to different models of innovation among which the most known are the "Linear model" and the "Chain Linked Model". Coombs (1998) includes among the models of diffusion of innovations also contributions such as the five serial model of the innovation process by Rothwell (1992), Pavitt's (1984) sectoral taxonomy of innovation processes, and the literature on the national systems of innovation (Lundvall, 1992).

The linear model, which has been the dominant model for long time and that can also be seen as a model of diffusion of an innovation, views the innovation process as based on R&D and going through the stages of:

Research---→ Development----→Production---→ Marketing

This model does not include any feedback paths to evaluate the performance of the innovation, to formulate the next steps or to assess the competitive position achieved as a result of the development or adoption of the innovation in question. An attempt to introduce this kind of feedback has been done by interactive models of innovation. One of the best known examples is the Chain Linked Model (Kline, 1985). In this model feedback loops are introduced to take into consideration the relationship between potential market and sales, links between knowledge and research, etc. As the OECD (1992a) report states:

"These models now emphasize the central role of industrial design, the feedback effects between downstream (market related) and upstream (technology related) phases of innovation and the many interactions of science, technology and innovative activities both within the firms and in cooperative agreements among them (OECD, 1992a, p. 16)".

Today, technology diffusion occurs mainly through components, machinery and equipment such as computers or computer assisted equipment. Such technology diffusion implies organizational changes such as acquisition and use of software, continuos training, adaptation of work organization and managerial structure, market exploration as well as development of technological links with other firms, suppliers and customers. Rogers (1995) describes models of diffusion of an innovation in a social system and in an organization, where the difference is that the unit of adoption is not the single individual of the social system, but the organization. Moreover, Rogers (1995) develops a model of innovation process in an organization, which is made of the two broad activities of initiation and implementation. These activities comprise the following five steps:

1. Agenda setting: general organizational problems that may create a perceived need for innovation.
2. Matching: Fitting a problem from the organization's agenda with an innovation.
3. Redefining/restructuring: the innovation is modified and re-invented to fit the organization, and organizational structures are altered.
4. Clarifying: The relationship between the organization and the innovation is defined more clearly.
5. Routinizing: The innovation becomes an ongoing element in the organization's activities, and loses its identity.

This model points clearly to the need for the management of the diffusion and assimilation of an innovation within an organization. An important dimension in the diffusion of technological innovation is, in fact, the capacity of firms to develop a strategy to take advantage and to learn how to use the technologies developed by other firms (Sundbo, 1995). This process involves substantial investments such as developing new products, new production processes, as well as organizational changes (NRC, 1994). Jon Sundbo (1995) has identified three competing paradigms or explanations of the innovation phenomenon**.** Table 3-1 gives an overview of the paradigms, the determinant of the innovation, the agent promoting the innovation.

Innovation Paradigm	Entrepreneurship Paradigm	Technology Economic Paradigm	Strategic Paradigm
Determinant of Innovation	Entrepreneurship	Technology development	Market-oriented strategy
Explanation of innovation	Psychological	Technological	Sociological
Agent	The amateur	The technician	The professional manager

Table 3-1: Three paradigms of innovation theory (Adapted from Sundbo, 1995)

This thesis could be positioned within the strategic innovation paradigm, where innovation is driven by the market and the external environment and where strategy formulation and strategic management play a central role in the adoption and development of innovation. Strategy as a means to manage the innovation process and to make plans for future innovations is also important because during the diffusion process the competitive position of the different firms (adopters and non-

adopters) change over time as does also the innovation being adopted (Silverberg, 1988).

Moreover, while good macroeconomic conditions are prerequisite for competitiveness, many key factors concern the micro-economic level and the capacity of firms to organize for technological change in particular. For example, the OECD Report (1992) gives further importance to micro-economic factors as determinants for competitiveness as they found out that efficient competition depends on the quality of products, superior process technology, and organization of production, speed of delivery and quality of after sale service. All these can be influenced by technological development (Porter and Millar, 1985). Finally, technological innovation is also responsible for changes in the structure of industries (Porter 1980) and has important policy implications. As McGee and Thomas (1994) assert:

"In the last decade we have witnessed the rapid emergence of technology as a major change agent in markets and industries around the world. The scale and pervasiveness of technological change has led to a wide acceptance of technology as a major strategic variable both for corporations and for national governments (McGee and Thomas, 1994, p.7)".

3.3 Porter and innovation

Even though Schumpeter (1939) recognized that technology and the processes of innovation are important change agents in the structure of industries and competition, Porter (1980) was one of the first strategy researchers to recognize the importance of innovation for reaching and sustaining a competitive advantage (Sundbo, 1995). Loveridge and Pitt (1990, p.9) maintain that many of the now well-known propositions about the relative competitive advantage of firms were first articulated- or comprehensively repackaged by Porter (1980; 1982). Porter also assigns a significant role to technological innovation which needs to be emphasized when it offers first mover advantage to early innovators or buttresses the firm's overarching competitive strategy of low cost leadership or specialization or finally is unequivocally the key to survive.

Porter (1980) has examined the inadequacies involving technology and technological change issues in both accepted industrial organization paradigms and the theory of the firm by recognizing that there was missing a comprehensive view of how technological change can affect the rules of competition. For Porter, however, technology strategy implies more the exploitation of innovations, rather than a stream of innovatory behavior over time. As Porter (1980) suggests that:

"Technological change is one of the principal drivers of competition. It plays a major role in the industry structural change, as well as in creating new industries. It is also a great equalizer, eroding the competitive advantage of even-well entrenched firms and propelling others to the forefront. Many of today's great firms grew out of technological changes that they were able to exploit. Of all the things that can change the rules

of competition, technological change is among the most prominent (Porter, 1980, p. 104)".

Porter and Miller (1985) use Porter's (1980; 1982) frameworks to determine the impact of technology on industry structures and to help formulate strategical choices to determine whether the company should be a first mover or a follower-imitator. Finally, the main value of Porter (1982)'s contribution to the field of technological change is that it focuses upon the firm as the unit of analysis in studying the impact of technology on the rules of the competitive game (McGee & Thomas, 1994).

In the next sections first a brief review of the field of strategic management, then a survey of the theoretical frameworks to study the strategic impact of information technology are given, finally Porter (1980)'s framework of competitive advantage and Porter (1982)'s framework of the value chain are described.

3.4 Definition of strategic management and strategy

The concept and theories of business strategy, including both corporate and business strategy have their origins in the military world. The word strategy itself has its roots in the Greek word stratego (Grant, 1997). Strategy, both in business and military terminology is different from tactics. Strategy implies a plan to allocate resources in order to get a favorable position, while a tactic is a scheme for a specific action. There are many definitions of strategy. One definition defines strategy as the pattern of objectives, purposes or goals and the major policies and plans for achieving these goals, stated in such a way as to define what business the company is in or has to be in and the kind of company it is or has to become (Andrews, 1971). A

second definition states that the purpose of business strategy is to reach a competitive advantage and the purpose of strategic planning is to enable a company to gain as efficiently as possible a sustainable edge over its competitors. Corporate strategy, thus, implies an attempt to alter a company's strengths relative to that of its competitors in the most efficient way (Ohmae, 1983).

For long time the development of business strategy has been driven by the practical needs of firms to make an overall plan than by the development of theoretical frameworks. Strategy as an independent field only started its development at the beginning of 1960s, mainly under the form of corporate planning. This was due to the problems faced by the managers of the increasing large and complex firms of the 1950's and 1960's. The diffusion of corporate planning was associated with the need for the corporation to diversify their product portfolios, while in the 1970's firms started focusing on achieving competitiveness as opposed to only planning for diversification and growth. In this period, the transition from corporate planning to strategic management took place. It is in this period that tools such as the Boston Consulting Group matrix, the experience curve concept, the PIMS studies and the SWOT framework started emerging (Grant, 1997). With the starting of the management era, the focus was on the firms' environment with a particular attention to the industry structure and competition. During the late 1980s and early 1990s, the strategy literature interest started shifting from the external environment to the internal aspects of the firm as a source of competitive advantage. The following table 3-3 gives an overview of the development of the field of strategy.

There are many different schools of strategic management. For example Mintzberg (1989; 1990) distinguishes between ten schools: the design, the planning, positioning, entrepreneurial,

cognitive, learning, political, cultural, environmental and configurational. Finally, Teece (1990) distinguishes four paradigms of strategic management presently existing:

1. One paradigm stresses that an effective competitive strategy involves the firm taking offensive or defensive action in order to create a defendable position against competitive forces. This approach is referred to as the competitive force approach and is mostly identified with Porter (1980).

2. A second approach is quite recent and is based on the ”new” industrial organization literature and focuses on entry deterrence and strategy interactions. This tradition is advanced by Shapiro (1989) and finds its advocates among economists who have developed capabilities in game theory. This paradigm stresses that industrial outcomes are a function of the effectiveness with which firms keep their rivals off balance through strategic investments, pricing strategies, signaling and control of information.

3. A third approach is the resource-based perspective, which emphasizes firm-specific capabilities and the existence of isolating mechanisms as the fundamental determinant of firm performance (Penrose, 1959; Rumelt, 1984; Wernerfelt, 1984). Industry structure and competitive interactions are of little importance inside this paradigm.

Period	1950s	1960s	1970s	Late 1970s & early 1980s	Late 1980s & early 1990s
Dominant Theme	Budgetary Planning & Control	Corporate Planning	Corporate Strategy	Analysis of industry & competition	The quest for competitive advantage
Main Focus	Financial Control through operating budgets	Planning growth	Portfolio planning	Choice of industries, markets, & segments & positioning within them	Sources of competitive advantage within the firm. Dynamic aspects of strategy.
Principal concepts & techniques	Financial budgeting Investment planning Project Appraisal	Market Forecasting Diversification & analysis of synergy	SBU as unit of analysis. Portfolio planning matrices. Analysis of experience curves and returns to market share	Analysis of industry structure. Competitor analysis. PIMS analysis.	Resource Analysis. Analysis of organizational competence & capability. Dynamic analysis: analysis of speed, responsiveness & first mover advantage
Organizational Implications	Financial Management as key corporate function	Developmt. of corporate planning Dept. Rise of conglomerates. Diffusion of M-form	Integration of financial & strategic control. Strategic planning as a dialogue between corporate HQ and the divisions	Divestment of unattractive units. Active asset management.	Corporate restructuring and business process reengineering. Building capabilities through MIS, HRM, strategic alliances, and new organizational forms.

Table 3-3: The development of the strategic management field (Source: Grant, 1997)

4. Dynamic capability approach mainly associated with Teece (1990). This approach builds on the resource-based approach, but it is different from it because it stresses the importance of developing new capabilities as well as exploiting rather different normative rules. This approach, like the resource-based approach, has roots in an older institutionalist approach to strategy, which was developed at the Harvard Business School in the 1950s and 60s by Christensen and Andrews.

3.5 Information technology and strategic management

The impact of technological innovations on industrial structures and corporations is pervasive also when the technological innovation in question is an information technology innovation as all the literature on information technology and strategy shows[3]. These studies have different focuses. For example NCR (1994) studies the impact of information technology (IT) at macroeconomic level, while studies by Porter (1980), NCR (1994) and Kling (1997) focus on the impact of information technology (IT) at industry level both in manufacturing and services. The impact of information technology (IT) at enterprise level has been dealt with by authors such as Porter (1982), Morton (1997), NCR (1994). Finally, many studies have been conducted on the impact of information technology (IT) at activity level among which there are Porter (1982) and Porter and Miller (1985). As already said, since the beginning of the 1980's the literature on the strategic potential of information

[3] Parsons (1983), McFarlan (1984), Benjamin (1984), Boynton and Zmud (1987) provide more information about the information technology and its strategic implications.

technology has also been flourishing. Earl (1988b) states that information technology (IT) can be applied strategically in at least four different ways (the interest of this thesis is mainly on 1 and 2):

1. to gain competitive advantage
2. to improve productivity and performance
3. to facilitate new ways of managing and organizing
4. to develop new business

Moreover, Earl (1988b) conducts a survey about the theoretical frameworks available to study the strategic potential of information technology and groups them according to the categories summarized in Table 3-2 below.
Some of these models are based on Porter's model of the five forces of industry competition as for example Parsons (1983) and Cash & Konsynski (1985). Porter 's frameworks of the five competitive forces and the value chain are the ones most commonly adopted both by researchers and by practitioners to study the impact of information technology at industry and corporation level.

Awareness Frameworks	Refocusing Frameworks (Benjamin, 1984), Strategic Impact of IT (Parsons, 1983), Scoping Model (Porter & Miller, 1985)
Opportunity frameworks	Systems Analysis Frameworks (Porter's value chain, 1982) Application Search Tools (Ives and Learmouth, 1984) Business Strategies Frameworks (Porter's (1980) Five Forces of Industry Competition, Cash & Konsinsky's (1985) Framework of IOS to Combat Competitive Forces)
Positioning Frameworks	Scaling Frameworks (The Strategic Grid by McFarlan (1984)) Spatial Frameworks (Earl (1987) Sector Model) Temporal Frameworks (Stage Model of IT Management by McFarlan and McKenney (1983))

Table 3-2: Frameworks to study the strategic impact of information technology (IT)

Furthermore, they are interesting for us and have been chosen as basis of our analysis mainly for two reasons:

1. They focus on competitiveness, industry and corporate structures, and the role of technology, which is mainly where the interest of the thesis is;
2. The value chain framework and the framework of the five forces of competitive advantage have been adapted to electronic commerce respectively by Rayport and Sviokla (1994; 1995) and by Bloch (1996). Rayport and Sviokla show how the information and communication technologies are transforming the physical value chain into a virtual value chain made of information. Bloch shows how electronic commerce can affect the forces of competitive advantage, thus changing the industry structure. A detailed discussion of these models is provided in chapter 6.

3.6 The five forces framework of competitive advantage

Porter was the first to apply the concepts of industrial organization economics to the field of competitive strategy. He has therefore contributed to give theoretical roots to the strategy field that until then had been mainly based on the Harvard Business School tradition of ”case studies” (Foss, 1993(a); 1993(b)). Porter’s (1980) framework of competitive advantage is, in fact, mainly based on the classical industrial economics paradigm of Structure-Conduct-Performance that has its roots in the work of Bain (1968).[4] In the traditional structure-conduct-performance analysis the conduct of the firm was determined by the industrial structure especially in terms of barriers to entry and concentration. In turns performances of firms were determined by conduct (Antonelli, 1997(a)). In this approach the internal capabilities or routines of the firm have little importance and the focus is mainly on the external environment.

The framework of the five forces of competitive advantage, illustrated in fig. 3-1 below, helps clarify what is the business strategy of the corporation, what are the strategic assumptions behind it, and how information technology (IT) can bring a competitive advantage. It does so by focusing on industry and competitive dynamics among suppliers, customers, the development of substitute products, the power of new entrants and competition among industry rivals. The strengths of these five forces vary from industry to industry and determine the ability of firms in an industry to earn, on average, rates of return

[4] See also Masson and Qualls (1976) and Moss (1981) for a more detailed description of this paradigm.

on investment in excess of the cost of capital. The attractiveness of an industry and the competitive position of a firm are both dynamic and change over time. Moreover, the company has three generic strategies to change its competitive position within the industry and to influence the industry structure itself: cost leadership, differentiation and focus strategy. External factors can influence the dynamics of the industry such as new regulatory laws, technological innovations, etc. The focus of this thesis is on electronic commerce as an instance of a technological innovation that is affecting the five forces of competitive advantage in the Scientific, Technical and Medical publishing sector.

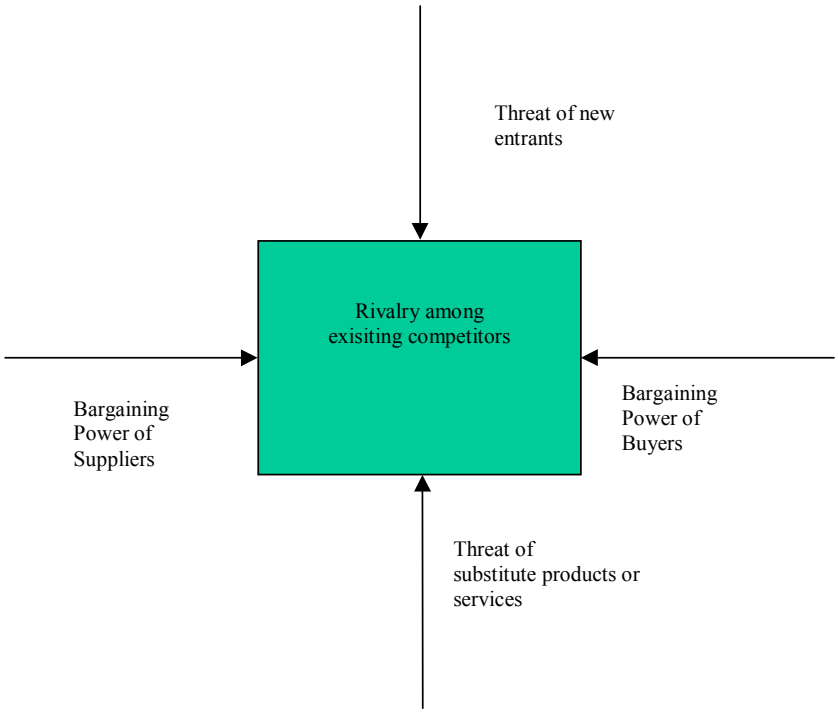

Fig. 3-1: The five-force framework of competitive advantage (Source: Porter 1980)

3.7 The value chain framework

One of the problems of the five forces framework of competitive advantage, described above, is that it focuses mainly on industrial dynamics and considers the firm as a "black box" as in the field of industrial organization. This problem is addressed by Porter (1982) by developing the framework of the value chain. The value chain framework, instead of looking at the firm as a number of departments, looks at it as formed of a series of activities which are divided into primary activities (production,

marketing, etc.) and secondary activities which are the financial department, information technology (IT) department, etc. These are called value activities because they should add value for which the customer should be willing to pay. The company is profitable if the value created by the activities exceeds the costs of performing them. An activity can be defined as a structured set of tasks (work) leading to a specific output for a specified internal or external client. According to NCR (1994, p.139) activities have several important characteristics, briefly summarized below:

- Activities operate on inputs from other activities that can be either internal or external to the firm.
- Activities have customers in the sense that there is a recipient for the outcomes of all activities in the workflow.
- Activities may or may not correspond to functional departments in organizations, and their linkage into the overall work flow of the organization may or may not correspond to reporting structures on an organizational chart. Activities may span external organizational boundaries on either the input or the output side (or both).
- Activities can be measured (e.g. throughput time, client satisfaction) to the extent that they form relatively complete segments of a workflow (starting with an input and ending with an output to a client). Finally, activities are often the target of investments in information technology (IT), which are undertaken as projects to support changes in relatively self-contained processes.

Each activity can be decomposed into a number of processes that can help us better understand how work is done at activity level. To gain a competitive advantage it is important that the company performs such activities in a differentiate way or at

lower cost then its competitors. Activities are interconnected by linkages, which represent interdependence among activities in the sense that one activity affects another in terms of cost or effectiveness. Trade-offs and optimization techniques are tools to gain competitive advantage.

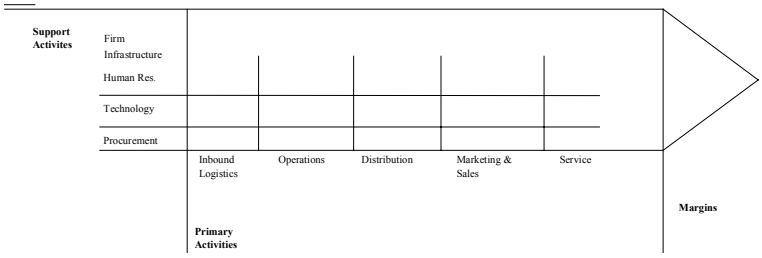

Fig 3-2: The value chain (Source: Porter, 1982)

Technology can affect either the activities of the value chain or the linkages. According to Earl (1988), technology can be used in the value chain as follows:

1. To automate and improve the physical tasks in any activity (e.g. computer controlled machine tools in assembly operations).
2. To physically connect and control activities across linkages (e.g. communications links between production and distribution centers).
3. To help perform, support, or manage value activities, e.g. inventory control systems.
4. To optimize or coordinate activities across linkages (e.g. CAD-CAM systems for computer integrated manufacturing).

In this thesis, a fifth point could be added: to transform activities for the on-line marketplace.

The value chain model, described in fig. 3-2, depicts the sequence in which activities typically occur and how they interact. Porter (1982)'s value chain model, which is also the most popular is linear. Alternative models are appearing like the value chain constellation by Norman and Ramirez (1993) and the value shops and value networks by Stabell and Fjeldstad (1998). Pedersen (1996a) describes the firm as a set of business cycles, instead of value chain of activities.

The value chain of a firm is embedded between the value chains of its suppliers and buyers, which constitute the value system of the corporation.

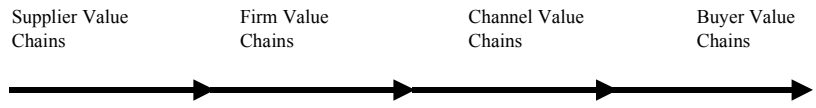

Fig 3-3: The value system (Source: Porter & Miller, 1985)

For example, suppliers have value chains that create and deliver the inputs purchased by a firm as well as there are value chains of channels, which perform additional activities on the way to the buyer. Finally, we mention the buyer's value chain, which is the value chain of the firm buying the output of a given firm.

3.8 Conclusions

This chapter has presented the concept of innovation and some theoretical models explaining its unfolding and diffusion. Some models dealing with the strategic impact of information technology (IT) have also briefly been mentioned. This chapter

has argued that Porter (1980) model of the five competitive forces and Porter (1982) model of the value chain are mostly interesting for this project, first because they are the ones mostly used and then because they have been adapted to electronic commerce by Bloch (1996) and Rayport and Sviokla (1994; 1995). The contribution of Porter to the field of innovation has also briefly been discussed.

CHAPTER 4: Electronic Commerce- Definition and Models

This chapter continues to contribute to the second part of the thesis, which concerns the diffusion of technological innovations by illustrating the technological innovation in question, Internet-based electronic commerce. The purpose of this chapter is, therefore, to briefly describe what is electronic commerce, what are the main frameworks and technologies underlying it, and to show that it can be considered as a technological innovation according to Rosenberg and Kline (1986) definition of innovation. The focus is on Internet-based consumer-oriented electronic commerce as opposed to business-to-business electronic commerce or EDI. Finally, the chapter briefly discusses what are the technological barriers to electronic commerce diffusion and shows that electronic commerce can be used to reengineer the business processes of a corporation for the on-line marketplace.

4.1. Introduction

Consumer-based electronic commerce is diffusing in the social system and is becoming part of our daily life as more and more consumers use Internet to buy and order many products and services online. Examples include: checking hotel services and room reservations; making airline reservations (for example Scandinavian Airline Systems (http://www.sas.dk) allows to make reservations on the web for internal flights in Denmark); buying software, listening and buying music (with associated problems of piracy as a new portable music player that can play music downloaded from the Internet has been released on the market (Http://www.nua.ie/surveys)); buying material goods such as cloths and foods (for example, ISO, (http://www.iso.dk),

a Danish supermarket provides the possibility to order the products on Internet and have them delivered at home); buying stocks and follow the stock market on-line, follow auctions of cars and fish (a fish auction is under development in Denmark). Approximately 20% of the general population is online and they tend to be members of the so-called ”baby boomers”, wealthy, employed, and well educated (Kannan, 1998). The Danish Ministry of Industry (1997) estimates that worldwide electronic commerce will be between 700 and 1,500 billions Danish crowns by year 2000, which is circa 2-4% of today’s world commerce. However, the data on the consumer on-line business are different from source to source. A forecast of on-line spending in US shows quite a big difference depending on the company that has conducted the survey as table 4-1 shows:

Research Firm	1995	1996	1997	1998	1999	2000
Forrester	0.25	0.52	1.4	2.4	4.0	6.6
Jupiter	0.58	1.2	2.3	3.8	5.5	7.3
Yankee Group	0.25	0.73	2.7	4.9	7.2	10.0
IDC	0.1	1.2	4.6	9.9	18.5	29.1

Table 4-1: Forecasts of consumer online spending in U.S. (billions of dollars) (Source: Kannan, 1998)

A report by Frost & Sullivan states that electronic commerce revenues in Europe will surge to over USD 8 billions by 2004, up from USD 35.8 millions in 1997 (Http://www.nua.ie/surveys). In terms of trade order numbers, ZDNet, an online magazine (Http://www.nua.ie/surveys), says that according to analysts at Credit Suisse First Boston and Piper Jaffray Inc. circa 253,000 online trades were conducted in the

third quarter of 1998. Overall, this represents a 16 % increase over the previous quarter and this increase is forecasted to last. This report defined an online trade as a trading order executed over Internet, rather then the number of customer accounts, which have been the basis of other estimates.

Most of the corporations have, at least, a presence on the World Wide Web (WWW). For example in Denmark 77% of the companies with at least 20 employees had a presence on Internet in 1998 and 42% had practiced electronic commerce by either taking orders on the Internet or making orders on the Internet. However, it is not clear from this survey whether the figures include only consumer based electronic commerce or also business-to-business electronic commerce or EDI) (http://www.dst.dk/Internet/k11/virk/virk.htm). As a result many companies are starting advertising online and the revenues generated by on-line advertising in 1998 more then doubled the ones in year 1997 and are estimated by the Znet magazine to reach USD 2 billions by the year 2000. This is not too much if compared with the spending and the sales in the marketplace, but nevertheless it is still a big number and indicates that the phenomenon of electronic commerce needs some attention from industries, governments and research institutions.

4.2. Towards a definition of electronic commerce

The electronic commerce concept has developed in the 70's even though electronic commerce under the infant form of EDI or electronic data interchange has been existing since the late 60's with the invention of the first data networks (Pedersen, 1997; Kalakota and Whinston, 1996). Early examples of electronic commerce are electronic order processing systems (e.g. ASAP

by American Hospital Supply Corporation) and airline reservation systems (e.g. SABRE by American Airlines). Recently, it has taken the form of interorganizational systems (IOS) (Bakos, 1991) and electronic markets (Klein and Langenohl, 1994; Malone, 1987). Since the advent of the World Wide Web (WWW) organization-to-consumer electronic commerce in contrast to organization-to-organization electronic commerce or EDI has started emerging. In the past electronic commerce has been based on proprietary/private networks and technologies, was very expensive and narrow scope and mainly implemented by large organizations such as IBM, Airlines, etc. With the advent of the World Wide Web (WWW), electronic commerce and especially company-to-consumer electronic commerce, is based on public networks such as Internet. Their main characteristic being that they are less expensive and widely accessible not only by corporations but also by the single individuals. There are many definitions of electronic commerce and much confusion there is about this term. For example Wigand (1997) states that

"Electronic commerce denotes the seamless application of information and communication technology from its point of origin to its endpoint along the entire value chain of business processes conducted electronically and designed to enable the accomplishment of a business goal. These processes may be partial or complete and may encompass business-to-business as well as business to consumer and consumer-to-business transactions (Wigand, 1997, p.5)".

In this definition Wigand (1997) includes one-way teleshopping broadcasts via cable and satellite television channels, via automated electronic markets, electronic shopping on the Internet and the World Wide Web (WWW), as well as electronic commerce utilizing an electronic market maker with a market

choice or set-top box in the consumer's home. Zwass (1996) defines electronic commerce as

"The sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications networks…Therefore as understood here, E-commerce includes the sell-buy relationships and transactions between companies, as well as the corporate processes that support the commerce within individual firms (Zwass, 1996, p.3)".

For our purposes, a broader definition by Kalakota and Whinston (1996) is adopted:

"E-commerce is associated with 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) (Kalakota and Whinston, 1996, p.1)".

This definition does not specify whether it is an interorganizational, organization to consumers or intra-organization commerce. In our analysis the emphasis is on organization-to-consumer electronic commerce and on digital products. For the purpose of this thesis a digital product is defined as a product, whose all value chain can be implemented with the use of electronic networks. For example a digital product is a product that can be produced electronically, can be distributed over digital networks, can be paid for over digital networks. Examples are software, information such as news, weather forecasts, research articles, music, financial information such as the stock exchange prices, and some type of services as

for example customer support service, airline tickets reservations, hotel booking etc.[5]

4.3. Electronic commerce theoretical frameworks

Different levels of transactions are identified in electronic commerce and correspondingly, different frameworks are defined (Wigand, 1997; Zwass, 1996; Kalakota and Whinston, 1996(a)). For example Kalakota and Whinston (1996a) develop an electronic commerce framework, where they define four building blocks of the infrastructure that support the business processes applications. The business process applications and the infrastructure itself are in turn supported by the pillar of public policy, legal and privacy issues and the pillar of technical standards for electronic documents, multimedia and network protocols. The four building blocks defined by Kalakota and Whinston (1996a) are:

- *"Common business services, for facilitating the buying and selling process*
- *Messaging and information distribution, as a means of sending and retrieving information*
- *Multimedia content and network publishing, for creating a product and a means to communicate about it*
- *The Information Superhighway-the very foundation-for providing the highway system along which all e-commerce must travel (Kalakota and Whinston, 1996a, p.3)".*

[5] For more detailed information about service in general, please refer to the working paper series in the SIC project, Roskilde University, http://www.sic.ruc.dk.

One pillar supporting all e-commerce applications and infrastructure is public policy, necessary to regulate issues such as universal access, privacy, and information pricing. The other pillar is technical standards and is used to regulate the nature of information publishing, user interfaces, and transport to ensure compatibility across the entire network. Zwass (1996) defines a framework of electronic commerce that consists of three meta-levels:

- *"Infrastructure: the hardware, software, databases, and telecommunications that together deliver such functionality as the World Wide Web over the Internet, or support EDI and other forms of messaging over the Internet or over value added networks;*
- *Services: messaging and a variety of services enabling the finding and delivery (on business terms, if desiderated) of information, as well as negotiation, transacting business, and settlement;*
- *Products and structures: direct provision of commercial services to consumers and business partners, intra-organizational information sharing and collaboration, and organization of electronic markets and supply chains (Zwass, 1996, p.5)".*

In this thesis two levels of transactions are identified:

- The infrastructure level, which includes the technical platform allowing the transactions to take place. Such technical platform includes telecommunications networks, hardware and software applications (This corresponds to the complementary technologies in fig. 9-1).

- The application level, which includes the business applications which can be performed with the use of the infrastructure level. Such applications include marketing and selling of products online, customer support, facilitating the production process, and in general all the business processes that can be implemented on-line in the organization to consumer electronic commerce (This corresponds to the on-line value chain and corresponding business processes in fig. 9-1).

Relevant issues for our framework are legal and privacy issues, developments in the field of multimedia and network protocols, technical standards for electronic commerce such as copyrights, secure payment systems, security etc. The following section gives only a brief description of these issues, being the main focus of the thesis to study the impact of electronic commerce on industrial structures and value chains.

4.3.1 Barriers to the diffusion of electronic commerce

There are many barriers, both technological and cultural, to the diffusion of electronic commerce. Among them security, copyrights, and payment methods are among the most important of technical nature.

Copyrights: in publishing they have the purpose of rewarding both the publisher and the author for their efforts and to get the funds necessary to finance further work. Copyrights are becoming more and more complicated with the increasing use of information technology. For example, the advent of information in digital or electronic form is increasing the possibilities for electro-copying, the electronic equivalent of photocopying

printed documents. Moreover, electronic information can be provided in multimedia form, that is text, sound, pictures etc. Since the copyright laws until now have changed according to the medium in question, the information in electronic form is creating problems. Many solutions are being tried to deal with the electrocopyrights issues. Some focus on the starting of the process by trying to control via licensing the information accessed in order to count the number of accesses. Other examples include monitoring of the identification codes in the transmitted information, using smart cards to allow controlled access to information and to provide automatic payment for it. This method is being tested by the CITED project (Copyrights in Transmitted Electronic Documents) which involves many publishers in the European Union (Page, 1997). Finally, new legislation in the copyright laws to deal with electrocopying might appear. The first step has been made by a task force established as a joint effort from the EU and USA governments which has published a report entitled ”Intellectual Property and the National Information Infrastructure” in 1995. These recommendations include that governments should prohibit the manufacturing or distribution of any device that can detect and circumvent electronic tags that might be used to protect copyrights on electronic networks. To conclude, it can be said that the copyright problem in the electronic environment has not yet been solved and the concept itself of ”fair use of electronic information” must deserve much more attention in the future.

Security: this may be the most important barrier to diffusion of electronic commerce in general and in electronic publishing in particular. A security threat is defined as a circumstance, condition or event which could potentially have an impact on data or network resources in the form of destruction, disclosure, modification of data, denial of service and/or fraud, waste and

abuse. Kalakota and Winston (1996a) divide security into three broad types:

- Client-Server security: this uses various authentication methods to ensure that only allowed users and programs have access to information stored in databases. These methods, mainly classified as access control mechanisms, include password protection, encrypted smart cards, biometrics and firewalls.
- Data and transaction security: ensures the privacy and the confidentiality in electronic messages and data packets including the authentication of remote users in network transactions for activities such as on-line payments. The purpose is to discourage the attempt to get a false identity while involved in any form of electronic data communication. Preventive measures include data encryption using various cryptographic methods.
- Message and data security: the lack of data and message security on Internet has become the highest problem to the spreading of consumer-oriented electronic commerce on Internet. Electronic data security is very important especially for banking and financial transactions by PCs, given the unauthorized network monitoring that can detect useful information such as credit card numbers. Message security falls into three categories: confidentiality which is very important in sensitive data, integrity which is the requirement that the data do not get modified during the transport, and message authentication, which is a mechanism that ensures the receiver that the identity of the transaction sender is right. The main techniques for message and data security are encryption techniques. Encryption can be defined as the mutation of information in any form (text, video and graphics) into a representation unreadable by

anyone without a decryption key. There are different encryption mechanisms: secret key cryptography, data encryption standard (DES) and public key cryptography[6]. The use of encryption presents some problems, among which: successful encryption requires that all participating parties use the same encryption scheme; there is no way yet to distribute the secret key to a person not known; encryption is very difficult to use, especially in the user interface to encryption, since many users want to have access to information as fast as possible without having to spend much time on the access procedure.

Payment Systems: are important barriers to the diffusion of electronic commerce. There are different ways to pay for electronic goods. The conventional payment methods such as cash, checks, bank drafts or bills of exchange are generally too slow for electronic transactions, especially for micropayments and the high transaction costs involved in processing them add greatly to the overhead. Therefore new methods of payment that meet the demands of the new electronic commerce environment must be developed. These new payment methods include electronic cash, electronic checks, smart cards, etc. (See appendix IV). These methods are all under development and testing. The main challenge with electronic payment systems is risk management, which can be mainly of three types: fraud or mistake, privacy issues and credit risk. While preventing fraud and mistakes requires some legal frameworks, dealing with privacy issues and credit risk requires better technological development in the security field, since the privacy of the consumer information of where, when and what they buy should

[6] For more information about encryption please refer to Kalakota and Winston (1996a; 1996b; 1996c).

be maintained from the many individuals and companies wanting to have access to such information.

4.4 Consumer-oriented electronic commerce as an innovation and reengineering

The advent of the World Wide Web (WWW) has been defining the new e-commerce era since the spring 1993, when the web browser Mosaic began to connect normal people to the web (Zwass, 1996). Electronic commerce technologies are here considered as a subclass of information and communication technologies (ICTs). And if information and communication technologies (ICTs) as such are not an innovation, e-commerce on the web can be seen as an innovation that is still at the beginning of the life cycle, and it is not clear yet the direction it will take. Here the innovation itself is the world wide web, the browser and all the classes of hardware and software that have been developed in order for consumer e-commerce to take place. According to the definition by Kline and Rosenberg (1986), Web-based consumer-oriented electronic commerce can be considered an innovation because:

- It is recent (first come to use in 1993),
- It leads to improvements in methods of doing innovation (as for example the use of SGML in production for creating new electronic products such as the electronic journal)
- It allows many other innovations such as new distribution channels, new forms of marketing, new sales channels, etc.
- It can also contribute to new organizational functions, especially through the reengineering of the business processes for the marketplace, and new organizational forms.

Much has been talked in the last few years about reengineering of business processes. The purpose of a reengineering project within a corporation is to streamline the old business processes and to introduce new information technologies to support the new business processes (Davenport, 1993). This literature acknowledges that many of the processes and structures of today's corporations are outdated and obsolete and have not kept pace with the changes that have taken place in many areas such as technological innovations and globalization. In a business environment where innovation, speed of delivery, service and quality are the most important factors, many companies still adopt outdated structures and business models and mainly use information technology to mechanize old ways of doing business instead of looking at new, innovative ways of conducting business (Hammer and Champy, 1993). Electronic commerce can be used for the reengineering of a company business processes for the electronic marketplace. In fact as Kalakota and Whinston (1996a) say:

"E-commerce is well suited to facilitate the current re-engineering of business processes occurring at many firms. The broad goals of re-engineering and e-commerce are remarkably similar: reduced costs, lower product cycle times, faster customer response, and improved service quality (Kalakota and Whinston, 1996a, p.1)".

Reengineering for electronic commerce is defined here 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, and in the future also of an increasing number of products. Business processes can be moved into the virtual, informational value chains (Zwass, 1996; Rayport and Sviokla, 1995). These

redesigned business processes can also be called on-line business processes or virtual business processes. Many companies are entering the electronic commerce arena, but the trend until now has been to reorganize only one or a few processes at a time for e-commerce, thus not taking full advantage of the potential of the web (Dutta, 1997).

4.5 Conclusions

This chapter has introduced electronic commerce as an instance of Information and Communication Technologies (ICTs) innovation. It has presented different definitions and theoretical models of electronic commerce, and has positioned this research within the stream of Kalakota and Whinston (1996a; 1996b; 1996c) by defining electronic commerce as the buying and selling of goods on the information superhighway. The major barriers or issues to the diffusion of electronic commerce have also been discussed and it has been showed how electronic commerce can be used for the reengineering of the corporate business processes.

Part III: Assimilation of Technological Innovations

CHAPTER 5: The Scientific, Technical and Medical Publishing Industry

This chapter starts the third part of the thesis, dealing with the corporate and industrial assimilation of a technology that is diffusing throughout the socio-economic system. This process should change industry structures and competitiveness rules. The purpose of this chapter is to present the Scientific, Technical and Medical (STM) publishing industry as an industry in transition. In chapter 7 it is shown how electronic commerce is impacting the industry dynamics through introduction of new substitute products, new entrants, intermediation and disintermediation. This chapter introduces a definition of what is an academic journal, who are the actors involved in the publication process, what are the developments in academic electronic publishing. Then the flow of the research journal and the actors involved in its production, distribution and consumption are described.

5.1 Background

The publishing industry has been traditionally a fragmented industry (Porter, 1982; Panorama, 1997). Most of the sector's constituent companies are small in size. Recently a trend of consolidation and diversification has been characterizing the industry. This has created a polarization between, on the one hand, the largest publishing and media conglomerates and on the other, an enormous number (tens of thousands) of small companies serving national markets, thus looking more like an oligopolistic industry then a fragmented industry. The publishing sector seems to have entered a stage of maturity and perhaps decline, even though much contradiction there is among

the different sources on the growth rate of the sector. These contradictions are mainly due to the diversity of the publishing sector and its close links with the printing industry. Globally publishers absorb about 40/50% of print production. The publishing industry includes many sectors among which magazines, newspapers, corporate publishing, books, reference material and journals (CEC, 1994a).

The publishing markets look very different depending on the region of the world it is looked upon and even within the same region there are big differences from country to country. In general USA is the world leader. For electronic information services, USA dominates the market, EU follows and third is Japan (CEC, 1992a). Regarding the electronic information service sector, EU, Japan and USA have their respective strengths and weakness. For example, Europe has some leading information and media conglomerates, a long publishing tradition and large and established markets for professional electronic information in key industrial sectors, as well as a language diversity which is an advantage for penetrating new markets. The main weakness of the European Union is market fragmentation in different sectors leading to technical barriers, the incompatibility of national standards and cross borders transaction costs. The USA presents advantages such as economies of scale in large English-speaking domestic markets, economies of scope through major "supermarket" host services, and a strong information technology (IT) industry. USA's main weaknesses are slower growth in domestic market due to possible maturity and relatively low use of electronic information services by small and medium size enterprises (SMEs). The main advantages of Japan are a large potential domestic market, high investments in information technology (IT) and IT-related R&D, and a highly competitive telecommunications infrastructure. The main Japanese

weaknesses are language barriers, cultural barriers to information as a commodity, immature information market and high production costs (CEC, 1993).

As already stated, this thesis focuses on Scientific, Technical and Medical (STM) Publishing. This sector is very interesting because electronic commerce can reengineer the whole publishing process and because the reader community of the academic journals is researchers or industry people that need the information as fast and updated as possible. Right now, instead, it takes considerably long time to get research results accepted and published and the all publication process is slow and cumbersome. Therefore, it could be expected that Scientific, Technical and Medical (STM) publishing is one of the publishing sectors that will be mostly affected by the new information and communication technologies (Panorama, 1997; CEC, 1996). In the analysis, the Science, Technology, and Medical (STM) publishing sector is considered at a high level of abstraction, and it is not taken into consideration any particular region of the world as it is believed that e-commerce will have the same impact on the publisher independently on the region of the world. Moreover, it could be expected that geographical regions do not exist when dealing with electronic commerce of information over the Internet, as the Internet is a network that spans the globe or at least gives opportunities to connect to it from other networks worldwide.

5.2. Trends affecting the publishing industry

According to Porter (1980) at each moment in time, an industry has a specific structure determined by the five competitive forces. This structure is undermined by some evolutionary

processes that push the industry towards its potential structure. There are many trends or processes that are affecting and will affect the structure of the publishing industry, and the very nature of the "published product" mainly in the context of the development of the information society. Table 5-1 gives an overview of these trends or processes.

Area	Current Issues/Long Term Trends	Main Aspect for Publishers
Technology	Convergence of technologies Decrease in processing costs Increase in processing capabilities New Authoring Tools Networks with higher data transmission capacity	Convergence of Industries and end user technology
Regulation	Telecom Liberalization Cross Media Ownership concentration Intellectual property rights issues Privacy issues	Convergence of regulation for different media
Economy	Growth of 3% p.a. Rising unemployment Rationalization (also white collar jobs) New work (flexibility, life long learning) For publishers: decline in print advertising	Rising purchasing power, but not in all segments of society
Demography	Europe's aging population Professional lives of women Individualization of life (one-person-households) University Crisis PC Literacy of Youths	Trend towards single households Rising electronic media literacy and competency of users

Table 5-1: Long Term Socio-Economic Changes Affecting the Publishing Industry (Source: CEC, 1996)

Technological innovation is a major source of industry structural change. Besides the issues mentioned in table 5-1 above, product innovation such as the new type of electronic journal can widen the market and therefore promote industry growth.

Marketing innovation such as the discovery of new channels of distribution or marketing such as the Internet can increase or raise product differentiation. Process innovations, or innovations in the manufacturing process or methods, can also affect the industry structure. In publishing, an important process innovation is the introduction of SGML as a hypertext language in the production of a journal.

Regulation or government policy can directly or indirectly influence an industry structure through regulatory/deregulatory laws. For example, new regulatory laws regarding international payments on electronic networks such as the Internet will have a direct impact on the publishing industry structure. Moreover, regulatory laws regarding the environment will likely impact the cost of the paper and therefore the publishing industry.

The category "Economy", besides the factors mentioned in table 5-1, also includes factors such as learning by buyers, reduction of uncertainty, diffusion of proprietary knowledge, accumulation of experience. The most straightforward effect is an increase or decrease in the cost and the price of the product, thereby affecting demand. An example is that of the early electronic calculators that was initially only sold to scientists and engineers, later also to students and bill payers. In our context it is interesting the explosion of home personal computing to the single households. This could imply that while the electronic journal would be first adopted by institutions such as libraries and corporations, later on it could be spread widely among the single professionals such as doctors, engineers, researchers, etc.

Finally, demography includes factors such as long run changes in growth, changes in age, income levels, educational levels,

changes in the lifestyle, tastes, philosophies and social conditions of the buyer population.

Other factors that contribute to change the structure of the publishing industry are rises in labor costs, lack of skilled employees, rises of paper costs, increases in marketing and distribution costs; and finally an increasing need to improve revenues and profits by improved production methods, generation of new products and servicing of new markets (CEC, 1992).

5.3. Scientific, Technical and Medical publishing industrial outlook

The publishing industry is presently transformed and has been transformed over the last 40 years by the information and communication technologies. Soon after the computers were invented in 1958 it was demonstrated their use for creating abstracts and indexes of textual works in the late 1950s. Advances for producing electronic publications have been made since the invention of computers and networks. Electronic information mainly in the form of on-line bibliographic databases has been existing in the last twenty years.

A study by the European Commission (CEC, 1996) estimates that the overall potential market for electronic publishing in Western Europe could be circa 12 Billion Ecus in the year 2000. The share of Science Technology and Medical sector could amount to circa 20-30 per cent of this figure or circa 625 millions Ecus (Mastroddi, 1996). Given that the number of journal articles produced in the European Union is circa one third of the world wide production, it could be extrapolated that the worldwide market for Scientific, Technical and Medical

Publishing will reach circa 1800-2000 Million Ecus by the year 2000. Moreover, institutional subscribers such as libraries, corporations and research institutions represent 80 per cent of the market, while 20 per cent is represented by single individuals such as doctors, researchers, etc. Ulrichs CD-Rom lists circa 143,068 journal titles worldwide, of which 35.4 per cent is produced in the USA, 31.3 per cent in the European Union, 3.8 per cent in Japan, 3.6 per cent in Latin America, 0.9 per cent in South East Asia and 24.9 per cent in the rest of the world (Vouttas and Cetto, 1996). Most of these journals are produced by scientific societies and academic institutions such as universities and research centers. However, there are also a considerable number of commercial publishers that are in the Scientific, Technical and Medical publishing market. The journal subjects in this field vary from agriculture to architecture, to engineering and veterinary and medical science. Swets and Zeitlinger, one of the biggest distributors of research journals in the world, have circa 30 subject categories. [7] Some of the biggest Scientific, Technical and Medical (STM) publishers are Reed-Elsevier, Springer Verlag, International Thompson, Elsevier Science, Longman, Chapman and Hall, the American Chemical Society, Blackwell Science. The Scientific, Technical and Medical Publishing Association represents (httt://www.stm.springer.de/members) 250 individual publishing companies and learned societies in 27 countries around the world. This association is affiliated to, but independent of IPA, the International Publishers Association. Therefore, this number is not really representing the total number of publishers in the academic field, but it gives a good idea of the industry. The

[7] Please refer to the company's URL (http://www.swets.nl/backsets/rpclindx.htm) for more information about the subject categories and a list of publishers in the respective subjects.

main concentration of publishers is in the United States, United Kingdom, Germany and the Netherlands.

There are circa 50-60 Scientific, Technical and Medical publishing members that have a presence on the World Wide Web.[8] Some have started offering electronic journals on Internet. Examples are Elsevier Science that with ScienceDirect has the intention to offer all its 1200 journals on-line and Springer Verlag that through the LINK project will offer all their 400 journals on-line. The Institute of Physics Publishing has also already made all the 33 journals available in electronic form at no extra cost to existing institutional subscribers. Walters Kluwer, specialist in the business and legal publishing currently supply 8% of their product in electronic form (both CD and on-line) and expect that figure to reach 15% by the year 2000 (Collier, 1998). Other companies that are experimenting with Internet-based electronic publishing are Blackwell Science, Munksgaard Publishing, and Sage Publications.

There are circa 700-800 on-line databases world wide in Scientific, Technical and Medical publishing, out of the 8,000 databases worldwide in publishing. Circa 40 per cent of the Scientific, Technical and Medical Publishing databases are bibliographic, circa 29 per cent contain also full text (e.g. Abi-Inform), while 4 per cent only carries images. The vast majority of these databases are in English language (88 per cent), 4 per cent are in French, 3 per cent in German, 2 per cent in Spanish and 3 per cent in other languages. Circa two thirds of these

[8] Please refer to the Internet site (http://www.univ-reims.fr/Labos/SciencesExa/ChimiePhysIndus/stm1.htm) for a comprehensive list of the Scientific, Technical and Medical Publishing members that have a presence on the World Wide Web.

databases are originated in USA and Canada, while circa one third is originated in Europe. The rest is produced in other countries.

As already stated, the advent of the World Wide Web (WWW) is having a big impact on the publishing industry and especially on Scientific, Technical and Medical Publishing. This is because the World Wide Web (WWW) might impact the publishing process itself by allowing many authors and their institutions to publish their research articles and reports directly on the Web. As of 1996 there were several thousand science sites on Internet. The most popular science subjects are engineering (880 sites), computer science (727 sites), medicine (612), biology (509), earth science (473) and physics (469). Most of the sites carry mixed information such as articles, news, references to documents, publicity, announcements, job seeking, call for papers etc. However, much confusion exists about the number of electronic journals. This is mainly due to the definition of electronic journals as often it includes also the tables of content distributed electronically (Mastroddi, 1996). In the next section, some surveys that try to give an idea of the number of electronic journals as well as attempt to segment the market by subject area are presented.

5.4. The market for electronic journals: towards a segmentation by scientific discipline

The market for Scientific, Technical and Medical publishing is very particular. A few journals within each discipline are recognized as being the prestigious journals, and these are in turn heavily used/cited in the discipline. Therefore each journal is a global monopolist in its field and prestige of the journal and

reputation of the editor play an important role in the subscription base of the journal and where authors prefer to submit their articles. The rules of the competitive environment in Scientific, Technical and Medical (STM) publishing are also different than the general discussion on market competition. If the barriers to get research results published become high (as for example long publication time), then researchers will try to get a new journal. In this period, given the wide spread use of the World Wide Web (WWW) for publication and the low cost of publishing on such a medium, the likelihood that the new journal is electronic is becoming higher and higher.

Presently, the two major barriers to efficient information dissemination are high subscription prices and long time lag between the initial submission of an article and its final publication, where the paper-based journals perform the poorest. Therefore, the need not only to create a new journal, but also of re-engineering the whole scientific publication process, by using information technology and especially electronic commerce in all the phases of the process (Bjork, 1996). As a result, in recent years new academic journals that represent a break-away from the former publishing models dominated by societies and societal presses are starting emerging that are electronic only as for example Itcon (http://itcon.fagg.uni-lj-si/). The problem with journal publishing on Internet is that even though it is of economic interest to the universities to publish on the World Wide Web (WWW), the prestige of commercial and societal publishing continues to exert a major influence on where scholars prefer to publish. Therefore there are big personal and cultural barriers for both well known and novice researchers to publish on electronic journals on the World Wide Web (WWW), few of which have been gaining prestige in their respective disciplines. It is important to break these barriers if the

electronic way of information dissemination has to succeed (Bjork, 1996).

However, the number of electronic journals is rapidly increasing since the networking technology and especially the World Wide Web have been used for electronic publishing, even though this number compared to the classical paper version is still very small. This is happening despite unresolved issues in electronic publishing such as responsibility for long term storage of the information in electronic format, pricing models and use restrictions from licensing processes.

There have been few surveys trying to understand the development of peer-reviewed (or at least scholarly) electronic journals. Hitchcock (1997) summarizes these surveys in table 5-1 below. It can be noted that the data of the surveys showed in the table are very different and sometimes very contrasting depending on the authors and year when the survey was conducted. For example, the two surveys of Harter and Kim (1996) and Hitchcook (1996) even though conducted the same year find contrasting results. Harter and Kim (1996) find 131 e-journals, of which 77 peer-reviewed and the rest scholarly, but not peer-reviewed, while Hitchcock find 155 electronic journals in Scientific, Technical and Medical publishing. Problems with comparing the results of these surveys are the criteria used to collect the data, and the definition of e-journal, as this term has been used to describe journals distributed on the web, electronic versions of table of contents and journals distributed on other networks and sold as part of databases. This summary table has been adopted here because one constant parameter in the surveys presented is that they look at peer-reviewed journals that are distributed on a network (even tough often free of charge).

Authors	Data Published	No. of Peer-reviewed e-journals	Criteria
Clement	October 1994	25 (4 on WWW)	Science, universal access, archived
Roes	December 1994	39 (14 on WWW)	Full-text
Hitchcook et al.	January 1996	115 (115 on WWW)	STM, full text
Harter & Kim	May 1996	77	Scholarly, refereed
Goldie	December 1996	508	STM
Hitchcook et al.	October 1997	Ca. 1300 (projected 3200 for 1998/1999)	UK Publishers

Table 5-2: Surveys data on number of electronic journals (Source: Hitchcook, 1997)

Hitchcook (1997) assume that by year 1999, there will be circa 1300 journals on the World Wide Web (WWW). Moreover, even though their survey is limited to UK, since in that number they include the international companies with a subsidiary in U.K., they believe that this number is close to the number of electronic journals published worldwide. The estimation of the number of electronic journals currently existing however represent a research project by itself and therefore the data as projected until 1999 in table 5-1 are accepted in this thesis as giving a good idea of the number of electronic journals worldwide.

Regarding the break down of the e-journals according to the discipline, not much data has been found. A survey conducted by Harter and Kim (1996) is reported here just to give an idea of the trends in electronic publishing in the different disciplines,

since the data themselves are a little outdated. Table 5-3 shows the break down of the e-journals according to the discipline and Table 5-4 shows the distribution of e-journals in the sample of Sciences, Social Sciences and Humanities as of year 1996.

Subject	Number of Ejournals (peer-reviewed)
Education	13
Literature	12
Mathematics	10
Library and Information Science	7
Computer Science	6
Communication	5
Information Technology, Media, and Society	5
Medicine	5
Religious Studies	5

Table 5-3: Subject Categories with the highest number of E-journals (Source: Harter and Kim, 1996)

Broad Subject Category	Number of Ejournals in the sample
Social Sciences	34
Sciences	28
Humanities	31
Professional	31
Could not determine	7

Table 5-4: Distribution of Ejournals in the Sample of Sciences, Social Sciences and Humanities (Source: Harter and Kim, 1996).

Again contrasting results have been found regarding the number of electronic journals in each discipline by Hitchcook (1996) and Harter and Kim (1996). Harter and Kim's (1996) survey finds that most of the journals are in the social science.

Hitchcook's (1996) study shows, instead, that most of the journals are in mathematics with the first math journal appearing in 1993, and that medicine and biology are also well represented in the e-journals with the first journal in this field appearing in 1994. Harter and Kim (1996) found only one e-journal in physics and they explain that this is due to the fact that the majority of the physics articles are in the Los Alamos e-print archive.

Generally Hitchcook (1996) says that it is harder to publish technical articles in electronic versions due to the many mathematical equations and pictures that require higher level of technology sophistication than most of the social science journals. This could confirm the hypothesis that the first journals have appeared in the social sciences and as technologies become more and more sophisticated the number of e-journals in the scientific and technology fields will overtake the number in the social science. Right now, it can only be concluded that new surveys are needed to estimate both the number of electronic journals and the fields in which they are published. Data on electronic journals are in fact a little outdated, limited and very contrasting, further confirming that the research field in electronic publishing is still at the beginning.

5.5. The Scientific, Technical and Medical publishing process

In the traditional publishing process, the following four steps can be distinguished (CEC, 1994b):

1. Origination: preparing the material for publication, including any necessary refereeing approval process.

2. Processing: the transformation of the material to a form suitable for widespread dissemination, usually involving text composition or other forms of re-keyboarding.
3. Dissemination: the distribution process itself. In the traditional, print-on-paper technology, distribution means the printing or reproduction of the text in a journal or as an issue in a report series, or book, and its physical transmission to a point at which it becomes accessible to potential users.
4. Indexing: the process of abstracting, cataloguing, and indexing for inclusion in a secondary publication, designed as a retrieval tool to help the user to become aware of the publications relevant to his particular problem. Most of these information is now on databases, located either on CD-ROM or available for real-time interactive interrogation using computer networks.

A traditional flow chart of the publishing process, in many ways similar to the activity flow of many other industries, is showed in fig. 5-1 below:

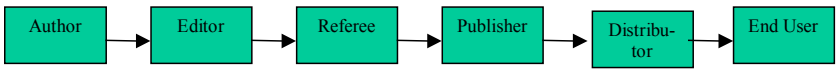

Fig 5-1: The value chain of the publishing industry

5.6. Actors and activities of Scientific, Technical and Medical publishing

Before analyzing how Internet technologies are affecting this industry (see chapter 7), we need to explain who are the actors involved in the production and distribution of a research journal and their activities. The journal publishing market can be explained in terms of the type of customers:

1. Individuals that being affiliated with some association get the journal for free.
2. Individuals that are regular subscribers to the journals.
3. Institutions: these include both public and corporate libraries and other types of institutions.

Fig. 5-2 below is based on an interview with the publishing director of a big international Scientific, Technical and Medical (STM) publishing company and shows the journal flow from the journal submission by the author to delivery to customers either by online services or by normal mail. The following is a brief description of each actor involved in the production and distribution of a journal.

The suppliers: The author can be envisioned as the supplier of the raw material information that will be refined and made ready to the customer in the pipeline of the publishing process. The author is the real producer of the information or product and usually is part of a research institution. All publishers have to find authors. In the case of the scholarly journals what is different is that often there is a substantial overlap between the author community and the reader community.

The editor and editorial board: has the responsibility to check the quality of the article and sends it to the referee. There can be senior and junior editors, associate editors and assistants. The main editor is an authority in the subject of the journal, has contacts with the people working in the field, and has an extensive knowledge of the subject. Usually the editor will be involved in discussion of editorial policy. Moreover, the role of the editor varies from involving all the responsibility for all the refereeing procedures and the flow of copy and proofs between authors, editors and printers to the extreme where the editor just

gives occasional suggestions. Often they get paid, even though this honorary would usually be less then consulting fees.

The reviewers: most reputable learned journals send any paper to be considered for publication to referees. The article is first screened by the editor in person to make sure that it is within the scope of the journal. The referees' reports are given in confidence, but some referees are willing to work with authors in order to get a better version of their papers. Usually referees or reviewers are not paid and it is difficult to find them because they can be overburdened with papers. In the traditional system the reviewing process is usually regarded too slow, cumbersome and open to abuse, even though the willingness of academics and research workers to continue to referee articles without payment suggests that they regard the system as valuable (Page, 1987). Usually the referees give comments and recommendations to a paper while the editor is the last one that make the decision about acceptance and rejection of the article.

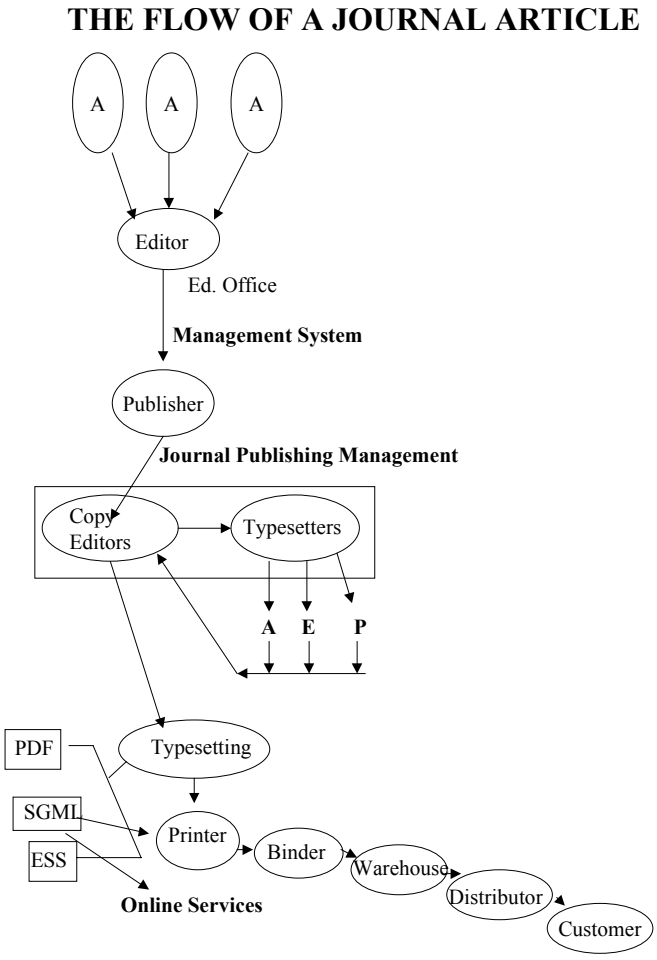

Fig. 5-2: The journal flow from author submission to delivery to customers

The publisher: transforms the different articles into a specific format and creates and distributes the journal. During this process the publisher has to do numerous functions, such as copy editing, typesetting, printing and binding. These functions can be done in house or outsourced. Usually they are outsourced, but there are some that do it in house.

- Copy editing: this is an important function and commonly it is done by the publisher either in the publisher's production department or by using freelance copyeditors. Sometime it is done at the journal's editorial office. If copy editing is done within the publishing house there is of course more control. The copy editor's task is to ensure that the material going to the printer is clear, consistent, unambiguous and well organized and to make it easy for the reader to follow and understand while changing as little as possible of the author's text. This of course requires some acquaintance with the subject matter. Copy editing's task include checking the illustrations to make sure that they are mentioned in the text and not missing, references checking for consistency in the text, foot and endnotes, etc.
- Typesetting: many publishers have their own typesetting department, while others outsource this function to specialist typesetters who produce the proofs, make corrections and make up the pages, but then send the final image on film to a printer. Typesetting costs constitute a large part of the total cost of production and offer most scope for savings. Nowadays there are a number of software packages that have contributed to decrease typesetting costs. Page Maker and Frame are some of them.
- Printing: the printing department can also be part of a publishing house, but very often it is outsourced. Printing is

also an area where many technological changes are taking place. In the last two decades lithography has become the dominant printing process. The printers have the function of making the printed version of the journal. Sometimes the printers also provide the paper and charge the publisher for that. Other times the publisher buys the paper from a paper supplier who charges also for warehousing costs.

- Binding: this is the function of making the collection of printed pages into a journal. Most printers offer limp-binding facilities, but not all can provide for binding, therefore it is often necessary to send the journal to the bindery as an extra step in the production process. Some binders have the extra facility to dispatch the journal directly to the subscribers, while other send the journal to the publisher who then stores it in the warehouse ready to be distributed to the subscribers.

The distributors: are physical carriers such as Royal Mail, Normal Mail, etc. which use surface or air mail. The distribution costs are usually fairly high. This is also due to the fact that before sending a journal by mail it is also important to package it to avoid damage during the delivery. Many publishers now use plastic film wrapping. Also the distribution function, as any other function in the publishing business can be done in house or can be subcontracted. There are a number of organizations specializing in the distribution of journals and handling subscriptions. It is important not to isolate distribution from other aspects of journal publishing. Accounts, editorial and production departments will need regular reports of the numbers of subscribers and will want to know who these subscribers are.

Subscription agents: are intermediary organizations that have an important role in selling the journals. They do not appear in the picture because they do not contribute to the physical distribution of the journals, however they are very important

intermediaries in the sale and marketing process. The agents have a role that is difficult to be taken over by each single publisher. In fact a typical library, whether corporate, public or university library, has something between 300 and 20,000 journal subscriptions coming from several hundred publishers in 25 or more countries. It takes time to track them down, deal with different currencies and a multitude of invoices, or learn the differences in trade practices between publishers. The agent collects and collates information on existing and new journals, particularly changes of price, title, frequency, publishers. The agent will search for information on particular titles, and often produces a comprehensive catalog of journals with current prices for library use. The agent collates orders by publisher and sends payments in the appropriate currency. The agent informs the publisher of changes of address and acts as a buffer for claims and queries. The library can then have just one invoice for the bulk of their subscriptions, in their own currency, regardless of where the publishers are based (Page, 1987). The agent is paid for his service by a discount from the publisher, which is usually around 5% of the list price (see for example Munksgaard Publishing list price), by a service charge to the library or by a combination of both.

5.7. Conclusions

This chapter has given an overview of the publishing industry with special attention to the Scientific, Technical and Medical (STM) publishing sector. It has been argued that this sector is interesting because the academic publishers are obliged to enter electronic publishing due to many factors: the reviewing system is at present too slow, the paper and distribution costs are becoming too high, the labor cost too expensive. Moreover, this sector is also interesting because there are a few companies that

are starting to sell and deliver their products on the Internet. The actors involved in the production and distribution of the journal have also been described, and in chapter 7 it is showed how some of them might be affected by the changing industry dynamics caused by the advent of electronic commerce.

CHAPTER 6: The Virtual Value Chain and a Business Value Model of Electronic Commerce

This chapter presents the concept of the virtual value chain and Bloch (1996) model of business value of electronic commerce. These models are important because they show that the structures of industries and value chains can change as a result of the assimilation of electronic commerce. The concept of the virtual value chain shows how information technology (IT) can transform the value chain from the marketplace to the marketspace. Bloch's (1996) model of business value of electronic commerce can be divided into two parts. The first part presents some sources of business value of consumer oriented electronic commerce to a corporation. The second part shows how electronic commerce can affect the five forces of competitive advantage of Porter's (1980) framework and the three generic strategies of focus, differentiation and cost thus showing how electronic commerce can change industry structure. The second part of this model is the basis of the industry analysis of Scientific, Technical and Medical Publishing conducted in chapter 8. The virtual value chain concept and the first part of Bloch (1996) model are basic to chapter 9 and chapter 10.

6.1. The concept of the virtual value chain

Internet and electronic commerce can be used to move stages of value chains (Zwass, 1996) and digital products from the marketplace to the marketspace. Rayport and Sviokla (1994) say

that the transactions of the marketspace are different from the ones of the marketplace in that:

- The content of the transaction is different because information about a product replaces the product itself.
- The context in which the transaction occurs is different because an electronic on-screen interaction replaces a face-to-face interaction at the physical location where the transaction otherwise would take place.
- The infrastructure that enables the transaction is different because computers and communication lines replace the physical locations such as the stores.

For example, the research journal is an aggregated collection of content such as the research articles and other editorial information; context such as the specific format, the editorial style, the way it is organized; and the infrastructure which includes the printing plant and physical distribution systems as for example normal mail systems.

Examples of physical products that are transformed for the marketspace thus becoming digital products are the Japanese car auction, that has been transferred on communication lines through a system that is called AUCNET, and the answering machine, that becomes a digital service when the local phone company offers electronic answering services. Other examples are the services offered by a bank in the marketplace when they are offered in the online version, and software, academic journals and books. These companies operate in two worlds, the physical and the digital and often manage two value chains, the physical and the virtual.

The virtual value chain is, like the physical one, a set of activities that are part of a value adding process that this time takes place in the online world instead of the marketplace. And if information and communication technologies (ICTs) were only support activities in the physical value chain, they become very important in the virtual value chain (VVC). The virtual value chain (VVC) usually is a mirror image and is parallel to the physical value chain (PVC). According to Rayport and Sviokla (1995), the virtual value chain (VVC) can be created by going through a three-stage process:

Visibility: this simply means the deployment of information technology (IT) as a supporting technology to perform different activities of the physical value chain (PVC). The information collected by information technology systems on the different steps of the value chain can help managers to plan, execute, and evaluate results with greater precision and speed, allowing them to see their operations more effectively through the information world.

Mirroring capability: when companies have reached the visibility necessary to understand how to leverage the information technology (IT) infrastructure to add value in the market place, they can begin to explore the marketspace, by implementing some or all of the activities of the physical value chain (PVC) also in the marketspace.

New customer relationships: the virtual value chain can be used and explored to establish new relationships with the customers, to try to understand and fulfill the needs and desires of the customers. This can be done possibly at a lower cost in the virtual world than the physical world.

An example of a corporation that operates both in the physical and virtual world is Oracle, which distributes some of their software packages both on the web and on the marketplace. In the publishing industry, Springer Verlag, Elsevier Science and many more are starting offering the physical product and the corresponding virtual product in the marketspace.

In chapter 10 it is shown how the business processes constituting the activities of the physical value chain (PVC) can be transformed in the marketspace to form the virtual business processes of Scientific, Technical and Medical publishing. However, much of the discussion in chapter 10 can have a more general character, as activities such as marketing, sales and customer support are in reality independent on the specific industry or product in question.

6.2. The sources of business value of electronic commerce

In this section it is shown how the technologies underlying electronic commerce such as the Internet, briefly called here with the term of electronic commerce, can give some value to the corporation, affect industry structures and be a source of competitive advantage. To do this, a model developed by Bloch (1996) is presented. This model shows that electronic commerce can be a source of business value to a corporation, can affect the five forces of competitive advantage of Porter (1980) model, and impact also the three generic strategies of cost, differentiation and focus. Bloch (1996) model has been chosen here because it deals with consumer-oriented electronic commerce as a technological innovation that has an impact on the dynamics of an industry, which is the main subject of the thesis.

6.2.1 A business value model of electronic commerce

What is the business value of electronic commerce to a corporation? Since the introduction of information technologies in the organization many studies have been conducted to measure the business value of information technology (IT) to corporations. The empirical results are often contradictory and very different. They generally show that productivity gains are small or inexistent hence the widely debated technology paradox. However, many believe that the effects of information technology (IT) should be looked upon from a competitive advantage point of view (Porter and Miller, 1985; Benjamin and Wigand, 1995).

The same is happening for corporations trying to conduct business on Internet. Many companies do not see the return on investment (ROI) necessary to justify the costs of engaging into this type of commerce. Many are skeptical of the value of e-commerce for a company and often Internet is described as the gold rush of the 1800's and e-commerce as a fad. Moreover, it is often said that the drivers of electronic commerce are only technological under the pressure of innovations in the telecommunication, computing and software industry. However, the business drivers are also an important component of the spreading of electronic commerce (Pedersen, 1996b; Bloch, 1996).

Bloch (1996) develops a business value framework that shows the value of electronic commerce for commercial organizations dealing with end customers. This framework identifies ten components of the business value of e-commerce for

corporations, summarized in table 6-1 and further elaborated in propositions 1-10. We have to notice that while these propositions identify some sources of business value to the corporation they do not identify or mention changes that should take place in the business processes of a corporation. In order to do so, a general framework of business value of electronic commerce, called the business value complementarity framework is developed in this thesis in chapter 9.

The Organization Source of Business Value from Electronic Commerce	
Improve it	Product promotion New sales channel Direct Savings Time to Market Customer Service Brand Image
Transform it	Technological and organizational learning Customer relations
Redefine it	New Product Capabilities New Business Models

Table 6-1: The components of the business value of electronic commerce (Source: Bloch, 1996)

The following are ten propositions that describe what can be the sources of business value of consumer-oriented electronic commerce to a corporation. The main message of these propositions is that electronic commerce can contribute to the business value of a corporation by increasing its competitive advantage. This can be achieved by improving the business processes through, for example, Internet-based product

promotion, on-line customer service, new sales channels. Furthermore, this can be done 1) by transforming the organization through the acquisition of new technologies (Internet systems) and consequent organizational learning in the assimilation phase; 2) by redefining the business models or creating new ones mainly through the introduction of new products or new product capabilities. Bloch (1996) states in proposition 1 that

Proposition 1: Through a direct, information-rich and interactive contact with customers, electronic commerce can enhance the promotion of products.

The advantages of electronic commerce for enhancing the promotion of products are mainly in the possibility of delivering information at anytime and anywhere, and allowing for customer interactivity and customization of the information content to the user profile. This is a direct consequence of micro-marketing or one-to-one marketing (Hoffman and Novak, 1996). This can be done with techniques such as profile matching and push technology. Hewlett Packard is an example of a corporation that uses customization and push technology. The "reference guide to buying a printer" is, in fact, a buying guide that can be customized to the customer needs such as price range, color etc. In the service sector, Bank of America allows the customization of its home page so that the customer can choose all the services he is interested in and bundle them together. Other examples are the LINK system of Springer Verlag and Science Direct of Elsevier Science (See chapter 7). Barriers to Internet becoming a diffused marketing channel are the infrastructure costs such as PC, modem, Internet connection, as well the cultural barriers of shopping electronically. Proposition 2 states that

Proposition 2: *Thanks to their direct reach to customers and their bi-directional nature in communicating information, electronic commerce systems represent a new sales channel for existing products.*

These products can then be divided into physical products and digital products. Physical products such as computer hardware and wine can be sold over Internet, but delivered only through conventional transportation means such as plane or trains. Examples of companies that are starting selling physical products through a home page on the Web are ISO, a supermarket based in Denmark (http://www.iso.com), Munksgaard Publishing bookstore, Amazon.com (the last two deliver the book in paper format to the costumer's address by conventional distribution channels). Digital or information products such as newspapers, research journals and software can be both sold and delivered instantaneously on the Internet. Examples of companies that are selling and delivering digital products on Internet are software.net that sells and delivers a software package instantaneously, and Elsevier's electronic journals division. In the service sector, telecommunication companies or brokers are starting to charge a fee for transactions such as selling an airline ticket on-line or charging to link to a service provider. Barriers to the diffusion of on-line selling are reliable and secure network payment systems, micropayments and cultural barriers. Proposition 3 states that

Proposition 3: *By using a public shared infrastructure such as the Internet and digitally transmitting and reusing information, electronic commerce systems can lower the cost of delivering information to customers.*

That is, by using a public infrastructure such as Internet for electronic commerce, corporations can achieve cost savings (in

comparison with the relative channels in the marketplace) in many activities involving the delivery of information to the customer such as packaging, distribution and customer service. This is very important especially in service industries such as telecommunication and banking, where the cost of customer support usually exceeds the product cost. For example, Sun Microsystems' online support service has saved the company over $4 million (Bloch, 1996). In publishing, warehousing, printing, binding and distribution costs can be eliminated with on-line delivery. The most important barrier to the diffusion of on-line distribution is the electro-copying problem for transmission of software or other digital products over a public infrastructure (see section 4.3.1). Proposition 4 argues that Internet contributes to a reduction of the total time required to get a product from production into the hands of the customer by saying that

Proposition 4: *Due to their instantaneous nature, electronic commerce systems allow a reduction of the cycle time associated with producing and delivering information and services.*

In some markets as for example the information or the financial market the capability of distributing a product as soon it is created might be extremely important and in these industries much value can be added by e-commerce. This is also true in Scientific, Technical and Medical (STM) publishing, where it is very important to get new research results published as soon possible. In this sector the cycle time can be reduced by several weeks if online systems are used (Page, 1998). Proposition 5 states that

Proposition 5: *Through intelligence built into systems and the extended availability of intelligent support systems, electronic commerce systems can enhance customer service.*

Customer support is a function where e-commerce could provide big benefits both to the company and to customer. There are already some companies or banks that are using Internet to provide on-line customer support. For example Wells Fargo and the Security First Network Bank are two examples of banks that offer on-line statements and answer e-mail on the account status. Other examples of companies that already have reengineered their customer support function for electronic commerce are Marshall Industries (El Sawy 1998) and Storage Dimensions (El Sawy & Bowies, 1997). Springer Verlag also has an online customer support together with a traditionally telephone-based one. Proposition 6 says that

Proposition 6: *Electronic commerce systems will become one of the components of a brand or corporate image, especially while targeting technology-friendly customer segments.*

This is still hard to prove, but many companies in industries where the corporate image is very important might use the web as a way to improve their image. In fact having an Internet address is becoming fashionable and indispensable for many companies. On the other hand, it is obvious that also in the marketspace, companies that have a strong image in the marketplace will dominate. In proposition 7 Bloch (1996) argues that

Proposition 7: *Rapid progress in the area of electronic commerce will force companies to adapt quickly and offer them an opportunity to experiment with new products, services and processes.*

These new technologies require new organizational models. For instance, the structure of the department dealing with electronic

commerce might have to be different from the structure typically used in the organization or new processes might have to be developed to deal with the authorization of publishing corporate information on the Internet. This type of corporate change needs to be planned and managed and organizations might have to try different models until they find the one that best fit them. It is in this normative context of how to best organize for electronic commerce that the fourth part of the thesis should be positioned. The purpose of this last part is in fact to develop a model that should give some suggestions for optimizing the business value of electronic commerce to a corporation. Proposition 8 states that another source of business value of Internet systems is that they allow for collection of information about customers that can be used to gain a competitive advantage:

Proposition 8: *Electronic commerce systems will allow for more personalized relationships between suppliers and their customers, due to their ability to collect information on customer needs and behavioral patterns.*

With the paradigm shift from mass production to mass customization and with the advent of the Web possibly to custom mass production (Elofson and Robinson, 1998) it is important that organizations understand and respond to the customer's needs and wants instead of just making and selling products. Internet and related technologies help recording information about a customer such as customer inquiries about a product, buying a product, etc. This information should help to better understand the customer's preferences and eventually alert them about arrivals of products of interest to them with the use of techniques such as push technology and profile matching. For example, Amazon.com, an online bookstore, through the use of intelligent software agents keeps the customer updated on new arrivals about the subject he/she is interested in. Springer Verlag

on-line service called LINK, includes a customer profile service, LINK Alert, that sends users information on new publications according to personal needs or upon request. Users provide a profile of their personal interests and receive an e-mail as soon as a corresponding publication appears. An important problem associated with the collection of such customer information is the ethical issues of respect of the individual privacy. Proposition 9 says that

Proposition 9: *The information-based nature of electronic commerce processes allows for new products to be created or existing products to be customized in innovative ways.*

Electronic commerce could add value in the manufacturing of the products themselves in addition to the marketing, distribution and customer support. This can happen by implementing mass customization to the extent where the customer could draw its own product. For example, Motorola is able to gather information about the pager from a client (such as color, features, form etc.), send it to the manufacturing plant, manufacture the specific model and then send it by overnight mail to the customer. In electronic publishing, the customer could create his own magazine by selecting the specific articles to be included in one issue, as presently done by the Harvard Business Press. The last proposition of the business value of consumer based electronic commerce says that

Proposition 10: *Changing industry structures and electronic commerce systems allow for new business models, based on the wide availability of information and its direct distribution to end-customers.*

Among the new business models, the most important ones might be the new electronic-only intermediaries that could form

around the electronic commerce business (Pedersen, 1997; Wigand, 1997). However, electronic commerce could also lead to a disintermediation effect as electronic commerce might directly connect the buyer and the seller. Idea Market (that was based in Austin, Texas) is an example of a fully electronic intermediary that tried to start an on-line business selling information on the Internet only. Their plan was to have a huge on-line library and to sell the product by the paragraph, page, full article, etc. Even though Idea Market was founded by a very experienced team in the information market and was backed up by Bill Gross, the founder of Idealab (Useem, 1997), the company went bankrupt even before the business officially took off. This example of lack of success shows how difficult it is to be an on-line intermediary in the publishing business. OVID Technology is an example of success, an Internet based electronic intermediary that contracts with the publishing companies to sell and distribute electronic only versions of articles and journals to institutions and single individuals.

6.2.2 The impact of electronic commerce on the five forces of competitive advantage

In this section we would like to show how electronic commerce technologies as an instance of technological innovations could impact the three generic strategies and the five competitive forces of Porter's (1980) model thus affecting the structure and dynamics of an industry.

6.2.2.1 Effect of electronic commerce on competitive strategy

This section summarizes three propositions describing how electronic commerce systems could have an effect on a company strategy and therefore affect the competitive advantage.

Proposition A1 states that electronic commerce systems on Internet or similar systems

Proposition A1: *offer a cost advantage through less expensive product promotion, cheaper distribution channels and direct savings.*

This proposition states that Internet can contribute to the strategy of being the low cost producer in an industry by providing for cheaper product promotion and cheaper distribution in comparison to traditional channels. Moreover, this proposition emphasizes how the Internet allows small companies to act in the same way as much larger ones by using a ”free” or very low cost infrastructure to promote their products on a global basis. The World Wide Web (WWW) therefore can be seen as a great equalizer, replacing an often costly distribution network by a public or widely shared infrastructure. For the publishing industry this implies that big established publishers could be threaten by small, new entrepreneurs that just establish a presence on the Internet and contract for example directly with editors to publish the material directly on-line. Proposition A2 focuses on how electronic commerce systems can contribute to the differentiation strategy of a corporation and states that electronic commerce

Proposition A2: *helps a company to differentiate itself not only through price but through product innovation, time to market and customer service.*

This proposition states that Internet can help a company differentiating not only by decreasing costs and therefore potentially being able to lower the prices, but also by offering the possibility to differentiate through the introduction of new digital products (based on Internet) and new on-line customer

service. However, the problem of price differentiation will exist in the marketspace as it has existed in the marketplace. For example a company that offers more on-line information about a product and offer a better on-line customer support on the web has a more advanced and therefore more expensive system. It should be expected that their prices are higher then companies offering a lower service level, as it happens already in the marketplace. Finally, proposition A3 describes how electronic commerce can contribute to the implementation of the focus strategy, by saying that Internet

Proposition A3: *Allows for customer focus strategies through better customer relationships.*

The idea is that electronic commerce helps focusing on a specific set of customers and delivering the best service to them. Electronic commerce enables the implementation of a focus strategy for a larger number of specific segments by using information technology for personalized service and mass-customization of products (mainly digital products) on a larger scale.

6.2.2.2 Effect of electronic commerce on new entrants and substitute products.

This section describes how electronic commerce could have an impact on the new entrants into an industry and on the creation of substitute products. Bloch (1996) argues that Internet facilitates the entrance into some industries of new players given the relatively low capital requirements for starting distributing digital products on electronic commerce systems. Proposition B1 states that electronic commerce systems on the Internet (or similar systems)

Proposition B1: *allow easier entry into traditionally hard to access markets, due to less expensive product promotion, new sales channels and reduced capital requirements.*

For example in Scientific, Technical and Medical (STM) publishing, a new entrant in the marketspace needs just a contract with the editor, an Internet connection and a sophisticated hardware and software system in order to sell the journals on the Internet. In the marketplace it is instead necessary to explicate a lot of functions such as binding, printing, physical distribution that either have to be done in house or outsourced and in any case implies higher coordination and higher costs than in the marketspace. Proposition B2 focuses on the effect of electronic commerce on entry barriers and states that Internet

Proposition B2: *Allows the raising of entry barriers in some markets through extensive customer learning (which makes switching more expensive), product differentiation and experience.*

This implies that a company that has experience in e-commerce for some time will gain a competitive advantage due to the experience acquired in this field as early adopter of the technology. Moreover, the company can also gain a competitive advantage through the market research data collected on-line about what are the customer needs and wants, on the basis of which it can offer better and more differentiated products (see section 10.7.5.2). Finally proposition B3 states that electronic commerce

Proposition B3: *Facilitates the introduction of substitute products in a market due to product innovation.*

Electronic commerce systems, as proposition 6 suggest will allow the introduction of many innovative substitute products and will help to build a brand name in them. For example, the electronic journal will be a substitute for the paper journal, selling on-line airlines tickets will be a substitute service for the ones presently offered by the traditional travel agencies, etc.

6.2.2.3 Electronic commerce and Intermediation

This section describes how electronic commerce can have an impact on the value system of an industry by giving rise to intermediation and disintermediation. Regarding this, Bloch (1996) in proposition C1 states that using electronic commerce systems on the Internet or (similar systems)

Proposition C1: *Makes it easier to suppress an intermediary in a distribution network, due to direct customer contact and the use of a publicly shared infrastructure*

The Internet can directly connect the buyer and the seller thus giving rise to a disintermediating effect. This can be more easily done if the network costs are not high as it is the case for Internet. The hypothesis of intermediation and disintermediation as a consequence of electronic commerce has been discussed by many authors (Pedersen, 1997; Benjamin and Wigand, 1995; Sarkar, 1995). Disintermediation means that many functions done in the marketplace by some intermediaries as for example the binders, the printers and the subscription agents in the case of Scientific, Technical and Medical (STM) publishing can be suppressed. This can happen by connecting the producer to the consumer directly. The publisher could, for example, sell the electronic journals directly to the customers whether these are institutions or individuals. In reality it is likely that such

functions cannot be supplanted completely, therefore new forms of intermediaries, this time based on Internet, will emerge thus giving rise to an electronic intermediation effect (Sarkar, 1995). Proposition C2 says that Internet

Proposition C2: *Makes it easier to become a new intermediary in an industry, by providing an added-value service through information management, such as integrators or re-packagers of more basic services.*

This is the electronic intermediation effect. Often electronic intermediation will occur because, as stated in the explanation of proposition C1, the direct connection between the supplier and the buyer are not always the optimum due to many reasons, often preferring to have an intermediary that does the search. This is mainly due to information overload, and the consequent increase in the cost and the time required to access multiple sites and to analyze them for quality and relevancy. The customer is looking at a total solution, while the suppliers are often specialized in their own area. Finally, customers often need a trusted third party to provide them with information about the reputation of a particular supplier. The last proposition, C3, regarding the structure of the value system of an industry that could change as a result of the adoption or assimilation of Internet states that electronic commerce systems

Proposition C3: *Make it possible to catch up with competitors thanks to the maturity of some technologies and learning experiences and are critical in not losing ground as market dynamics shift.*

This is a little in contradiction with the fact that technology can raise the entry barriers, but if this is true at the beginning, with time as technologies mature they become cheaper and therefore

other companies, the followers, might technologically be able to catch up. The question whether this is enough to suppress the competitive advantage of the early adopters is though still present and very likely it means that the early adopters have to continue innovating in order to keep their competitive superiority (Bloch, 1996).

6.3. Conclusions

This chapter has introduced the concept of the virtual value chain and a model of business value of electronic commerce. This model shows how Internet-based consumer oriented electronic commerce can be a source of value to a corporation and can affect the five forces of competitive advantage. Moreover, it also briefly shows how electronic commerce can support the three strategies of focus, differentiation and cost. The model introduces two more factors that are a consequence of electronic commerce: disintermediation and electronic intermediation. The second part of this model will be used to show how electronic commerce is impacting the five forces of competitive advantage in the Scientific, Technical and Medical Publishing industry (See chapter 7). The first part of this model (the sources of business value of electronic commerce) will be the starting point of chapter 9. In this chapter it is argued that in order for electronic commerce to be of any value to a corporation, complementarities have to be explored between different factors when entering the electronic business.

CHAPTER 7: The Impact of Electronic Commerce on the Industrial Structure of Scientific, Technical and Medical Publishing

This chapter is the last one of the assimilation part of the thesis. It shows that electronic commerce is changing the structure of Scientific, Technical and Medical (STM) publishing. The analysis is structured mainly around the forces of new entrants, new substitute products with consequent intermediation and disintermediation and bargaining power of suppliers and buyers. The analysis shows how the advent of electronic commerce is giving rise to electronic journals as substitutes for the paper version of the scientific journal, how new entrants into the academic journal market can threaten the traditional publisher, and how new electronic intermediaries can be a threat both to the traditional publisher and to the subscription agents.

The analysis concludes that both the publishers and the subscription agents are reengineering for electronic commerce to survive the threat of new electronic-based intermediaries. Elsevier Science and Springer Verlag are given as examples of publishers that are early adopters of electronic commerce, while Ovid Technologies is given as an example of an electronic intermediary. In this analysis the point of view of the publisher is taken, even though the subscription agent is also considered in the section on intermediation and disintermediation. The main reason for this choice is that the publisher coordinates the core activities of journal publishing, the way this process is presently taking place for most learned journals.

7.1. New entrants

As already stated, in this chapter the second part of Bloch's (1996) model and Porter's (1980) model of the five forces of competitive advantage are used as basis of the analysis (See section 6.2.2 and section 3.6). Therefore I now analyze how electronic commerce as a particular type of technological innovation is affecting the forces of new entrants, suppliers, buyers, substitute products in the specific sector of Science, Technology ad Medical publishing, thus showing that this industry is changing as a result of electronic commerce. We start by analyzing how electronic commerce can have an impact on new entrants.

Proposition B1 of Bloch (1996) states that electronic commerce make entry into hard to access markets easier due to reduced capital requirements and new sales channels. In Science, Technology ad Medical publishing some of the new entrants facilitated by the low capital requirements are (Okerson, 1997):

1. Innovative researchers and scholars: in this category are included the editors of the few referred or lightly referred electronic only journals that currently exist or are planned. They are editors of publications such as The Electronic Journal of Communication (University of Windsor), Ejournal (Suny Albany), the Journal of International Academy of Hospitality Research (Virginia Tech), the Journal of Reproductive Toxicology, and The Public Access Computer System Review (University of Houston Libraries). Presently editors of electronic journals are academics who spend a great deal of time being reviewers and referees, editors, publishers, advocates, marketers. However, it is unclear whether these activities, which are the path to tenure

and grants in the paper medium, will bring similar rewards in the electronic medium given the high cultural barriers that often prevent researchers from submitting their work to electronic-only journals (see section 5.4.2). However, in the long run external economic conditions may push scholars to start networked electronic journals instead of paper ones especially if serial prices continue to increase as in the past and substantial cost savings can be realized if the new start-up journal is electronically distributed on networks.

2. University-based electronic publishing: nowadays the Universities publish at most about 15% of their faculty's output. This includes discussion papers and periodicals coming from individual academic departments as well as formalized university outlets like university presses and publication offices (Bailey, 1994). However, even though a vision of university based electronic networked publishing is often expressed by many librarians and other members of the university community in order to regain control over distribution of its own intellectual output there are only few university electronic journal publishing activities, and they are mainly in the field of preprints. For example, the Stanford Linear accelerator has supported a preprint database in high-energy physics for about fifteen years that can instantaneously be distributed over telecommunication networks. Another major initiative is the IMP (Instant Math Preprint). This project consists in maintaining a database of abstracts on a network computer in a major university. The authors will submit the articles to their local computer center simultaneously, where they will be stored on a network computer. After searching the abstract database, users will be able to retrieve desired article files from host computers via anonymous FTP. At the moment it is proposed to extend the project to about ten key research universities. The

abstracts will also be searchable on ”e-math”, the American Mathematical Society’s member service. It is very likely that especially in scientific fields such as mathematics and physics the university-based electronic publishing will flourish substantially.

3. Computer conferences as electronic journals. Many scholars and librarians begin to take seriously the scholarly computer conferences (known as ”lists”) available through the various networks such as BITNET and Internet. More and more academics view it as a new kind of journal. Some of the benefits are: (1) accessing a wealth of informal information; (2) linking to colleagues and growing ideas quickly with a variety of input and critique; (3) sharing ideas all over the world in a matter of minutes; (4) finding new colleagues and learning who is pursuing the same interests in another discipline. This new method of communication has the potential to transform scholarly writing and publishing far more dramatically than the motivation to unbundle journals, publish quickly, or even reduce subscription costs (Okerson, 1997). The role of the journal and present reviewing system has also been the subject of a discussion in ISWorld list in the spring 1999 questioning whether the present system is at all necessary.

4. New electronic intermediaries. These are new organizations that distribute the journal electronically only such as Idea Market, or OVID Technologies. These organizations could directly contract with the editors to get the journals for on-line only publication. These new entrants are facilitated by diminishing costs of technology and the learning curve by early adopters as well as by the low capital requirements to make an electronic version of a journal (as also proposition 3 and 7 in the business value of e-commerce in chapter 6

suggest). In fact, even though Internet should be commercialized in the future, its communication costs should be as cheap as long distance calls and faxes (Okerson, 1997). The cost factor is important as also editors or libraries have the necessary inputs and means to create and distribute an e-journal.

7.2. Substitute products

Proposition B3 of Bloch (1996) model states that electronic commerce facilitates the introduction of substitute products because it offers many possibilities for product innovation. This is really the case in the Scientific, Technical and Medical publishing as electronic commerce can give rise to many substitute products for the paper version of the academic journal, among which the electronic journal and the computer conferences (known as lists). Substitution is the process by which one product or service supplants another in performing a particular function or functions for a buyer. Substitution plays a prominent role in determining industry and firm's demand. Penetration against substitutes is a major reason why industries and firms grow and the emergence of substitutes is a major reason why they decline (Porter, 1980).

There are different levels and forms of substitution. The simplest one is when one product performs the same function as another product in the same buyer value activity. In the more complex levels, the substitute performs a wider or narrower range of functions than an industry's product. As already said, in the Scientific, Technical and Medical (STM) publishing sector, the main substitutes for the paper journal are the electronic version of the journal and the mailing lists described above.

These substitutes have many characteristics that add value to the old paper versions of the scholarly journal, among which are:

- The possibility through the hypertext function to instantaneously make a link to references or other literature (thing that did not exist in the paper version).
- The possibility of quickly searching, with a search engine, for a specific article, author etc. in a database.
- The possibility of customization in the sense of delivering and selling just one article, one section, etc. without the customer having to buy the whole issue.
- The immediate delivery of the product over an electronic network without having to rely on the physical distribution system.

The substitution threat is also a function of the relative value/price of a substitute compared to an industry's product, the cost of switching to the substitute and the buyer's propensity to switch.

If the price that can be charged for the electronic version can be substantially less than that charged for the paper version then people would have the tendency to switch to the electronic version. This of course should be the case given the fact that there are no warehousing, binding, printing and distribution costs for the electronic version. In reality right now, the price of the electronic-only version is substantially higher then the price for the paper version, while the electronic version as an add-on to the paper version implies an increase in price of about 30% respect to the paper version only (see the price catalogs of Munksgaard International Publishing, 1998). This means that publishers are very conservative and prefer to keep the status

quo as long as possible by discouraging the electronic-only versions of the journals.

Switching costs could also make a difference in the adoption rate of the electronic journal. In fact, if for an individual to get a paper version all what is required is to subscribe to the journal, for the electronic version it is necessary to have a computer, a modem, a printer, access to Internet and the database where the journal is stored (See Munksgaard International Publishing Price Catalog, 1998). This might not be a problem for big corporate customers or institutions, but it could be a problem for single individuals. An increase in the single individual propensity to switch to a substitute can be foreseen, though, in light of the demographic trends such as increased PC literacy of youth, rising electronic media literacy and competency of users (See section 5.3) as well as in the nature of the Scientific, Technical and Medical (STM) publishing market itself which is mainly made of highly literate, specialized people usually using computers and networks as daily breads.

7.3. Bargaining power of suppliers and entry barriers

Proposition B2 of Bloch's (1996) model states that electronic commerce allows to raise entry barriers in some markets through extensive customer learning, product differentiation and expertise. Regarding the Scientific, Technical and Medical publishing sector it is hard to foresee what will really happen when the electronic journal will take off. It could be argued that the product differentiation capability offered by electronic commerce could give a first mover advantage thus raising entry barriers. However, we can say that bargaining power of suppliers and entry barriers are not as important as new entrants,

substitute products or the issues of intermediation and disintermediation. The suppliers to the publishers are, in fact, the authors who through the ”filtering” channel of the editorial and refereeing process are the real suppliers of the raw material. The power of these suppliers is very low in Scientific, Technical and Medical (STM) publishing since the author usually writes the article for reputation, personal advancement, or carrier purposes. Actually authors might even sometimes pay a fee to contribute to the publisher’s expenses for publishing their articles (Page, 1997). Obviously there is the threat of forward integration as the universities or the editors could potentially start publishing the material themselves in electronic formats (Line, 1995). Moreover, the inputs from the supplier could have an impact on costs or differentiation. This can happen first because the supplier could hypothetically decide to charge a price for the articles and then because the format in which the file is received has a direct influence on the typesetting and copy editing costs incurred by the publisher.

Regarding the entry barriers they are very low especially due to technological advances, particularly in DTP (Desktop publishing). This is also the reason why many printing and publishing companies in the European Union are small firms employing less than 10 workers. Less than 1 % of printing firms employ more than 500 people, while 85% of companies have less than 20 staff (Panorama, 1997).

7.4. Implications of intermediation and disintermediation for Scientific, Technical and Medical publishing

Proposition C1 of Bloch’s (1996) model states that electronic commerce makes it easier to suppress an intermediary in a

distribution network due to direct customer contact and the use of a publicly shared infrastructure which is Internet. On the other hand, proposition C2 states that electronic commerce makes it easier to become a new intermediary in an industry, by providing an added-value service through information management such as integrators or re-packagers of more basic service. These propositions are both true in the case of Scientific, Technical and Medical publishing. In fact, the introduction of online services (or electronic journal) as a substitute for the paper journal implies that a lot of actors are not necessary anymore, however, others come into the picture like telecommunication companies, access providers and electronic intermediaries like Ovid Technologies. This is the intermediation and disintermediation effect discussed by many authors (Pedersen, 1997; Benjamin and Wigand, 1995).

7.4.1 Intermediation

Proposition B3 states that electronic commerce can give rise to new substitute products. In turn new substitute products might give rise to new players/new actors that can be seen both as producers of new products, but may just be new companies that step in and install on-line databases to distribute and sell a product completely on-line as proposition C2 states. In order to find out about the different products, the consumers (being single individuals or institutions) need to devote economic resources such as search time to collecting and assembling of information on the market. Specialist businesses (intermediaries) often perform this function for a price, since information seekers might trade off the time they should devote to the search for a fee they pay the intermediary. For example, this is the role of the travel agency in the tourism industry (Locksley, 1992). In Scientific, Technical and Medical publishing, the subscription

agent explicates the role of the information collector and facilitator (as the travel agent).

However, the increasing number of publishers that offer electronic versions of journals will increase the search costs to find relevant electronic articles and therefore it might be desirable to start paying an electronic intermediary to do the search (Bloch, 1997). Consequently, the number of new companies (electronic intermediaries) that starts licensing articles from different publishers and distributes them electronically only as for example Ovid Technologies should also increase. This puts a big pressure on the present intermediaries or subscription agents operating only in the marketplace (Rayport and Sviokla, 1995) to reposition themselves and to start looking for new added service to the customer. Right now, the old subscription agents are reengineering in order to provide also on-line services (interview with a major publisher). An example is OCLC, which gives library users access to 85 on-line databases and circa 5 millions full text articles. OCLC databases can be accessed through the World Wide Web for retrieval of the article, which is then sent to the customer either by e-mail, by fax or by normal mail. OCLC is an example of non-gateway agent since it has its own collection of in-house databases and provide access only through libraries (http://www.uk.oclc.org/oclc/eco/service.htm).

There are two types of electronic intermediaries: the gateway agents and the agents that maintain a copy of the journals on their databases and sell it to the customers. They are illustrated in Fig. 7-1 and Fig 7-2 respectively.

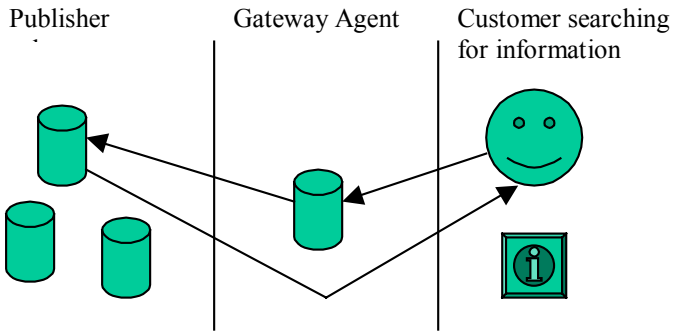

Fig 7-1: Gateway Agent

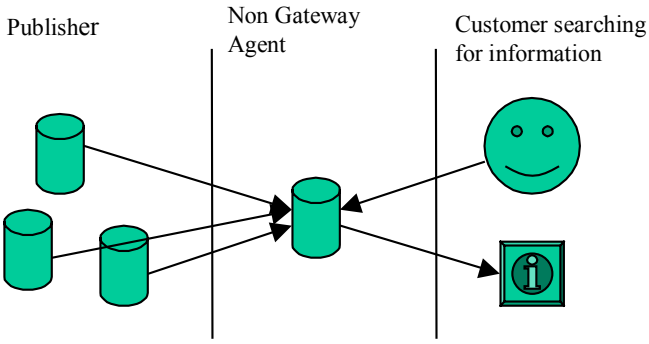

Fig 2: Non-Gateway Agent

The gateway subscription agent functions as a broker, which establishes a relationship, called a subscription, between one producer and one consumer for specific data. The purpose of the subscription is to relieve the burden on both the producer and the consumer for maintaining the currency of the data. As data changes, the producer should inform the broker of these changes. The producer should not have to maintain a subscriber list and send changes to each subscriber. Likewise, the consumer should be informed by the broker of any changes; the consumer

should not have to poll each producer periodically to detect changes (Byte, 1997). The publisher usually prefers the gateway kind of agent. In the business model of the non-gateway agent, in fact, the publisher would loose control on the subscriber list and would be even difficult to know how many copies are sold (Interview with a major publisher). The following section gives an example of a fully Internet-based intermediary that operates only in the marketspace and could constitute a threat both to the traditional subscription agent and to the publisher.

7.4.1.1 An example of a fully electronic intermediary: OVID Technologies Inc.

Ovid Technologies Inc. (http://www.ovid.com) is an Internet-based electronic only intermediary. This company was founded in 1988 with the intention to provide access to bibliographic and full text databases within academic, biomedical and scientific research. Ovid now has circa 30,000 licensed customers that include academic and medical libraries, pharmaceutical firms, research facilities, consortia and governmental agencies. Ovid technologies is an electronic agent that establishes partnerships with content providers as for example Blackwell Science to offer online access to many databases among which ABI/Inform and EMBASE. These databases are updated weekly, monthly or quarterly depending upon publication frequency and /or user needs. The Ovid Full Text Collections are, instead, Ovid's own implementations of the electronic full text of more than 80 leading biomedical journals, among which Annals of Internal Medicine, Journal of the American Medical Association, Science. Regarding Ovid system platform, Ovid's information and articles can be accessed via Internet and the World Wide Web, which enable browser searches from any desktop and ensure complete platform-independent access. (http://www.ovid.com/product/online/online.html)

7.4.2 Disintermediation

A consequence of using Internet for distributing the electronic version of the journal (as proposition C2 in Bloch (1996) states) is that activities such as printing, binding, warehousing, packaging and physical distribution of the journal are not required to be done by the publisher. They are in a sense incorporated into the electronic version and electronic distribution of the journal. Therefore also the traditional subscription agent of the marketplace is not necessary anymore. This is the disintermediation effect or a break in the value system of Scientific, Technical and Medical (STM) publishing. Such disintermediation also brings cost reduction and time reduction (from submission to publication) as for example the cost can be cut by the cost of printing, binding, physical distributing and, partially, typesetting. Moreover, a look at a typical journal schedule (Page, 1997, p. 48) shows that with on-line services also the time to produce and distribute a journal can be reduced minimum by 4 weeks (the time for printing and binding) plus the shipment time.

Presently the situation is a hybrid one where both activities (electronic publishing or online services of electronic journals and physical distribution of paper versions) are taking place. This means that the Scientific, Technical and Medical (STM) publisher and subscription agent have to operate simultaneously in the marketspace and the marketplace (Rayport and Sviokla, 1994). In order to meet customer demands in the new electronic age, they have to reengineer for the marketspace and in doing this they have to find optimal business models (as proposition 10 in Bloch (1996) stated) to gain a competitive advantage both in the marketplace and in the marketspace. Today the Internet is

overloaded with journals, and articles published on line, etc. As in any industry there will be a need to differentiate among all these offerings, and strong brand names will prevail. The importance of reputation, strong brand names, first mover advantage and on-line marketing are important factors that can lead to increased reputation of intermediaries and publishers entering the e-commerce arena. It is likely therefore that established, well-known publishers will also dominate in the marketspace if they enter it at the right moment.

Moreover, the publisher itself can be seen almost as an intermediary between institutions as "parents" of the author, in which capacity they pay most if not all of the costs of production, and institutions as "parents" of the author/consumer, in which capacity they pay via the library or department all of his/her costs of consumption. In fact, the market for research journals is a special kind of market, where one party (the publisher) gets his material for free (or for a small fee paid to the editor) while another party really pays for the consumption and the creation of the product. Institutions are willing to pay the costs of both production and consumption because they need the material. In the case of industry they need it for research and development, in the case of academic institutions because it is their job to pursue research and create knowledge. Because of this intermediary position of the Scientific, Technical and Medical (STM) publishers, many suggest that they should themselves be bypassed by the research institutions, thus giving rise to a disintermediation effect and directly connecting the institutions producing the article with the institutions consuming it. This should happen by universities singularly or jointly starting publishing the material themselves (see section 7.1). As part of this change, the packages we call journals would probably give way to databases of unpackeged individual articles. Moreover, the system could be less costly since the

institutions would not try to make a profit. However, the answer to whether it would be more cost-effective is not known yet. The same would happen if the publisher should pay for the article production costs to the university. The journals would end up being just more expensive and the institutions would end up paying for it in any case (Line, 1995).

In the following section two major publishers that are reengineering for electronic commerce as a result of the pressures from the substitute products and the threat of being disintermediated (as propositions C1, C2, B1 and B3 suggest) by new Internet based entrants are presented.

7.4.2.1 Examples of companies that are reengineering for the marketspace

As already said, many publishers in the Scientific, Technical and Medical publishing sector are experimenting with Internet and many are already offering electronic-only journals (E.g. Munksgaard Publishing, Blackwell Science, The Institute of Physics, etc.). This section focuses on two leaders that are among the pioneers of the electronic commerce frontier in Scientific, Technical and Medical (STM) publishing: Springer Verlag and Elsevier Science.

Springer Verlag

Springer Verlag (http://www.springer-verlag) based in Germany was founded in 1842 and has been for some time a leader in electronic publishing innovations, being a founding member of the ADONIS Consortium and a managing partner in the MeDOC project. MeDOC is one of the leading research projects in the German government, dealing with the construction and testing of distributed information systems. The main goal of the

company is to provide online versions of journals and books at the user desktop including both current issues and back issues, combined in a digital library. Springer Verlag has developed LINK, an information service created for the Internet, which represents a digital library delivered directly to the workplace of scientists, librarians and information brokers. It can be expected that in the near future all 400 journals offered by Springer can be accessed on LINK (http://link.springer-ny.com/tutorial/service.htm). The Aim and Scope of every journal as well as the article abstracts can be read and the full texts of the article can be searched with advanced search engines and accessed only by subscribers registered for the journal in question. LINK also offers a ”Forum for Science” in which scientists can communicate with Springer and journal editors in moderated forums. This is a very innovative, value adding concept and represents a new form of community organizer (CEC, 1996). A customer profile service, called “LINK Alert” sends to the users via e-mail the table of contents of journals of interest including links to the abstracts of the articles. Right now, LINK Alert includes circa 12 journals and will in the future be expanded to all the others. The abstracts are free of charge for anybody, while to access the full article is necessary to have a subscription to the paper version. The users of LINK will have access to the electronic versions of the articles and journals before the print versions come to the market, if they are regular subscribers. This is done by a service called “Online First”. “Online First” is not a system of pre-prints, but of articles in their final format, once accepted for publication. The only advantage is that users have access to the article immediately after acceptance notice, without having to wait several months for the paper version. From a technology point of view LINK consists of a web server, a firewall as well as high performance databases and file servers.

Elsevier Science

Elsevier Science (http://www.elsevier.nl) is a leading publisher in the Scientific, Technical and Medical sector that is also strongly moving into on-line publishing. Elsevier Science has been one of the leaders of electronic information distribution through the TULIP (The University Licensing Program) program that started in 1991 and ended in 1996. The goal of this project was to test systems for networked delivery and use of the journals at the customer's desktop. Today Elsevier has made a commercial extension of the TULIP program called ScienceDirect. This service is the world' most comprehensive web-based database of scientific, technical and medical journals. It offers libraries, institutions and other end users complete electronic editions of any titles from Elsevier Science's list of 1,200 journals, as a substitute or addition to the paper version. Right now, ScienceDirect offers Internet access to remotely stored full text of more than 279,000 scientific journal articles published by Elsevier Science. It is possible to find back material on-line until 1995. Some of the articles can then be downloaded online to the customer's hard drive, while others can be ordered through the document delivery service. Elsevier Science has also established a system called Contents Alert Service, which sends via e-mail the prepublication of the table of contents of each journal to the interested users. Examples of online journals with full hypertext capabilities are Immunology Today Online (ITO) and Vaccine Online. The company is also reengineering the journal production by establishing a Computer-Aided Production department that requires the entire retooling of the journal production system. In the future, journal articles will be stored in (media-neutral) databases, and supplied on-line, CD-ROM or print from the same source.

7.5. Electronic commerce implications for the value system actors

The hypothesis of intermediation and disintermediation (see propositions C1 and C2 in Bloch (1996)) state that companies will be disintermediated by electronic commerce systems and as a result new electronic intermediaries will emerge. This thesis argues that many companies as a response to the disintermediation threat, will reengineer for electronic commerce often operating both in the marketplace and the marketspace. In Scientific, Technical and Medical publishing, the present situation, in fact, is a hybrid one where both activities (electronic publishing or online services of electronic journals and physical distribution of paper versions) are taking place. For example, Springer Verlag and Elsevier Science, presented above, are two corporations that are incorporating electronic commerce into their business model, while OCLC Subscription is an example of a subscription agent that is also reengineering for the marketspace.

In reengineering for the marketspace an optimal business model has to be found and a number of choices have to be made (as proposition 10 in Bloch (1996) also states) at every step of the process. Choices and decisions have to be made regarding how to organize the production processes and what technologies to use. For example, what types of editing tools (SGML, standard files) should be used? What policies for the article submission format should be adopted? Accept any format or restrict it to few word processors packages? More importantly, what type of databases to use in building the document repository? Should one choose a well-known relational database such as Oracle or newer object-oriented databases that are not so well tested, but can be a better choice for SGML documents? In the distribution

stage, there are decisions to be made as to which search engine, what user interface, etc to choose. In the marketing functions, choices regarding the marketing strategies and supporting technologies have also to be taken. For example should we use a push or a pull advertising strategy? A subscription pricing model or a connection charge model? Should a company have a customer support center? How to organize it? What kind of payment systems to adopt in the online sale transactions? In organizing such online publishing business it is also important to analyze the types of changes this new online system brings to the organizational structure. (Should we have flatter organizations slowly moving towards the virtual organization?)

All these considerations point to the importance of management and strategy when entering the field of electronic commerce. Strategy is not only important to be first to market a product and to gain a competitive advantage, but also to establish a so-called dominant design in the industry (Hax and Wilde, 1999; Utterback, 1994) the purpose of which is to gain and increase profitability. The dominant design usually takes the form of a new product synthesized from individual technological innovations introduced independently in prior product variants. The electronic journal is at an early innovation stage and has not reached the stage of a dominant design yet in the sense of Utterback (1994), given that many pilot projects are still going on. This leads to the fourth part of the thesis, which attempts to give some suggestions for strategies formulation. These suggestions are mainly expressed in terms of exploration of complementarities when planning for on-line commerce.

7.6. Conclusions

This chapter has analyzed what are the changes that the advent of electronic commerce could bring to the Scientific, Technical and Medical (STM) publishing sector. This analysis has been conducted by using Bloch (1996) business value model described in chapter 6 and Porter's (1980) framework of competitive advantage. Springer Verlag and Elsevier Science have been used as two examples of publishers that are using Internet to sell and distribute their journals on-line. Ovid Technology has been given as an example of an electronic intermediary that is substituting the traditional distribution agent of the marketplace, while OCLC has been briefly mentioned as a subscription agent that is also reengineering for electronic commerce. It has also been argued that many companies need to reposition themselves for electronic commerce as a response to the threat of new intermediaries. This points to the importance of strategy and strategic management to plan and manage such a change. This is the subject of the next part of the thesis, which tries to give some suggestions based on the complementarity concept for strategy formulation when planning for on-line commerce.

Part IV: Strategy

CHAPTER 8: The Business Value Complementarity Theory

This chapter is the first of the strategy section of this thesis. As seen in the previous section, technological innovation diffuses throughout the socio-economic system and in so doing it impacts industrial structures and value chains. The single corporation needs to manage this process and often it needs to develop a strategy. The strategy section of the thesis has the multiple purpose of presenting the theoretical frameworks used in this part and to build a normative model for strategy formulation when entering the field of electronic commerce. In this section, therefore, the concept of complementarity is presented as being basic for strategy formulation and business value complementarity theory is presented as a tool to investigate complementarities between different variables (chapter 8). A normative model that can be used as a guideline for strategy formulation is developed (chapter 9); how this model can be applied in Scientific, Technical and Medical Publishing (STM), thus deriving the specific business processes of the online marketplace is shown (chapter 10). This chapter presents the theoretical framework of business value complementarity theory that is the basis of the normative model developed in chapter 9 and of the analysis conducted in chapter 10. Business value complementarity theory (Barua 1996) is based on a multilayer business value model and on complementarity theory. Barua's (1996) specific instance of business value complementarity theory is applied to the field of reengineering. Therefore it has seemed appropriate to briefly outline the business value complementarity theory and the re-engineering literature. This chapter begins with a definition of the concept of complementarity and its introduction in the field of manufacturing and reengineering, then an overview of

Business Process Reengineering (BPR) is given and finally the theory of business value complementarity is presented.

8.1. The concept of complementarity

In order to understand the normative framework of chapter 9, we need to describe what complementarity is and how it is used in recent strategic management and reengineering literature. Complementarity is an old concept within the field of economics, but it has only recently been applied to different fields. In this synthesis we do not enter into the economic details of the theory, but rather we try to understand and describe the concept itself and its extension to groups of activities. In order to explain this concept the famous example of coffee and tea, which is often used to explain complementarity is described here.

Tea and coffee are usually defined as "substitutes" because a person chooses to drink either one or the other. Moreover, tea and lemon are complements because lemon is used together with tea, while tea and salt are said to be independent because usually they are not used together. Further, there is also the relationship between cream and coffee, cream and tea and cream and lemon. That is, cream and coffee as well as cream and tea are also complements, therefore cream and lemon should also be substitutes in relation to tea. Samuelson (1974) defines three argumentation to identify the substitute/complement relationship, which we would like to quote here:

1. *" First, there is the 'either-or' relation of tea and coffee: at 4 o'clock we want a cup of something, and if coffee will not serve, tea will or vice versa. Related to this first polar-case*

notion of either-or is the contrasting "and-both' relation of tea and lemon.

2. *Add a pinch of tea to my previous ration of goods and services. Alternatively add a squeeze of lemon. Each makes me better off. But now add tea and lemon doses together (i.e. make them both now available to me). Because the benefit of tea and lemon together is greater than the sum of their separate benefits, surely I have a right to regard tea and lemon as complements. Likewise, imagine adding each of coffee and tea as alternatives. Since the benefit from both together is surely less than twice the benefit of one, (as my yearning for further stimulation and warmth satiates), I regard coffee and tea as substitutes.*
3. *Finally, there is a third test to decide that tea and lemon are complements: it involves the fact that a rise in tea's price will cause a reduction in my demand for lemon. By this test criterion, coffee and tea will be said to be substitutes if a rise in the price of one causes the demand for the other to go up (Samuelson, 1974, p.1255)".*

Recently the complementarity concept has been more widely used in the field of manufacturing and management. Milgrom and Roberts (1990; 1992) have been among the firsts to revitalize the complementarity concept by applying it to the manufacturing field. Studies by Barua (1995; 1996) have applied such concepts to the field of management information systems (MIS) and business process reengineering, while Brynjolfsson (1997) has also started applying it to the field of business process reengineering (BPR).

Milgrom and Roberts (1990, p. 514) use the term complementarity not only in the traditional sense of a relation between pairs of inputs, but also in a broader sense as a relation among 'groups of activities'. These groups of complements are

defined so that if the levels of any subset of activities are increased, then the managerial return to increases in any or all of the remaining activities rise. Consequently, if the marginal costs associated with some activities fall, it would be optimal to increase the levels of all the activities in the group.

Milgrom and Roberts (1990) define two activities as "complementary" if the profit or value created by doing both at the same time is greater then the sum of the individual profits from doing just one or the other. Moreover, the standard definition of complementarities in economics is market oriented and states that "two inputs to a production process are said to be complements if a decrease in the price of one causes an increase in the demand for the other". However, Milgrom and Roberts (1992) introduce a more inclusive definition:

" 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 (Milgrom and Roberts, 1992, p.108)".

Complementarities among activities imply some mutual relationships and dependence among various activities, whose exploration can lead to higher profitability. Therefore when there are complementarities among different activities, it is important that the firm's strategy explores such complementarity to increase profitability. In order to illustrate how complementarity works in the field of manufacturing, a quote from Milgrom and Roberts (1990) is provided here:

"As an illustration, let us trace some of the indirect effects of a fall in the cost of computer-aided design (CAD) equipment and software that leads to the equipment being purchased. Some CAD programs prepare actual coded instructions that can be

used by a programmable manufacturing equipment, so one effect of the adoption of CAD may be to reduce the cost of adopting and using programmable manufacturing equipment. Since the prices of the equipment are also falling, the effects of the two price changes on the adoption of that equipment are mutually reinforcing. Of course, CAD also makes it cheaper for the firm to adopt a broader product line and to update its products more frequently. If the firm does so, than an indirect effect is to make it more profitable to switch to more flexible manufacturing equipment that is cheaper to change over" ... Thus CAD equipment, flexible manufacturing technologies, shorter production runs, lower inventories, increased data communications, and more frequent product redesigns are complementary. However, the complementarities do not stop at the level of manufacturing, but extend to marketing, engineering and organization..It may be unprofitable for a firm to purchase a flexible CAD/CAM system without changing its marketing strategy, or to alter its marketing approach without adopting a flexible manufacturing system, and yet it may be highly profitable to do both together (Milgrom and Roberts, 1990, p. 515).

Milgrom and Roberts (1990) give also a model to study complementarities in production. In this model they use purely algebraic methods to formalize the idea of groups of complementary activities[9]. Brynjolfsson (1997) is also starting to highlight interactions and complementary practices in the redesign of the organizational processes, by giving the example of a collection of critical complements including the use of flexible machinery, short production runs and low inventories.

[9] Please refer to Milgrom and Roberts (1990) for a detailed description of this concept and mathematical proofs.

Brynjolfsson (1997, p.3) says that emphasizing one such practice increases returns to its complementary practices. Vice versa, doing less of a given complement reduces returns to its operating dependents. Therefore more flexible machinery draws value from and adds value to shorter production runs. Trouble begins when change agents fail to identify feedback systems that push business units back toward old ways of doing business or they miss synergy that would strengthen the new and better ways of doing business they wish to establish. Hax and Wilde (1999) have also taken up the notion of complements in defining a new business model, where one of the ways to gain strategic advantage and to increase profitability is the system lock-in strategic option. The main issue in this option is to look at the overall architecture of the system in strategy formulation, meaning the exploration of questions such as: How can a company gain complementors' share in order to lock out competitors and lock in customers? Hax and Wilde (1999) define a complementor as a provider of products and services that enhance a company's offerings. Examples of complementors are computer hardware and software producers. In section 8.3 the business value complementarity theory will be illustrated in detail, while a brief overview of business process reengineering is first given in the next section. This is due to the fact that the concept of business process reengineering is extensively used throughout the thesis, and especially in building the specific instance of the business value complementarity theory illustrated in this chapter.

8.2. Business process reengineering

The Business Process Reengineering (BPR) literature takes a process approach in analyzing an organization's global structure and can be divided into two main streams. One, following Hammer and Champy (1992), calls for radical changes in the corporation structure and another one, following Davenport (1993) calls for starting with small reengineering pilot projects within the company and then extending to more areas of the organization. Both these currents acknowledge that many of the processes and structures of today's corporations are outdated and obsolete and have not kept pace with the changes that have taken place in the last couple of decades in many areas such as technology and globalization. In fact in a business environment where innovation, speed of delivery, service and quality are the most important factors, many companies still adopt outdated structures and mainly use information technology (IT) to mechanize old ways of doing business instead of looking at new, innovative ways of conducting business. These are the reasons why Hammer (1990) believes that it is important to undertake "reengineering" by starting from scratch as reengineering cannot be planned meticulously and accomplished in small and cautious steps. It's an all-or-nothing proposition with an uncertain result. Reengineering involves not only the business process itself, but also other factors such as job designs, organizational structures, management and incentive systems, etc.[10]

Davenport and Short (1990) also acknowledge that information technology has, until now, mainly been used to speed up office

[10] See for example the case of the reengineered Account Payables at Ford in Hammer (1990).

work rather then to transform it. And while information technology (IT) has been used with success in redesign work in the manufacturing function, not so can be said in the other functions of a firm and in the service sector as well. Davenport and Short (1990) introduce a new thinking about the relationship between information technology (IT) and business process redesign, by stating that information technology (IT) and business process reengineering (BPR) have a recursive relationship and each is a key element in thinking about the other. Therefore thinking about information technology should be in terms of how it supports new or redesigned business processes, rather then business functions or other organizational entities. In turn, business processes and process improvements should be considered in terms of the capabilities information technology can provide.

A business process is defined as a set of logically related tasks performed to achieve a defined business outcome, while a business system is defined as a set of processes. According to Davenport and Short (1990) a set of processes forms a business system, or the way in which a business unit, or a collection of units, carries out its businesses. Examples of business processes are creating a marketing plan, ordering goods from a supplier or developing a new product. Processes have two important characteristics:

- They have customers who can be either internal or external to the firm.
- They cross organizational boundaries and are generally independent of formal organizational structure, thus normally occurring across or between organizational subunits.

Processes can be interorganizational, interfunctional or interpersonal. The interorganizational processes are those taking place between two or more business organizations. The interfunctional processes exist within an organization, but are realized by crossing several functional or divisional boundaries. A third category of processes is the interpersonal processes, which involve tasks within and across small work groups, typically within a function or department. Examples are a commercial loan group approving a loan or an airline flight crew preparing for takeoff. Other dimensions of the business processes are objects and activities, that is, the business processes can be characterized by the type of objects manipulated and activities involved. Usually the objects manipulated in the processes are of two types: physical and informational. Physical object processes manipulate real tangible things and manufacturing is the classical example; informational object processes create or manipulate information. These are for example the processes involved in preparing a marketing plan or designing a new product. Finally, the process activities can be also of two types: operational and managerial. Operational processes carry out the organization's daily business purposes, while the managerial processes help also to control, plan or provide resources for operational processes. Reengineering cannot be done without dealing with such issues as the role of management in the redesigned processes, the implications for the new organizational structure, new skill requirements and therefore downsizing of a specific group to perform IT-enabled process improvement.

To summarize, some characteristics shared by the literature on business process reengineering (BPR), identified by Kutscher (1995) are presented below:

1. Process orientation: from structure to process. This tries to overcome some of the problems of scientific management.
2. Definition of business processes: a process is intended to be a specific set of activities that go across time and place with a beginning and an end, with inputs and outputs. Business processes aim at producing an output that supports a firm's targets and cut across functions, departments and in some cases across the boundaries of an organization.
3. Contents and boundaries of business processes. These vary from firm to firm and a firm should group all its activities in a small number of business processes varying from 10 to 20. For example IBM uses 18 processes among which are production, customer fulfillment, customer feedback and hardware development.
4. Business processes owners and responsibility. Top management should take the responsibility for the business processes to ensure their optimal management as well as their continuos improvement.
5. Customer orientation: Business Process Reengineering (BPR) is customer oriented and the outputs of the process should support both the firm's objectives and satisfy the customers' requirements. Customers should be involved in the redesigning of the processes.
6. Reengineering as a radical change of business processes. Reengineering of business processes is a radical break of process structures, which bears great risks. Most of the reengineering projects end up into failure, but when they succeed the advantage can be great.
7. Holistic view of processes instead of piecemeal engineering. Business process reengineering (BPR) takes a holistic view of the processes that need to be changed. Such a view can avoid engineering of isolated parts of a business process, which often can result in suboptimal solutions.

8. Top-down approach of business process re-engineering. A holistic view goes hand in hand with a top down approach. Due to the risks of radical change and the broad, cross-functional scope of business process re-engineering (BPR), top management should initiate and monitor the reengineering process.
9. Benchmarking of business process reengineering. This means that business processes are benchmarked, implying that the continuous improvement and radical innovation are necessary in order to reduce cost and time and to increase customer satisfaction and organizational flexibility. Such benchmarking is necessary however to understand the true cost drivers.

8.3. The business value complementarity theory

This theory is based on a multi-layered business value model coupled with the complementarity theory or concept to assess complementary relationships between the variables (both dependent and independent) of the model. In building the specific instance of the model, Barua (1996) addresses the re-engineering problem in corporations and it is this model, which is summarized below.

As already said, re-engineering implies the use of information technologies to streamline and improve business processes with the main goal of increasing efficiency and stay competitive (Hammer and Champy 1993). Reengineering also implies organizational restructuring. But even though reengineering has been a methodology much used by corporations, the profitability of most reengineering projects is still not very evident. Many studies agree that while some companies have enjoyed very

good bottom line improvements with reengineering projects, about 70% of the firms having started such projects were very much unsatisfied with their results. There have been several hypothesis trying to explain this high rate of failure of re-engineering projects among which expecting too much too soon and lack of partnership between information technology (IT) and business.

In developing the theory of business value complementarity, Barua (1996) hypotheses that two more factors might contribute to the low success of a reengineering project. The first is the lack of clear guidelines for measuring the impact of such projects on organizational payoff and the second is not having understood that while the reengineering project might be successful per se, the lack of appropriate changes in correlated activities or processes might lead to overall unprofitability.

In developing the business value complementarity model, Barua (1996) first identifies the key drivers of organizational value and then tries to explore possible synergies between these value drivers. Barua (1996) also identifies three questions that management must address before undertaking a reengineering project or any organizational change. The answer to these questions is the basis to build the business value complementarity theory:

1. *Is there any stimulus (internal and /or external) the response to which is a change in organizational design?*

As an illustration, Barua (1996) uses the example of the oil industry that through the late eighties and early nineties faced increased uncertainty due to environmental and safety regulations, increasing global competition and a weak economy. As a result Phillips 66 was having a disappointing financial

performance and after analyzing their business they concluded that the key to profitability in the new economic situation would involve a strategy that focused on cost efficiency. Similarly industry internal competition may force an organization to become more efficient through restructuring its operations. Barua (1996) further states that the change does not need to be the response to an immediate crises, but it could also be "anticipatory", based on a consideration of economic and technological trends as a technological innovation that is spreading in the social system.

2. *If the answer to this question is yes, then what are the drivers of value that we need to improve through the design change?*

To address this question Barua (1996) develops a multi-level business value model whose purpose is to show the relationship between the critical success factors of reengineering and their drivers. In developing such a model, Barua (1996) put at the highest level overall performance measure variables such as return on investment (ROI), company profitability, market growth, etc. These are the dependent variables that need to be optimized. The intermediate level consists of intermediate variables that are the drivers of the performance measures and include customer satisfaction, turnaround/response time, coordination levels within and outside an organization, capacity utilization and inventory turnover (in manufacturing), etc. The lowest level of the multi-layered business value framework are the design variables, the value of which must be determined in the study and include information technology, organizational and business process characteristics, decision authority and incentives. These are the independent variables that have to be changed to have an impact on the intermediate and the overall performance variable. The third question necessary to address in order to be able to build the business value framework is:

3. *What specific changes in factors pertaining to decision authority, business processes, incentives and information technology (IT) should be implemented to increase the payoff? By how much and in which direction should these factors change? What is the impact of these changes on the performance measures chosen in question number 2?*

Barua (1996) believes that the answer to this question has to be found in the presence of complementarity among the different design variables at the lowest level and between the different levels of the business value model. According to Barua (1996) the presence of complementarity is addressed by the question:

"Does the value derived by increasing one factor increase by increasing the other factors in appropriate directions? The most important point here is the coordinated nature of change in multiple factors. While synergy is not a new concept, making design decisions based upon an explicit recognition of the value created through the synergy is clearly a new approach to managing organizational design dynamics (Barua, 1996, p. 416)."

The business value complementarity model could be generalized as in fig. 8-1 below, where Overall Performance Measure Variable is a variable chosen among profitability, return on investment (ROI), market growth, ect. This is the dependent variable that has to be optimized in terms of profitability. In the model developed in chapter 9 it is the business value of electronic commerce. The intermediate variables V1, V2, V3 etc. can be chosen among customer satisfaction, turnaround/response time, capacity utilization etc. These are intermediate variables that are a function of the independent variables of the model and that in turn will have an impact on

the overall dependent variable that has to be optimized. In the model developed in chapter 9 they are the activities of the value chain. The design variables D1, D2, D3, D4 can be chosen within information technology (IT), business processes, incentives or decision authority. These are the variables that have to be redesigned in a reengineering project. In the model of chapter 9 they are the business processes corresponding to each activity of the value chain and the complementary technologies.

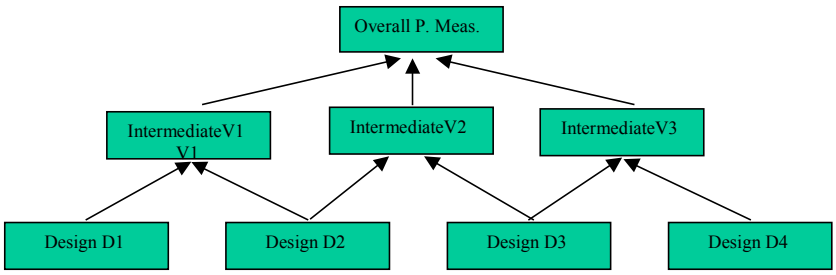

Fig 8-1: A Generic Business Value Complementarity Model

The model in fig. 8-1 should be read from bottom to top and the variables are all interdependent as the following equation shows:

Overall performance measure = F (V1 (D1, D2, D3, D4), V2 (D1, D2, D3, D4), V3 (D1, D2, D3, D4)

The equation above means that the overall performance measure is a function of the intermediate variables V1, V2, V3, each of which in turn is a function of the independent variables D1, D2, D3, D4.

Barua (1996) also states that in a reengineering project it is important to take into consideration which factors to change, in which direction the change should take place and how big the

change should be. The application of the complementarity theory in analyzing the effects of information technology (IT), business processes and other decision variables such as incentives and decision authority on the intermediate and high level performance variables should give some directions, even though only qualitative in nature, about the synergies existing between the variables of the different layers of the model. Moreover it should give some ideas about whether it is possible to maximize the net benefits to the overall performance measure variable by exploiting complementary relationships between variables of interest. In conclusion, by combining the complementarity theory with a multi-level business value model showing relationships between key performance measures and their drivers, the overall performance variable can be maximized when the design variables and the intermediate variables are changed in a way that takes into consideration synergies and possible complementarities among them. In the specific instance of business process reengineering, Barua (1996) argues that

" The organizational payoff is maximized when several factors relating to IT, decision authority, business processes and incentives are changed in a coordinated manner in the right directions by the right magnitude to move toward an ideal design configuration. Our analysis further shows that when a complementary reengineering variable is left unchanged either due to myopic vision or self-interest, the organization will not be able to obtain the full benefits of re-engineering due to smaller optimal changes in the other variables (Barua, 1996, p. 409)".

Barua (1996) develops a specific instance of the model based on the reengineering literature in order to specify and give a practical example of the business value complementarity theory, to highlight the concept of complementary changes in a hierarchical set of relationships and to illustrate some techniques

of model building. Obviously the business value complementarity model can be used to analyze also problems and relationships that are not specific to the reengineering literature. As Barua (1996) states:

" The assumptions of the model are general enough to include a broad class of business environments. However… we are not developing universal value models which can be used by any organization in their reengineering projects. We also do not make a claim regarding the completeness of the list of performance and choice variables in the model (Barua, 1996, p. 409, p. 416)".

It is clear therefore that Barua (1996) sets the general basis of a business value complementarity framework, shows that complementarity exists between the different variables at the same level and between variables at different hierarchical levels. This model can then be applied to the particular situation and problem at hand. Please refer to Barua (1996) for more details about the model assumptions and rationale. For us here it is enough to summarize that the multilayered business value complementarity model can be used as a theoretical foundation and methodology to explore hierarchical relationships in analyzing a given problem whether it is in the reengineering field or not. Moreover this model can be used to explore whether complementarity exists between the different variables both at the same and at different levels. In this thesis, the general ideas of hierarchical business value modeling and complementarity are used to build the business value complementarity model of electronic commerce (chapter 9) and electronic publishing (chapter 10). In developing this model, we try to argue for complementarity among the different variables from a qualitative point of view.

8.4. Conclusions

This chapter has presented the complementarity concept and its use in the field of manufacturing and business process reengineering. Then the concept of business process reengineering has also been discussed and finally the business value complementarity theory has been summarized. This theory shows that complementarity might exist between the variables of a multi-layer business value model, both between variables at the same level and between variables at different levels of the model. This chapter also argues that the business value complementarity theory can be used as a tool to explore synergies among different organizational, technological and other performance variables in the formulation of strategies and in the planning of organizational models or designs.

CHAPTER 9: A Business Value Complementarity Model of Electronic Commerce

In the previous chapters we have seen that electronic commerce can change industry structures, can give rise to new intermediaries and can disintermediate the present actors of an industry value chain. We have also seen the implications of electronic commerce for the actors of the Scientific, Technical and Medical publishing sector. It has been concluded that many actors are repositioning themselves in order to compete with new start-ups operating only in the marketspace, thus competing both in the marketplace and the marketspace. This chapter presents a business value model of electronic commerce. This is a normative framework that could be used as a methodology to formulate corporate and technology strategies when entering the field of electronic commerce. This model establishes a relation, even though only qualitative, between technology classes used to go on-line, the re-engineered activities of the value chain and corresponding business processes to the business value of electronic commerce. The connection with strategies and specifically technology strategy is also made. This chapter presents a generalization and an explanation of the theoretical model that is used in chapter 10 to derive the specific business processes of the on-line value chain of Scientific, Technical and Medical publishing. The main ideas of this chapter have been presented as an article at the Management of Information Technology Conference (MICT1999) held in Copenhagen, September 14-17 1999. The article has also been submitted for publication.

9.1. Introduction

Since the introduction of information technologies in the organization many studies have been conducted to measure the business value of information technology (IT) for corporations. The empirical results are often contradictory and very different. They generally show that productivity gains are small or not existent and that the effects of information technology (IT) and electronic commerce have to be looked upon from a competitive advantage point of view (Bloch, 1997; Cronin, 1995; Porter and Miller, 1985). A study by Hitt and Brynjolfsson (1996) identifies three sources of information technology value to a corporation: productivity, consumer value and business profitability. The study also shows that information technology (IT) contributes to increases in the productivity and consumer value, but not business profitability, hence the widely debated technology paradox. The same is happening for corporations trying to conduct business on Internet. Many companies do not see the return on investment (ROI) necessary to justify the costs of engaging into this type of commerce. Many are skeptical of the value of e-commerce for a company and often Internet is described as the gold rush of the 1800's and e-commerce as a fad (Bloch, 1996). That is also probably true if a company just develops a World Wide Web (WWW) homepage and hopes to make money by having that presence on the Internet. This thesis argues that to succeed in electronic commerce it is important to take a more radical approach by reconsidering the business processes that have to go on-line.

Bloch (1996, 1997) argues that the business drivers are an important component of the spreading of electronic commerce by developing a business value framework identifying ten sources of business value of company-to-consumer electronic

commerce for commercial organizations, summarized in table 6-1 in chapter 6. Bloch (1996) basically shows that electronic commerce can contribute to the business value of a corporation mainly in three ways: by improving the business processes, by transforming the organization and by redefining the business models. Electronic commerce can contribute to improving the business processes of a corporation through new ways of promoting the product (on-line promotion), new sales channels, by enhancing customer service and consolidating the brand image with electronic commerce systems and by lowering costs through on-line delivery. Electronic commerce can contribute to the organizational transformation due to new customer relations, new technologies and organizational learning. Finally, electronic commerce can redefine a corporation structure by offering the possibility to explore new business models and new product capabilities such as digital products. The propositions 1-10 in table 6-1 of chapter 6 identify some sources of business value of electronic commerce to the corporation, but they do not identify or mention how changes should take place in the corporation when organizing for electronic commerce. In this chapter a business value complementarity framework of electronic commerce is developed in order to give some ideas about how to maximize the business value of electronic commerce. This model is based on the business value complementarity theory and the value chain analysis illustrated in chapter 6 and chapter 1 respectively. Here the issues of complementarity between the different variables of the model are addressed in a qualitative way.

9.2. A business value complementarity model of electronic commerce

This section develops a business value complementarity model of electronic commerce, which tries to give an answer to the question: "How can the business value of a corporation's electronic commerce be optimized?"

9.2.1 Understanding the variables of the model

The high level (performance) dependent variable of the model in fig. 9-1 is the business value of electronic commerce. The objective is to make such a variable as optimal as possible, either in terms of competitive advantage or profitability. This can be done by exploring complementarities among the intermediate variables of the model, which are the activities of the value chain, and the independent variables that are the corresponding business processes and the technologies available to transform these activities and processes for the marketspace.

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. These re-definitions can be obtained by applying the communication and information technologies (ICTs) to each activity of the value chain (See chapter 10). The value chain of the market space or virtual value chain can therefore be redefined as the use of computer and Internet-based technologies to organize the physical value chain activities completely on-line.

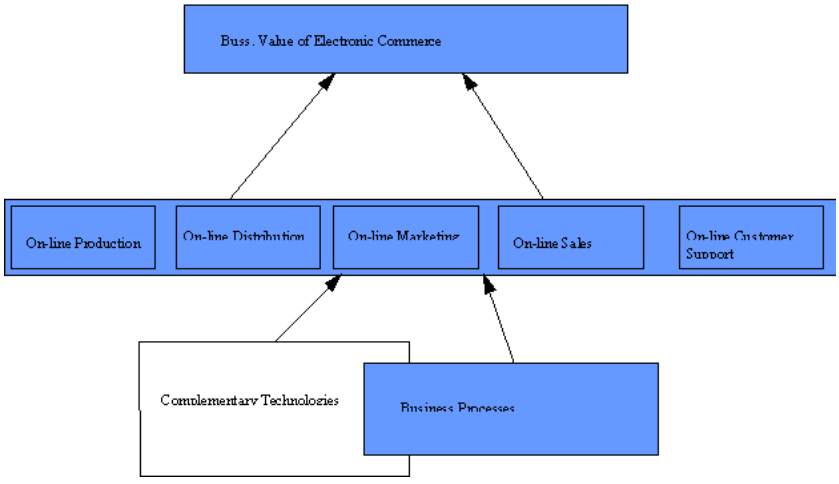

Fig 9-1: Business Value Complementarity Model of Electronic Commerce

Business processes corresponding to each activity of the value chain

The business processes in fig. 9-1 are the specific processes into which each primary activity of the on-line value chain can be decomposed (See chapter 3). The activities of on-line marketing, on-line sales and on-line customer service and the corresponding on-line business processes 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.). Examples of business processes associated to the primary activities of the on-line value chain are as follows:

- *On-line distribution*: electronic search, electronic selection and retrieval, electronic transmission of the product in question.
- *On-line marketing*: on-line advertising, on-line market research, on-line promotions and public relations, on-line pricing models or pricing models for on-line business.
- *On-line sales*: information gathering/recognizing a need, negotiation/search for solutions and settlement/making a purchase.
- *On-line customer support*: customer inquiries and answer to customers.
- *On-line production:* as said, the processes of on-line production depend more on the specific digital product. In the example of Scientific, Technical and Medical (STM) publishing they are: electronic authoring, electronic submission, electronic reviewing, document formatting, electronic storage. In chapter 10 a detailed description of these processes is given.

Complementary technologies

The complementary technologies in fig. 9-1 are those technologies that can be used for the transformation of business processes from the marketplace to the marketspace. These can be divided into 3 groups: networking and communication technologies, database technology and database management systems (DBMS), and application software. Each group includes some technology classes, as for example:

1. Networking and communication technologies include Internet, the WWW, Client/Server computing, Web-Database integration.

2. Database technology and database management systems (DBMS) include repositories, object-oriented databases, inverted file and relational databases, query languages, data warehouses.
3. Application software include search engines, user interface, browsers, push and pull technology, profile matching, data mining tools, payment systems, mailbots, mailing lists, discussion forums. Moreover in case of Scientific, Technical and Medical (STM) publishing it could include authoring systems, while in case of the software industry it might include programming languages.

Each activity of the value chain has as complementary technologies a subset of all the technology classes. For example, the complementary technologies of on-line customer service are Internet, the World Wide Web (WWW), Client/Server computing, relational databases, mailbots, mailing lists and discussion forums. A detailed discussion of these technologies is given in appendices I, II, III, IV.

9.2.2 Explanation of the model

In the model of fig. 9-1 complementarity should be applied to explore possible synergies between all the primary activities of the value chain, corresponding business processes and supporting technologies when re-engineering for the marketspace in order to maximize the business value of electronic commerce. This should lead to a better fit between the overall organizational strategy, the business processes that have to be transformed for electronic commerce and the information and communication technology (ICTs) system that should be designed and implemented to support such strategies. This way can be avoided investments into a computer system, which

could not be used at a later point if new business processes should be added for the transformation for the marketspace. Moreover, the exploration of complementarities would avoid the implementation of a business model that does not correspond to the corporation's objective or strategy.

It is argued that to succeed in electronic commerce, it is not only necessary, for example, to establish a marketing presence on the Internet or the World Wide Web (WWW). It is instead important to reengineer the parts of the value chain and the corresponding business processes relevant to the product in question and the company strategy (and possibly the all value chain in case of digital products). This should be done by taking into consideration the complementarities between the primary activities, between the business processes constituting each activity as well as between the business processes and the supporting technologies.

Complementarity at value chain activity level. It is argued that to reach an innovative and value-adding business model of electronic commerce, it is important to explore complementarities among the different activities of the value chain when reengineering for electronic commerce. That is the more activities of the value chain are simultaneously conducted online by taking advantage of the e-commerce technologies, the more likely it is that the business value of electronic commerce will be maximized. Of course the number of primary activities and corresponding business processes that have to be transformed for the marketspace depend on the company's type of product (digital or not) and strategy (see the previous section). In this thesis it is suggested that the adoption of a holistic approach in redesigning the primary activities that should be re-engineered for electronic commerce would be a more successful strategy than reengineering only one or some at

a time. This is due to the 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 (1986) 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. Due to complementary relationships, it could be expected that for a digital product the corporate value created by adopting electronic production, on-line distribution and on-line marketing in tandem in the same company will be much higher than the sum of the values created by the adoption of such functions in two or three distinct corporations. In fact, a corporation that uses and integrates the World Wide Web (WWW) and database technologies in the production, distribution and marketing of a digital product (being this information as in the case of the publishing industry, software or music) would have a competitive advantage in the marketspace over a company that for example uses such technologies only in production and distribution. In Scientific, Technical and Medical (STM) publishing, for example, this can happen because on-line production and distribution contribute to shortening the time lag between submission, publication and delivery of an article, but the company might still not be very successful because it might not properly understand the customer's needs and expectations of the marketspace, due to a marketing paradigm shift taking place in the on-line community.

Complementarity at business process level. Theoretically, each business process corresponding to any activity of the value chain could be reorganized for e-commerce independently on the others. It is argued though 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 a

higher business value of electronic commerce (which in turn should lead to higher profitability) 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 as it is done by the Harvard Business Press Online. 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 site combined with the data from more conventional market research channels of the marketplace would contribute to a more effective highly targeted on-line advertising programs then data gathered only in the marketplace. This is because the data collected on-line can give a more accurate customer profiles then only data gathered in the marketplace. Hence the complementarity between the on-line market research and the on-line advertising processes. In on-line sales, providing for electronic payment/settlement (instead of having to make a telephone call or fax the order) in addition to information searching and gathering on the company's product selection would make the electronic shopping process easier. Furthermore, it would decrease the chance that the customer closes the Internet connection without having downloaded or bought the product. Hence the complementarity between the processes of on-line settlement/making a purchase and on-line information gathering and searching.

Complementarity between business processes and supporting technologies. In the design phase, it is important to consider potential complementarities between business processes that have to be redesigned for on-line commerce and the supporting technologies. This should lead to a better system design, that also offers possibilities for further expansion if other business processes are going to be added for online transformation. The complementarity theory, in fact, gives also a theoretical rationale for adopting a holistic approach when considering the business processes that have to be redesigned for on-line commerce and the supporting technologies in a simultaneous fashion. In fact, the more advanced the technologies used, the more likely it is that the business processes will be conducted in an efficient and value maximizing way. 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 better built are the user interface and the repository systems. Hence the complementarity between the search process and the technologies required for its implementation. 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's strategy). Hence the complementarity between databases, product to be stored and customization level in production.

Complementarity at technology level. Complementarities between the different technologies used to implement the system should also be explored before deciding on the system design. 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. In on-line distribution, a system with the most advanced search engines, the most 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 micropayment system would be much higher then a system not providing for micropayments, where the user has to use the credit card even for small transactions. Micropayment technologies, however, are not fully developed and diffused yet. 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 & Todd, 1996/1997).

9.3. Model implications for strategy formulation

This section describes how the framework could be used as an analysis methodology for a company (small and medium size) wanting to reengineer for electronic commerce. Assuming that a company wants to start consumer electronic commerce on the Internet, the company should first analyze which value chain activities could be conducted on the Internet by taking into consideration the nature of the company's product. For example, for digital products such as software, journals, music, the whole value chain can be implemented on line, including production and distribution, since these are typical products that can be produced with information and communication technologies (ICTs) and distributed over Internet. In case of companies selling physical products such as wine or flowers and services, only the marketing, sales and the customer support activities can be transformed for on-line commerce. Therefore most interesting for this thesis are corporations that produce and sell digital products or services. A company should also decide on

the three fundamental strategies or any combination of them (Porter, 1982) and explore how electronic commerce can help the company implement that specific strategy by considering the sources of business value presented in table 6-1 in chapter 6. For example a company wanting to implement the strategy of cost leadership, meaning that the company wants to become the low cost producer in the industry, can use Internet to support this strategy. Internet in fact can lower cost in many ways: by promoting the products directly to the customer (thus saving promotion costs), by distributing the product over Internet thus saving distribution costs, by lowering marketing costs through on-line marketing and advertising (see chapter 6). For example in Scientific, Technical and Medical (STM) publishing, the cycle time for production and distribution of a journal can be reduced minimum by 4 weeks, and the costs can be cut minimum by binding, printing, packaging, distributing and some typesetting costs by using Internet for the production and distribution of a journal in electronic version instead of the paper version.

A firm wanting to implement a product differentiation strategy can use e-commerce as enabler of this strategy. Electronic commerce, in fact, can be used to create new substitute products (as proposition B3 in Bloch (1996) states), to enhance some product attributes, or to give different customized versions of the same product (as proposition 9 in chapter 6 states). For a journal distributed over Internet, the customer might choose to buy only a part, an article or a section or can choose to have a personalized version of the journal sent directly to the desktop. In publishing (even though not in Scientific, Technical and Medical publishing), this is for example done by the Wall Street Journal Personal edition on-line (http://www.wsj.com).

A company wanting to implement a focus strategy can use e-commerce to realize such a 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 (as proposition 9 in chapter 6 also states).

The choice of what strategy or combination of strategies a company wants to pursue is relevant to the primary activities of the value chain, and the corresponding business processes that have to be implemented on-line. The company strategy is also relevant to the classes of technologies that have to be chosen to enter the electronic market place. After having identified the value chain activities that can be conducted on line (depending on the type of product) and the company strategy, it is important to explore the synergies or complementarities among the different activities in order to implement on-line all those that would contribute to increase the business value of electronic commerce. Moreover, it is necessary to map the business processes that correspond to each activity of the value chain and investigate what are the synergies between these processes. Finally, the company should investigate what technology choices are available to implement the business processes considered for on-line commerce and formulate a technology strategy. Such a strategy should include not only what kind of computer hardware, software and networks to use, but also decisions regarding how to go 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)? During all this process it is important to explore whether there are

complementarities between the different variables (value chain activities, business processes, technologies). For example, if a company decides to start marketing on the Internet, it should explore if there are synergies between marketing and other value chain activities as for example sales or customer support. In that case the company should give the possibility to a client to buy the goods directly on-line and offer on-line "real" customer support (e.g. in form of Frequently Asked Questions (FAQs) or the possibility for the customer to send e-mail to a company representative and get an answer!). At technology level, for example, could it be better to buy a system that supports (or give the possibility of supporting) different functions and business processes on-line, rather then try to modify or even substitute the system at a later stage? This is the same idea as developing a robust design for a technology system (Utterback, 1975). In fact the exploration of complementarities among the different parts of the system should lead to a more "robust" design, which in an ever changing world is strategically more feasible than leanly configured designs which only satisfy transient producer or user requirements (Rothwell and Gardiner, 1988).

9.4 Problems in using the complementarity approach

Problems with the complementarity approach are that it is difficult to consider all the variables at once (both technological and organizational variables) especially when often the re-engineering projects are started as pilot projects within an organizational unit and then are extended to the whole company. Moreover complementarities might lead to the development of comprehensive, complicated systems that might not be necessary if the company shift or radically changes its strategy within few years, with obvious waste of funds and resources.

Finally, theoretically robust designs where complementarities have been taken into consideration should reduce uncertainties and minimize risks for both producers and users. In a perfect and stable world with perfect knowledge, the exploration of complementarities could establish optimum designs for the individual product and processes in questions (Rothwell and Gardiner, 1988). Unfortunately, this situation rarely happens in practice given the uncertainty about market and competition. Therefore, strategically, it sometimes might be better (or more practical) to opt for a robust compromise design configuration rather than for a lean optimal one (according to the business value complementarity framework) in order to cope with the uncertainty of the marketplace and marketspace. However, companies that are starting using the holistic approach and the complementarity concept in defining their strategies are starting appearing. For example, Hax and Wilde (1999) identify the system lock-in strategic option, where the company considers all the meaningful players (complementors) in the system that contribute to the creation of economic value. According to Hax and Wilde (1999) Microsoft, The Yellow Pages, Visa and MasterCard are examples of companies that have used an holistic approach to lock in all the complementors or companies that would create and maximize the value to the company.

9.5. Conclusions

This chapter has presented a framework (methodology) to help formulate organizational strategies and technology choices when entering the e-commerce field. This framework is only at theoretical level. Further research has to be done to validate the model by applying it to specific industries and by finding some empirical support. There are many companies starting using the World Wide Web for electronic commerce. In organizing a

business for electronic commerce, a number of choices have to be made at every step of the process. Choices and decisions have first of all to be made regarding what strategy to adopt (cost, differentiation or focus) and then what are the business processes that have to be re-organized on-line and what technologies to use in order to support such a strategy. In this article we have argued that companies should explore the synergies and complementarities existing among the business processes, the supporting technologies and between the business processes and technologies in order to invest in electronic commerce systems that best supports the company strategy. This is equivalent to the marketplace concept that the structure, systems and human resources of an innovative organization should all interact with its strategy, both influencing and being influenced by it, and further, that its strategy formulation should be guided by a good understanding of the nature of innovation (Fairtlough, 1994).

CHAPTER 10: Towards a Business Value Complementarity Framework of Electronic Publishing

This chapter, which is the last one on the strategy section, develops a business value complementarity model of electronic publishing. The main objective is here to illustrate how the model developed in chapter 9 can be applied to a specific industry or problem. The overall dependent variable that has to be optimized becomes therefore electronic publishing, instead of electronic commerce of chapter 9. This model could be used as a normative model for developing, planning and managing the transformation of the publishing processes for the marketspace. The main idea of this model is that by applying the concept of complementarity in the choice of the value chain activities and the corresponding business processes that have to be reengineered for the online marketplace, it is possible to reach an optimal model. Rather then arguing that complementarities between the different variables of the model should be explored, (which has been done in chapter 9) here the specific online business processes of the value chain activities of electronic publishing are derived and discussed. As mentioned earlier, some of these business processes are specific to electronic publishing (mainly those corresponding to production and distribution), while others have a more general application such as marketing, sales and customer support. For these three value activities therefore the discussion will have a more general theoretical character, with referrals to the scientific, technical and medical publishing sector where examples have been found or where appropriate. The technologies supporting such processes are mentioned (and explained in detail in the appendices I-IV) and examples of specific corporations or journals that have reengineered some business processes for the

on-line marketplace are given. As already stated, it is too early to find companies that have reengineered the whole value chain for online commerce therefore the examples are taken from different companies within the scientific, technical and medical (STM) publishing sector. This chapter is a longer version of an article that has been published in the March 1999 issue of the Journal of Information Science.

10.1. Introduction

As the Internet and the World Wide Web (WWW) become more and more popular, many publishing companies need to reconsider their strategy in order to incorporate electronic commerce into their business model (Scupola, 1999; Chellappa, 1996) . The main idea is that publishing companies need to start competing in two worlds: a physical world of resources that take place through traditional markets and a virtual market of information, that takes advantage of the electronic commerce and that gives rise to the "marketspace". In the "marketspace" there could be many opportunities for traditional publishers, given the type of "product" they produce and deliver: information. The competition in the marketspace comes not only from the same competitors that operate in the market place, but also from companies that operate only in the marketspace. By searching Internet, we can find many companies that operate only on the Internet. These vary from simple book sellers to companies that have the same functions as the publishing houses in the market space, and especially the functions of organizing and screening the information in order to facilitate the consumer search and to gain the consumers trust (new electronic only intermediaries). Moreover these companies have also to deal with two kinds of value chain: a physical value chain and a virtual value chain made of information. In the particular case of

Scientific, Technical and Medical publishing we have a mixed (physical and virtual) value chain as for example the processes of copyediting cannot really be done electronically. Finally, to succeed in the electronic publishing business, a company must have, acquire, or develop in-house five key strategic resources: information, appropriate data processing facilities, communication channels, enough financial support to overcome initial low rates of return on investment, a clear appreciation and understanding of market/user needs (Earnshaw, 1996).

10.2. Mass customization: a dominant trend in electronic publishing

In order to understand how electronic commerce is changing the publishing processes it is necessary to understand a major trend in the publishing industry as in many other industries: mass customization (Pine, 1993). Reengineering the publishing business for the online market place gives great opportunity for mass customization, as journals completely tailored to the particular customer can be produced on demand and on the fly. To support this idea, we mention some trends that are emerging in the publishing industry:

1. From individual documents to compound documents: individual documents contain only text, while compound documents integrate text, pictures and eventually video in order to make the online experience more attractive and exciting.
2. From isolated items to universal linking: while individual documents are linear and physically limited to themselves, dynamic documents, through universal linking, can connect the readers to other related files just in a second by clicking on the desired items.

3. From subscription-only pricing to advertiser and sponsor subsidies: this is especially suitable to special interest publishing as advertising works better in special interest publications, where the advertisers have the opportunity to reach highly targeted markets at a reasonable price.
4. From Internet versus the commercial online services to Internet via the commercial online services: due to Internet services such as the World Wide Web (WWW), also online services are offering bridges to Internet to their subscribers.
5. From publishing as a rocket science to publishing for everyone: the Internet's tools, low-cost structure and the high audience are making publishing available to any literate person, being the financial and technical barriers to entry fallen dramatically, since the World Wide Web (WWW) has taken off in the spring 1993. On the other hand, this creates much confusion, information overload and more then ever the need for online intermediaries such as editors and journals to filter the information published for information quality assurance.
6. From CD-ROM vs. online services to CD-ROM integrated with online services: more and more often the online information is offered both online and on CD-ROM (Janal, 1995).

As already said in chapter 9 and better explained in the appendices, the technologies that most importantly will affect each step of the workflow of the publishing process and of the value chain of the single publisher and allow for this kind of mass-customization are the information and communication technologies. These can be seen as formed by three components: communication technologies, application software and database management systems.

Moreover, electronic publishing as opposed to the print versions of journals should reduce costs and add value to the standard printed product. These can be achieved by the following capabilities:

1. Enabling faster access to information.
2. Enabling electronic searching of research results such as articles, abstracts, etc.
3. Offering new forms of access as for example to include access to relevant data in end products, thus providing additional information.
4. Providing new links between units of information such as integrated referencing, hypersearch capability and forward references to other articles.
5. Providing for new distribution systems.
6. Maintaining long-term archive of journals' material.

10.3. Towards a new definition of electronic publishing

Electronic publishing (even though the term is used in many different ways) falls traditionally into two categories, with overlapping in some part of the process (CEC, 1992):

1. The use of computers to facilitate the production of a conventional product;
2. The use of computers and telecommunications systems to distribute data electronically.

Dijkhuis (1985) presents a very detailed taxonomy of definitions of electronic publishing. If we consider the primary activities of the publishing industry's value chain in fig.5-1, we can redefine electronic publishing as the use of computer and Internet-based

technologies to organize the publishing process completely on-line. This process goes from the creation of the product (article, journal, etc.) at author level to submission for review, to creation of the product in the final format ready for electronic distribution to the reader/end user, to marketing and sales. Electronic publishing becomes therefore the process of on-line production, on-line distribution, on-line marketing (including advertising and market research), on-line sales and on-line customer support. Such computerization of the publishing process can now be achieved due to advances in telecommunication and computer technologies such as interactive databases, satellite telecommunications, powerful application software and networks such as Internet, and the World Wide Web (WWW). In the following sections first a business value model of electronic publishing is developed, then descriptions of how the publishing processes could be transformed (and are being transformed) by the advent of the new electronic commerce technologies are given. As already said, Appendix I, II, III and IV give detailed descriptions of the classes of technologies available to implement such new on-line processes.

10.4. Towards a business value complementarity model of electronic publishing

In this section, a business value complementarity model of electronic publishing is developed. This is a particular instance of the business value complementarity model of electronic commerce developed in Chapter 9. This model can be used as a guiding methodology to explore synergies between the different activities, publishing processes and supporting technologies when formulating a strategy to enter the electronic publishing

field and to optimize the design of the computer system necessary to go on-line (see fig. 10-1). The high performance variable (dependent variable) is in this case electronic publishing. The intermediate variables are the value chain activities, while the business processes and the complementary technologies are the independent variables.

As in the model of chapter 9, the basic idea is that the exploration of complementarities among the different independent and intermediate variables should lead to an improvement in the performance of the high level dependent variable. The business value model in fig. 10-1 has to be seen, therefore, in light of the complementarity theory at all the levels of the hierarchy. Complementarities might exist between the primary activities, between the business processes constituting each activity as well as between the technologies. Finally, complementarity might exist also between the business processes and the supporting technologies. Please refer to chapter 9 for a detailed presentation of the general model and a theoretical discussion of possible complementarities between the different dependent variables. In this chapter it is shown what the specific business processes are corresponding to the value chain activities of electronic publishing and how the model in chapter 9 (See fig. 9-1) can be applied by deriving the specific business processes of electronic publishing.

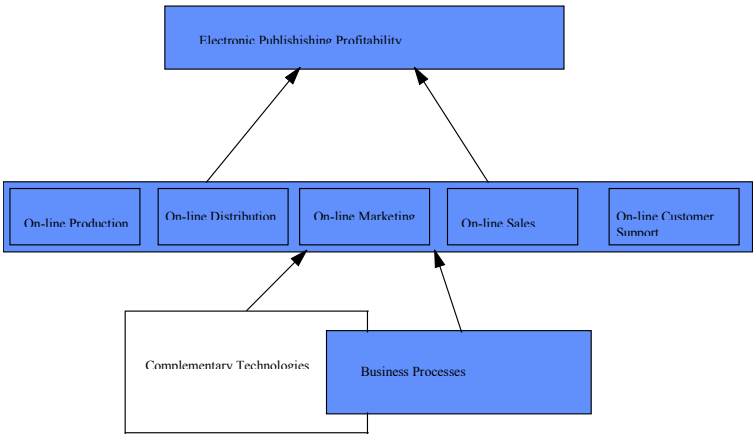

Fig 10-1: Business Value Complementarity Model of Electronic Publishing

Tables 10-1 and 10-2 below summarize the primary activities of electronic publishing, and the corresponding business processes and supporting technologies, already mentioned in chapter 9. The following sections present definitions of the on-line value chain activities and discuss how the transformation of these activities and corresponding business processes from the marketplace to the marketspace can take place.

Value Chain Activities	Online Production	Online Distribution	Online Marketing	Online Sales	Online Customer Service
Business Processes	Electronic Authoring	Electronic Search	Online Advertising	Information Gathering/ Recognizing a need	Customer Inquiries
	Electronic Submission	Selection & Retrieval	Online Market Research	Negotiation/ Searching for Solutions	Answer to Customers
	Electronic Reviewing	Electronic Transmission	Online Promotions & Public Relations	Settlement/ Making a purchase	
	Document Formatting		Pricing Models For Online Business		
	Electronic Storage				

Table 10-1: Business processes of electronic publishing

10.5 On-line production

This section focuses on the transformation of the processes of production from the marketplace to the marketspace, while Appendix I gives a detailed description of the technologies supporting this transformation. Traditionally, the production of a journal took a long time as the author had to submit the paper to the editor, then the editor had to forward it to a reviewer etc. All this occurred (and still usually occurs) by conventional mail. Electronic production means in this thesis that all the steps in this process that can be conducted with the help of computer and networking technologies are conducted in such a way. Copy editing cannot for example benefit much from the electronic commerce technologies and therefore it is the same process both

in the marketplace and the marketspace. A main advantage of this should be to reduce the overall production time and costs.

Value Chain Activities Technologies	On-line Production	On-line Distribution	On-line Marketing	On-line Sales	On-line Customer Service
Networking and Communication Technologies	Internet WWW Client/Server Web-database integration	Internet WWW Client/Server Storage & Printing Devices	Internet WWW Client/ Server Web-database Integration	Internet WWW Client/ Server	Internet WWW Client/ Server
Database Technology & DBMS	Repositories Object-oriented & Relational Databases	Databases Query Languages	Datawarehouse Inverted File & Relational Databases	Databases Query Languages	Relational Database (e.g. databases of FAQs)
Application Software	Authoring Systems (E.g. Microsoft Word, Latex, SGML, HTML) User Interfaces Browsers (E.g. Mosaic, Netscape)	Search Engines User Interfaces (e.g. filling-out forms) Browsers Push and Pull technology Profile Matching	Data Mining Cookies Profile Matching Push and Pull Technologies	Payments Systems (e.g. electronic cash, electronic cheques, encrypted credit cards) Search Engines	FAQs files Mailbots Mailing Lists Discussion Forums

Table 10-2: Technologies supporting the business processes

For example, the author creates a document in a computer format that will be sent electronically to an editor. Subsiquently the editor forwards the document to the referees in an interactive manner, finally the revised version will be electronically sent to the publisher who in turn put it on a centralized database for on-line distribution, indexing, etc. At this point of the process, the product could also be sent to a printer for the paper version, or be put on CD-ROM. In the networked environment, the classical workflow showed in figure 5-1 (the value chain of the publishing process) is replaced with a model where interactivity among the different actors plays a major role. Authors can speak

directly to readers, the reviewers could communicate among themselves (as in the case of the Decision Support System Journal (DSS), an electronic journal developed at the University of Austin, Texas, http://www.yama.utexas.edu), and finally electronic versions of the article could be put on an information repository for further retrieval, distribution and indexing. All this in a much shorter time than in the traditional publication process.

On-line production can be therefore defined as a distributed (over a network) way of handling the process of creating a journal in a format ready to be sent to the customer. In on-line production we distinguish the following business processes (please refer to appendix 1 for a detailed discussion of the technologies supporting these processes):

1. Electronic authoring: the process of writing the article in a format that can be electronically manipulated. It is important to take into consideration the requirements of the online environment when choosing a word processing package to minimize the work required to put the manuscript in a form that can be manipulated electronically for online retrieval, search and distribution. The publisher might establish rules regarding the word processing packages to be used by the authors. For example, First Monday (www.firstmonday.dk), an Internet-based electronic journal, requires that the documents sent for publication are in either plain ASCII text or in HTML. The technologies supporting the document creation process are the authoring systems. They can be distinguished as low-level procedural mark-up languages such as Adobe Acrobat, and generalized or descriptive mark up languages such as SGML, which supports HTML as document type definition (Kalakota &Whinston 1996). Procedural mark-up languages do not provide any

interactivity function, do not allow for incorporation of the document information necessary for on-line publishing, and do not allow for manipulation of the information accessed, limiting therefore the advantages of electronic publishing. Generalized or descriptive mark-up languages, instead, work on the basis of a logical description of documents and should be flexible in order to be able to use search and retrieval techniques on the documents. For example, Munksgaard Publishing in First Monday requires the article to be written by the author in HTML in order to facilitate the work at the publishing house.

2. Electronic submission: the transmission of the article over a network to an editor. This could be done for example by e-mail or by downloading the article directly to the journal's web site. The main technologies supporting this process are Internet, client/server computing and the World Wide Web (WWW). For example, The University of Texas at Austin has developed an electronic system to speed up the submission, reviewing and publication process for the Decision Support Systems Journal paper version (http://www.yama.utexas.edu/dss). In this system the author connects directly to the web site of the journal, and can electronically download the first version of a document file directly to the Decision Support Systems Journal server, where it can be accessed for revision by the reviewers. The technologies used by Decision Support Systems Journal (DSS) are Internet technologies and Oracle Data Base Management Systems (DBMS). Another example is provided by First Monday, which accepts submissions of articles only in electronic format via e-mail and preference is given to articles, which take advantage of Internet, by using graphics, programs, HTML and other feature not possible in print (http://www.firstmonday.dk). Finally, the IRIS

conference (http://www.iris22) has a template that can be downloaded from the conference server and used to format each author's article into a specific format that will make the publication of the proceedings much easier and faster.

3. Electronic reviewing: Web technology can be mainly used to speed up this process by allowing for faster transmission of the document instead of traditional mail. Here the editor could electronically notify two or three reviewers about the article or this could be done directly by the computer system as it happens in Decision Support Systems Journal (DSS) described above. It should be possible for the reviewers to access the article through the web, view the article on their screen, add notes and comments to it in an electronic fashion and even interact with each other to exchange comments and opinions (www.yama.utexas.bus.edu/dss). Important issues here are security (both of the manuscript and of the comments made by the reviewers) and copyright that deal with electrocopying of information in electronic format. Many solutions (technical and not) are presently being looked upon both by the European Union and by the United States Government (Page, 1997). Please refer to section 4.3 for more details on these issues. Technologies supporting this process are the networking technologies described under electronic submission above.

4. Document formatting: In the traditional environment, publishers used proprietary and presentations based systems to re-type the original document into the desired production format (see the Elsevier Science example at the end of this section). The typesetters did this, after the copyeditors had checked the article. In the on-line environment the role of the copyeditors might not change, while the typesetting process could be either eliminated (Collier, 1998) if the

journal is totally electronic, or in the present situation at least streamlined by having for example the typesetters working directly in SGML environment. Authoring systems (See electronic authoring above) and application software such as ad-hoc micros play an important role in the implementation of this process. Elsevier Science is an example of a publisher that has started re-engineering the production process by streamlining many different departments into an SGML-based environment (Tulip Report, 1996). Munksgaard Publishing and Blackwell Science have started a pilot project to explore the production of journals directly into SGML-based environment (interview with a major publisher).

5. Electronic storage: the process of putting the document into a repository or database for further search, retrieval and distribution through networking and computer technologies. Issues are performance, integrity, method of distribution and level of granularity for mass customization purposes. In fact, as we are moving beyond the era of mass production in the manufacturing arena, it is likewise reasonable to move beyond mass production and towards mass customization of journals. To provide for electronic storage of all the published material for further search, retrieval and sale, the publisher has to build a local digital library. Regarding the costs of storage, Collier (1998) shows that in the electronic environment are lower than in the marketplace. The same is also true for the distribution costs and physical costs such as paper, printing, disc etc. Repositories, databases, and user interfaces are the technologies that support the electronic storage process. The relational and the object-oriented databases and Database Management Systems (DBMS) are the best suited to build repositories of complex data such as documents containing text, images, graphics, audio and

video for customization of information products (Spring, 1991). For example, the Decision Support Systems Journal (DSS) information repository is built with a relational Database Management Systems (DBMS), Oracle.

A publishing house that is reengineering production for electronic commerce is Elsevier Science. Elsevier Science originally entered the field of electronic publishing with the Tulip Project, which connected the company with many university libraries in the US for electronic creation and delivery of many journals. In this project, they first produced the paper version by using many different formats and production methods and then scanned the paper versions with an optical scanner to obtain the electronic version ready for network delivery. As is said in the Tulip Report (1996):

"At present, Elsevier Science is consolidating all these different production methods to streamline the output into standard electronic format such as SGML, Postscript, PDF, JPEG and TIFF, which then becomes the basic material to not only produce paper versions of the journals in the most appropriate typeset form, but also to provide real electronic versions of the journals based on SGML. In the future we should experience a state where paper is the derivative of the electronic journal, the reverse of the situation in Tulip (Tulip Report, 1996, p. 4)".

10.6 On-line distribution

Online distribution implies the use of a telecommunication network such as Internet to send the electronic format of the journal, article, etc. to the end user/reader for reading, downloading or printing, in opposition to the distribution by conventional mail of the marketplace. Once the product is

prepared into a publishable format, it can then be distributed in different forms: CD-ROM, Internet and paper version.
In this section we are mainly interested in the distribution of papers over networks such as the Internet. This can be done in many ways. For example, the journal can be sent through e-mail messages, if the reader has a subscription to the journal or through list servers as for example ACS Magazine, an electronic journal distributed by the Library School Department of the University of Houston. The article or collection of articles could also be sent on demand to the client site over the network. An important issue in the on-line distribution is the copyright problem. In this section we describe how the processes of the distribution activities can be transformed in the marketspace. The technologies available to implement this transformation are given in Appendix II. The main processes in the online distribution from the standpoint of the final user are:

1. Electronic search: The user first formulates a query about the information needed by filling out a form provided interactively by the browser (such as Netscape navigator, Mosaic, etc.) and then sends the form back to the system, which searches, for the required information. End-user interfaces, databases (see electronic storage) and browsers play a very important role in this process. The browser, used in the interactive part of the process, is an application allowing users to manipulate the information located on different servers, once it has been found by the search engine. User interfaces should provide a user-friendly screen to search the queries and to browse matched documents. For example Ovid technologies has a very friendly graphical interface, which is the same across all platforms, obviating the need for user retraining (http://www.ovid-tech).

2. Selection and retrieval: the system presents the list of items retrieved, the user selects the most appealing ones and then the

actual retrieval of the object takes place. Supporting technologies in this process are databases and Database Management Systems (DBMS) (see electronic storage), user interfaces (see electronic search) and search engines. The problem with search engines is that often they find too much information that matches the query, most of which may be irrelevant. Recently, filtering systems have been added to many search engines to filter the information retrieved or rank order the items in order of importance. WAIS is a search engine often used by publishers that are entering the electronic publishing business, as for example Springer-Verlag. This system is very popular because it uses natural language queries. Many search engines, including WAIS, use a technique known as profile matching to automatically run searches and alert the user when new documents of interest to him become available. Profile matching is based on a personal profile built for each user indicating the reader's interests and parameters for customized interaction. Springer Verlag uses profile matching in their on-line system LINK (http://www.springer-verlag). Elsevier Science has also established a system as part of the Contents Direct and Contents Alert Service, which sends via e-mail the prepublication of the table of contents of each journal to the interested users (http://www.elsevier.nl/homepage)

3. Electronic Transmission: physical transmission over a network of the retrieved information, on-screen displaying and eventual storing on the local computer of the final user or printing. Technologies supporting this process are the Internet and the World Wide Web (WWW), computer, printers and software packages that can get the information stored in the database and transmit it to the web. These packages also have the capability of creating a paper or a CD ROM version of the document. See the examples of Link and Ovid technologies in this section. The recent developments in push technology should

start a new era in the on-line distribution. Push technology promises, in fact, to deliver proactively the customized information needed, when needed, directly to the user desktop, thus avoiding the lengthy searches for information that characterize the phase of search, retrieval, and transmission. It is a substitute for pull technology, which is basically how the web works today.

10.7 On-line marketing

As already said, since marketing is a more general activity then production or distribution, which are more dependent on the particular product in question, the discussion in this section will have a more general character. I begin by describing how the Internet can change the marketing concept, contribute to the implementation of micromarketing and target marketing and then I describe the processes of on-line marketing.

10.7.1 Background

From the point of view of marketing communication, online marketing is not a one-to-many, one way form of communication, as it is in the mass communication media of the market place. The hypertext, interactive and mass customization possibility of the Web makes the customer in charge of what he/she wants to explore and investigate (Hoffman and Novak, 1996). The World Wide Web (WWW) also allows a 'Custom Mass Production' which is buyer driven. As Elofson and Robinson (1998) say:

"Buyer driven custom mass-production entails joining buyers with locally unique preferences together in a global electronic format to form a market that suppliers can serve in a cost-

effective way…. Custom mass-production (CMP) can be realized through an electronic broker that represents individual buyers in a multistage bargaining action…The desirable effects of such an electronic broker, a CMP broker, include lower search costs, greater buyer power as a result of buyer consolidation, and lower barriers to new entrants as a result of using the web as a distribution channel (Elofson and Robinson, 1998 p. 58)".

Marketing communication and advertising on the web should also be much cheaper than in the traditional media (Kling, 1994). A publisher that would like to start its business on the electronic marketspace has to consider two types of marketing: conventional marketing as we know it from the marketplace and a new type of marketing concept that should be suitable for the online environment. As Palmer and Griffith (1998) say:

"The shift in underlying marketing fundamentals may be the driving force luring many organizations such as General Motors, Exxon, JC Penney, Wal-Mart, and others on the web. The web may represent a fundamental paradigm shift in the way business operates (Palmer and Griffith, 1998 p.45)".

There are two main concepts that are fundamental to online marketing: customization or the idea of providing different users with different types of information; and interactivity, which may be used by the seller to understand the consumer's needs (Hoffman and Novak, 1996). More importantly, interactive communication is necessary in order to process a transaction. Marketing on the Internet is still not mature. Many talk about the usefulness of the traditional marketing paradigm in the marketspace, but a clear, consolidated marketing concept that works fine for the online commerce has not been developed yet. Many businesses are trying different pricing and business

models, but still there is much confusion as to which are the most suitable to the online community. For example the advertising industry is struggling with the new paradigm of online marketing. They do not know how to charge for advertising. This confusion leads to many trials and error types of situations and to many opportunities for the pioneers who establish an early presence in the online market in order to first understand how this electronic world functions and later to gain a competitive advantage in the electronic market place.

In the following sections we give first a description of the marketing concept that is emerging in the online community, then we talk about micromarketing and target marketing, finally we give a description of how the marketing processes (advertising, market research, pricing and promotion) are being transformed in the marketspace. A brief description of the technologies available to implement this change is given in Appendix III.

10.7.2 The emerging online marketing concept

As already said, online marketing is not anymore a one to many, one way, form of communication, but the web interactive nature lead to a one to one, both way, interactive relationship. Marketing communication performs normally three functions: inform, remind and persuade (Hoffman and Novak, 1996). The traditional mass media are well suited for the first two functions, inform and remind, but not for the persuasion function which is much more effective in the marketspace, where it is possible to make ads and content highly customized to the specific user. Marketing communication on the World Wide Web (WWW) is driven much more by the consumer than in other traditional medium due to the interactive, nonlinear searches initiated and

controlled by the end user. Therefore concepts such as customized advertising, customized marketing, online market research become extremely important. The message sent to the customer has to be interesting and possibly customized to the specific consumer profile in order to attract attention. In the World Wide Web (WWW), the hypertext and interactive characteristics make the customer in charge of what he/she wants to see, explore and investigate and make the final user not just a passive subject, as in the one to many model, but an active subject, with the power of deciding whether he wants to take a look to a specific ad, whether to go back to that site at other times, and finally whether or not to buy the product. Moreover, marketing communication and advertising on the web should be much cheaper then in the real world, given the structure of the system.

Kling (1994) has compared the World Wide Web (WWW) with other marketing media such as broadcast media, salesperson, print media, automated telephone systems, and he found that the World Wide Web (WWW) appears to have the following properties:

- low marginal cost of providing information to an additional user;
- low marginal cost of providing additional information to a given user;
- low cost of providing timely updates of information;
- low fixed cost of setting up a server;
- low cost of providing customization;
- low cost of interactivity.

The ability of the web and other information technologies to gather, analyze and distribute large quantities of data, makes the

World Wide Web (WWW) very attractive in electronic publishing because of the potentially wider selection of products available to the end user compared with conventional distribution channels. The interactive aspect of Internet allows then for relationship marketing and product customization to an extent that is not possible on the conventional media. In this thesis, we deal mainly with the marketing communication, advertising, pricing, market research and promotion and publicity aspects of the marketing activity.

While in the traditional marketing approach the only strategy available to the marketer is the push strategy, in the online marketing both push and pull strategies are possible. In interactive marketing, customer satisfaction is very important given the structure of the communication medium. In fact, if in the real world the so called "word of mouth" negative and positive feedback is going to be to some extent limited to the people a single user knows, on the Internet a negative or positive comment could potentially reach hundred or thousand of people, if we only think about the power of Internet tools such as Newsgroups. One of the characteristics of Internet in fact is to give rise to an on-line community, characterized by particular interests (Hagel and Armstrong, 1997; Kannan, 1998). Finally, as Porter (1982) does in defining the primary and secondary activities of the value chain, we also distinguish marketing from sales and customer support activities.

10.7.3 Online micromarketing and target marketing

One of the most important benefits the Internet and the World Wide Web (WWW) have brought to companies is the easiness with which to do targeting and micromarketing. Micromarketing

means focussing on a specific segment with particular characteristics within the total target population. Customer targeting, within the selected segment, is also a way to come closer to the consumer and to sustain a two-way communication between the seller and the buyer. The importance of micro marketing and targeted marketing is revealed by the fact that the average consumer is constantly exposed to commercials of every kind during their daily lives (Hoffman and Novak, 1996). In the marketplace, micromarketing is mainly implemented by direct mail, telemarketing and sales people. In the marketspace micromarketing can be implemented by producing, possibly on the fly, highly customized "publication products", such as magazines or newspapers ads tailored to the specific needs of the particular customer, therefore producing different advertising contents depending on the customer profile.

There are also Internet advertising agencies that are starting now and whose job is to collect data about customers and then sell these data to companies in order to develop targeted advertising campaigns. DoubleClick, Inc. is an Internet advertising broker, established in New York that targets its ads very narrowly. This company collects information about the computer software the customers are using, what are their IP addresses, what are their reading habits and try to guess what kind of products they might be interested in buying (Moukheiber, 1996). With this kind of information, they can count how many times a reader has seen an ad and how many times they have clicked on it. If after the third time the user does not click on the ad, they remove it from that particular machine in order to save money. This is very equivalent to what a mail order does: they remove the customer from the list if after a certain number of times he hasn't ordered anything. Moreover, it could be possible to get information or ideas about advertising campaigns also by the discussion groups

or from Internet forums explicitly set up on the Internet for that purpose (Kannan, 1998).

The Internet and World Wide Web (WWW) allow promotions, discounts and advertising to be highly tailored to the individual customer, by offering a level of service that is not possible in the marketplace. While in the marketplace the marketers are the ones that bear all the costs of the marketing campaign, in the marketspace the costs are shared among the marketers that have to invest resources for the campaign, the customer who often has to pay for the connection to Internet on the base of connection time or bytes of information transmitted to his computer (and therefore would not like to invest his time on unuseful advertising) and the service provider, who needs to store and transport the data.

10.7.4 Processes of on-line marketing

In this section we would like to illustrate what are the business processes of online marketing and to show some of the similarity and differences between the marketing processes of the marketplace and the marketspace. Within the marketing activity we distinguish on-line advertising, on-line market research, on-line promotion and on-line public relations, and finally on-line pricing models.

1. Online advertising: online or interactive advertising is the use of Internet and other on-line systems both to advertise in electronic journals and to advertise on networks to create awareness. There are two ways of advertising on the Internet: the pull-based and the push-based model. In the pull-based advertising model the message is put out in generally available areas (e.g. a banner on a World Wide

Web page) from which the consumer must pull the information. In the push-based advertising model, specific consumers are niched out and addressed directly, traditionally by sales people or direct mail, in the online marketplace by e-mail. New intermediate advertising models based on the idea of a broker who contract with advertising agencies and negotiates with the customer whether and what kind of advertising to see while browsing are now emerging (Kohda & Endo, 1996). The technologies enabling interactive advertising are the networking technologies, database systems (see electronic storage), profile matching (see electronic selection and retrieval), push technology (see online distribution) and cookies or similar software. For example Infoseek uses cookies to capture behavior information in order to provide more direct future searches. Springer Verlag uses a software package to track the users connecting to the LINK system, which is different from the cookies and follows a session concept (http://link.springer-ny.com/tutorial/service.html).

2. On-line market research: online market research is the process of collecting information on-line about the consumer, such as the types of sections or articles she/he reads and other collectable types of information. Many are rising ethical issues regarding the collection of information about the customer during an on-line session, without the customer knowing about it. The main purpose of market research is to understand the customer's profile, demographics, etc. This information can be used for on-demand mass customization of journals or to develop a push or pull strategy. Market research data can be collected via discussion forums, creation of information databases about the customers visiting the site (similar to the point of sale (POS) systems) or by buying data from third party

companies (Kannan, 1998). The most important technologies supporting this process are web-database integration, datawarehouses, databases (see electronic storage) and datamining tools such as intelligent agents, multidimensional analysis, traditional querying and reporting tools (Watterson, 95). Many companies are buying software packages from third party companies to collect data on their customers (See the example of Springer Verlag in On-line Advertising).

3. On-line promotions and public relations: this is the activity of finding successful strategies to promote the company and the company's products in the online environment by posting company's information to newsgroups, list-servers and e-mail lists. Promotional tactics from large companies show that consumers are genuinely interested in online promotions (Janal, 1995). The technologies supporting this process are Internet services such as e-mails and newsgroups. A strategy could be to combine the on-line promotional activities with the marketplace activities as the following example shows. Elsevier Science in the Tulip project used both on-line and traditional types of promotions (direct mail campaigns, announcements on traditional bulletin boards) to make the electronic version of the journals known and accepted by the user community. Some online promotional activities undertaken by Elsevier Science in the lunch of the Tulip Program were the introduction of the Tulip home page on the Elsevier World Wide Web (WWW) home page, announcements on electronic bulletin boards and targeted e-mail messages (Tulip Report, 1996, p. 2).

4. Pricing models for on-line business: these involve finding the most suitable pricing models for the online community in

order to diversify the company's products and generate high revenues. In electronic publishing, emerging pricing models are pay per drink, pay per site (site licensing), pay by subscription, pay by connect time, pay by search time, and no direct pay (free information subsidized by advertising). The pricing model that a company can adopt is strongly dependent upon the technologies used to build the repository and the payment systems. Until now in Scientific, Technical and Medical (STM) publishing the dominating pricing model has been the subscription model. Recently OVID Technologies, an electronic intermediary, is offering the subscription model, the pay per drink model and a combination of both. (Http://www.ovid-tech)

10.7.5 An in-depth analysis of the processes of online marketing

This section analyzes in more details the business processes of on-line marketing briefly discussed above: on-line advertising, on-line market research, on-line promotions and public relations and on-line pricing models.

10.7.5.1. Online advertising

Advertising is the process of reaching the customer through mass media, Internet, salesperson, with the clear objective of influencing the customer's purchasing behavior. A company that wants to start a digital business should not only advertise online but also use the conventional advertising media, especially at the beginning of the business. In this section we are mainly concerned with online advertising. Janal (1995) defines the concept of interactive advertising on Internet as

" The ability to interact with the source of the message you are receiving to either stop the playing of the message, to divert it to another area within the message for additional info, and to have the source of the message respond to your desire. Marketers who want to get a message across should not think absolute persuasion, but rather serving the online service's customer through the efficient and intuitive delivery of information about the product (Janal, 1995, p. 270)".

Pete Snell, general manager of CKS Interactive, an advertising agency, in Janal (1995) says that the following are important steps regarding doing successful online advertising:

1. Throwing away the commercialism. The information should be delivered in a reactive, not proactive, mode. A forum or area where people can go to get information should be established, and ads to attract people to such a forum should be used. This online forum can create one-to-one or one-to-many dialogues and its interface should be easy to navigate by being intuitive, looking good, and having communicative icons.
2. Reminding about the power of word of mouth. This is the best way to sell a product and this is especially true in the online communities, where a user satisfaction/dissatisfaction can instantaneously be communicated to all the members of the community.

Moreover, other differences between traditional advertising and online advertising include:

1. The dimensions of time and space take on completely new perspectives online. Space is virtually unlimited, and time is what the customer takes to read an ad, not what is bought for delivery. Ads can use the amount of space that is appropriate

to the message, not to the confines of a page or a 30-second commercial.
2. Online ads are measured by hits or the number of times a reader accesses the ad.
3. Frequency and learning are different online because people seek out ads, and it is not anymore necessary to have high frequency levels to ensure a hit-or-miss learning experience.
4. Targeting to highly defined markets is a key benefit. Communities of people gather around common interests and topics, naturally creating qualified audiences.
5. Advertising online creates a new time frame. Messages can be created, posted and revised in minutes, not months.

Advertising models on the Internet

As already stated, there are two ways of advertising on the Internet: push-based advertising and pull-based advertising. Active or push-based advertising is usually implemented with the use of e-mail, often called junk e-mail. E-mail is not appropriate in a networked environment, because it lacks the main characteristics of interactive marketing, which are adaptability, flexibility and responsiveness. In interactive marketing, in fact, it is important to have a dialogue with the customer and to get some feedback from him/her. Pull-based advertising should be informative and educational to attract the consumer attention. Usually incentives are built in the message to stimulate the customer's interest and response, in order to build a relationship between the company and the customer. But can consumer awareness of the existence of a company be created? This can be done according to O'keefe (1996) with three different models, described below.

- Billboards: the billboard model refers to information placed where it will come to the attention of customers in the course

of other activities and does not require active search. Billboard advertising is often used to reinforce or remind the consumer of the advertising messages communicated through other media (Kalakota and Whinston, 1996). Billboard advertising should be clear, direct and simple because the ad is going to be seen by the customer while he is surfing the net and probably will not spend much time viewing it.

- Virtual Mall: this option relieves the business from managing its own server, by leasing some space from the mall owner, who draws traffic to the mall by advertising. Often the mall owner manages also the orders and the transactions. Virtual malls provide entertainment, information as well as shopping.
- Virtual Catalogs and Yellow Pages Directories: these services include electronic resource location and services, yellow pages services, mail address look up, services equivalent to the telephone companies' white pages. They often couple information on products or services with facilities for ordering, like a physical catalog. Other advantages of virtual catalogs are: 1. The catalog can be linked to the inventory data, so that the user can see if an item is immediately available or not; 2. A company can immediately add new items to a catalog, without waiting for the next catalog printing; 3. The consumer is provided with search facilities to quickly locate items. This is especially useful for producing catalogs with thousands of items, such as books or articles.

As already stated, new research in this field suggests models of online advertising implemented by introducing intermediaries or agents who contract with the advertising agencies and negotiates with the users to see advertisements while browsing. This process is in many way similar to the subscription procedure for

technical magazines, which are full of technical articles and advertisements that target the subscribers of the magazines (Kohda and Endo, 1996).

10.7.5.2. Online market research

Online market research is the online collection of data about what the client buys, how much they buy, what are their preferences, etc. in a database from which it should be possible to conduct market segmentation, customer profile, etc. This is similar to what the point of sale (POS) systems have been doing until now at the retailer site (Varney and McCarthy, 1996).

Data collected on the customer account can be used for promotions targeted to the single end user, in this way avoiding the big wastes of across the board promotions. In fact, in interactive marketing it is possible to offer discounts only to those customers that are cost sensitive and that would be willing to switch brand or shopping habits just to save money. Online market research data could also be used to develop a discriminating pricing strategy. This can be done by directly collecting data into a database on the customers that log on to the company site (in our case the publishers' site). In fact, it is possible to keep on the World Wide Web (WWW) server detailed information about the files that were accessed, how frequently they were downloaded, what are the users' IP addresses that access such files, how much that IP spends monthly on the site, what kind of information the user buys, what paths they are navigating, how much time they spend on each page of information, etc. As already said, ethical issues about collecting information on the consumers without they knowing anything are very important and a possible barrier to the collection of such data. Another possibility is to buy the data directly from third party companies, who have the specific

functions to collect and sell such data. This is what is done by Doubleclick, an Internet advertising broker. As Kannan (1998) say:

" These intermediaries contribute to an efficient market by adding value in five distinct ways: 1) researching customer information needs, 2) Acquiring the relevant information products, 3) managing intellectual properties and copyrights, 4) authenticating information servers, 5) complementing, processing and adding value to information products. The role of intermediaries in researching customers needs will contribute to lowering search costs as they have better knowledge of the information sources and the suitability of the diverse and complementary information from different sources for customer needs (Kannan, 1998, p.39)".

In fact, even though on-line information can be accessed quickly, it might be expensive especially since most on-line servers are charging by the hour, which may result in high costs for inexperienced searchers. Intermediaries with their expertise in searching and their extensive knowledge of the servers, their contents and value might conduct the search in a much more efficient way. This cost advantage might increase as intermediaries acquire specialized knowledge and expertise (Kannan, 1998).

There are other online sources of information that can be used for market research such as general and specialized newspapers and periodicals online, historical research that can help marketers get a perspective on events and discover the history of their competitors as well as information about advancements in the field. Demographics information can give information about where the customers live and which markets are emerging. Finally, while the point of sale (POS) terminals memorize only

numerical data, the data collected on the marketspace are more complicated, therefore new techniques to store and analyze them are required. Another area of interest is what kind of analytic tools such as forecasting models, statistical programs, etc. to use in analyzing this raw data to come up with a successful marketing strategy (Wheldon, 1997; Watterson, 1995).

10.7.5.3. Online promotions and public relations

Promotional tactics from large companies show that consumers are genuinely interested in online promotions (Janal, 1995). One of the promotion strategies that has been proved successful is a free product sample, such as allow the consumer to look at a short description of an article and maybe download it. This is especially important because the all culture of the Internet has evolved around free available information. It is also possible to conduct public relations in the marketspace and at a cheaper price then advertising. Traditional public relations strategies can be used online to build relationships with the customers and reporters. Some strategies need, though, to be adjusted just for the online community. In the marketplace, some of the things that public relations can accomplish are:

- Building an image for the company or product.
- Exposing the company or product to new audiences.
- Reinforcing images and messages within an audience to create demand for products.
- Building relationships with new customers.
- Cementing relationships with old customers.

It is possible to provide online publicity directly by broadcasting your message to newsgroups, listservers and e-mail lists without having to go through a third party to promote the message. In

this way the bias of a third media is removed, by allowing direct transmission of the message. Online publicity also has the advantage of creating a one-to-one relationship between the company and the customer. In order to provide online publicity it is necessary to publish informative material about the company and its products online. The information published online could include press releases, company background, fact sheets, testimonials, data sheets, case histories and financial reports. Once the press release or other information has been created, it can be posted on some of the newsgroups and forums that cover that topic, company-operated forums, mailing lists and paid press release distribution services (Business Wire and PR Wire are two such examples that distribute company press for a fee) or in some of the magazines and newspapers that are offered online. Press releases including abstracts of new articles can also be sent by e-mail to the customers' addresses that are accumulated into a database during the business operations.

For example Cyberia Communications, Inc., a consulting service for companies planning to go online, has about 500 names of online editors and journalists who are interested in their press release. Some of them prefer to get the press release by email, some by normal mail and still others by fax. Another form of publicity is to have information about the company and its products on the World Wide Web home page and let the customers look at it by themselves and give them the possibility of asking questions about the products and the companies. This is done by many companies as for example Elsevier Science, Springer Verlag and Ovid Technology Inc. These questions need to be answered very quickly by the company either by automatic response systems through the Internet, or by allocating an operator to check the messages and to respond to them as soon as possible (Janal, 1995).

10.7.5.4 Online pricing models

There are no standard pricing models to sell information on the web, whether under the form of journals or articles on the web. The most used pricing models for commercial online services have been based upon connect time and usage charges. These models have the effect according to Hoffman and Novak (1996) of discouraging usage. In the short run, flat-rate systems encourage consumer experimentation and system use. In the long run, usage-based pricing maybe more appropriate as the Web matures as a sales medium, one day possibly becoming as ubiquitous as the telephone. The main pricing models can be generally classified into selling content versus licensing access.

Based on this distinction, we can distinguish six main pricing models to sell information on the web: pay per drink (or pay per glass), site licensing, subscription, connect time, search time, free information subsidized by advertising. Traditionally, the dominant models have been subscription and connect time. Now also the other models are becoming popular. As already said, Ovid Tech. (http://www.ovid-tech) uses the subscription model, the pay-per-drink model and a combination of both, while Dow Jones has used all such models.

10.8 On-line sales

Online sales means the possibility for a customer to retrieve, order, and pay for information over a network (Internet). Among the issues here are safe network payment systems and search engines to locate the information. According to traditional economic theory the market is characterized by market transactions between actors having different roles, where the aim of the transaction is a trading agreement between a supplier

and a customer and the following settlement of goods and/or services. In a market transaction the following actors can be identified: the suppliers that have goods or services to sell; the buyers that engage in a purchase transaction; and finally the intermediaries that perform supporting functions (such as banking) to improve the efficiency of the transaction process.

In the traditional marketplace, the prevailing types of sales are face-to-face sales, telephone sales and mail order. On the Internet there are two types of sales: ordinary commerce in tangible things and information commerce. Froomkin (1996) says that information commerce is more of a departure from the traditional sales. It has the immediacy of a face to face transaction, but little mutual identifying information need necessarily be exchanged. In information commerce, unlike ordinary commerce in tangible things, there may be no package to help identify the sender after the goods were delivered. Electronic publishing falls into the information commerce category, where both parties will conduct the sale or market transaction electronically: the buyer will send digital cash (or the credit or debit card number) and the seller will send digital information over the network. The market transactions (from the buyer and seller's point of view) can be separated into three phases:

1. Information Gathering or Search: from the buyer's point of view, information regarding available products, their specifications, suppliers and delivery terms is gathered. From the seller's point of view, information regarding the needs of the potential customers is gathered. The information needed in this process can be found by searching the World Wide Web (WWW) with the use of search engines such as Yahoo and Lycos. Customers can get answers to the specific questions that arise during the buying

process directly from the online seller's site if it is well constructed.

2. Contact and Negotiation: As soon as the relevant information have been gathered and evaluated, potential transaction partners are contacted and terms and conditions (terms of payment and delivery, additional services etc.) are negotiated. This process is mainly supported by the networking technologies and by the online customer service center, described in the next section. The web site also constitutes an important sale tool because the customer can choose the product that she wants to see, read as much information as she wants about the product and ask questions if necessary.
3. Settlement: in this phase (which may consist of a number of sub-transactions) the deal is settled and goods and services are exchanged for payments. The web site should allow placing an order if the customer believe to have found the information needed (Klein and Langenhol, 1995).

The main technologies supporting the settlement phase are the networking technologies, databases and repositories (see electronic storage), search engines (see online selection and retrieval) and the payment systems. The preferred method of payment on the Internet is still the credit card (encrypted or not). Normally the user fills out an online order form with personal information and the credit card account number and sends it over the network. Due to security issues many people prefer to make a phone call or to fax the information. Multi-site micro-payment systems are starting appearing that give the possibility to the customer to shop around on different web sites for small amounts such as a dime, fifty cents, etc.

Equivalently, the customer sees the buying process in three distinct phases: recognizing a need, searching for the solution

and making a purchase. In electronic commerce, the customers can get answers to the specific questions that arise during the buying process directly from the online seller's site if it is well built and constructed. The web site constitutes an important sale tool because the customer can choose the product that he wants to see, read as much information as he wants about the product, ask questions if necessary and finally place an order if he thinks he has found what he needs.

As already mentioned, in the traditional marketplace, the prevailing types of sales are face-to-face sales with payment systems such as cash, checks, credit and debit cards. Other types of sales in the market place are telephone sales, which lack the face-to-face aspect of a sale in a store; the interested parties very likely do not know each other and there is a time lag between the placing of the order and its fulfillment. This can lead to many problems such as the purchased information might be different from what is expected. In the telephone sale, the payment can be made by debit or credit card because this gives the merchant an assurance that the client would pay. A mailed payment is also often a prerequisite to the shipment of the good. There are many ways and many problems in conducting a sale transaction on-line, described in the following sections.

10.8.1 Ways of conducting online sales

Customers can order products in many ways:

- By completing an online order form. The home page should be an attractive and inviting catalog of the company's products and the order form should be as clear and simple as possible. In fact, long order forms asking for too much information might discourage the customers. Incentives such

as free pieces of information or granting access to other areas of the home page could be also offered in exchange for filling out the form;
- By sending an e-mail note which specifies the products that has to be purchased;
- By printing downloading, printing and filling out the order form, and then sending it via fax or phone.

Before sending any product online, it could be useful to take some steps to reduce the risks of electronic commerce, among which:

- Use of the membership method. The idea is that, as in journal publishing for example, in order to buy from a publisher's site, the customer must be a member of the publisher list, and have submitted the address and the credit card number, as well as the membership number and the password that are assigned by the seller when registering to the site. Such membership number and password should then be used every time an order has to be placed.
- Calling the credit card authorization center to verify the credit card, if the plain credit card payment system is used.
- Asking for the customer address for verification purposes. This is especially important for online orders of information products that are transmitted to the customer over the network.
- Requesting payment in advance to avoid situations where the customer does not pay giving reasons such as the product has not been downloaded properly or fully or the information is different from what expected.

10.8.2 Advantages and problems associated with online sales

Online shopping presents advantages and disadvantages. The end user can order information directly from the publisher by simply using a computer and eventually a modem 24 hours per day, 7 days per week. The information requested can be downloaded immediately or at most via e-mail. For the publisher, sales over a network can be used to build relationships with the customer and to support him/her through on-line customer service. Marketers can keep track of their best customers and alert them to sales and special promotions (see also section 10.7.5).

Electronic information, both in terms of journal content and advertising ads is usually cheaper to deliver than their printed counterparts because of savings in the printing process and in paper expenses. However, there are also many problems associated with transactions in electronic commerce. From the merchant point of view there are many problems. Examples are authentication or knowing the buyer's identity, certification or proof that the buyer has the requirements to buy the product, confirmation or the buyer's authorization for payment, nonrepudation or the customer's denial of having placed the order, assurance of payment from the buyer side. On the other hand, the buyer also has the authentication problem of determining that the seller is who he claims to be. Furthermore, other problems from a buyer's point of view are integrity or protection against unauthorized payment, recourse or the possibility of complaining somewhere if the seller fails to deliver what promised and as promised, confirmation or receipt

for the purchase made, privacy and anonymity as regarding the merchant (Froomkin, 1996).

10.9. On-line customer service

On-line customer support is the use of the Internet and other online systems to answer customers' inquiries regarding subscription policies, pricing, old issues, etc. The customer support activity should be designed to answer all the inquiries about the company and the products the customers might have in as a satisfactory way as possible. The use of online systems to answer support questions should be faster, quicker, easier and less expensive than the more traditional methods such as 1-800 numbers. The online customer support centers are open 24 hours per day seven-days a week, and this system can be used to build loyal customer relationships, even though there is still the cultural and psychological barrier that many people prefer to personally speak to an agent. El Sawy & Bowies (1997) and El Sawy (1998) give examples of corporations that have redesigned the customer support processes for the electronic economy. Jarvanpaa and Todd (1997) have surveyed the reactions of shoppers on the World Wide Web (WWW) in relation to product perceptions, shopping experience, service quality and perceived risk. They found that consumers are generally dissatisfied with the costumer service online companies are offering. The improvement of such activity for the marketspace should therefore provide opportunities for competitive advantage in the online business. As Jarvanpaa and Todd (1997) say:

"In essence, the consumers found that the merchant or mall was not attuned to the customer's needs and expectations. Even when customers found a site, which they were interested in, they

often found it uninformative, poorly organized, and difficult to order from. In addition to a lack of information about products and how to order them, the consumers noted a lack of basic information on company policies with respect to pricing, returns, delivery time and guarantees that would allow them to evaluate customer service. Others were also looking for added services such as online assistance in the purchasing process (Jarvanpaa and Todd, 1997, p. 73)".

The customer support processes can be summarized as follows:

- Costumer inquiries: the customer has some questions, and either contacts the company and looks for possible information to pull out about the company and its products, or sends e-mail messages to the customer service address.
- Answers to customers: the company provides answers to the questions posed by the customers. This can be implemented by sending personalized e-mail messages as answers to inquiries by e-mail, by posting files on the site that address FAQs or by using mailbots (Janal, 1995). The main technologies supporting the customer service activity are networking technologies such as Internet and its applications (for example e-mail), the World Wide Web (WWW) and client/server computing.

So far the online customer service has been mainly used as a complementary activity to the more traditional customer service center. For example Springer Verlag has a customer support center for the LINK system that provides support by both the traditional means such as phone and telefax and e-mail. The opening hours are still between 9a.m. and 5 p.m. MET.

10.9.1 Technologies and strategies to provide customer support

There are many strategies to provide customer support in an efficient way. The following are some of the strategies suggested by Janal (1995), we think are suitable to the publishing industry:

- Using e-mail and e-mail boxes to help the customers: this strategy provides a quick answer to the customer and low cost to the company. Moreover, almost all the users of online systems know about email or easily can learn how to use it. In this model the customer should send an e-mail to the company's customer support department, who would answer to it as soon as possible with another email message. Moreover, to optimize the use of the support staff, a separate mailbox could be established for each different product category such as business, sports, ect. or for each different magazine or newspaper available online. This removes a step in the sorting process, by eliminating the need of sending the message to the person in charge of a certain line of products.
- Creating a mailbot to respond to common questions: this will reduce the personnel costs in handling such questions, the systems will be less overloaded, and the customers will receive their answers in a faster way. This strategy is based on the idea that many customers' inquiries are identical and the support staff uses a lot of their time to answer the same type of question. By creating e-mail files and by putting them into mailbots, the company can help people find and receive information in a faster way.
- Creating files of Frequently Asked Questions (FAQs): this strategy also decreases or eliminates the use of personnel

staff in handling certain inquiries, while the customers receive faster responses. This can be posted to the company forum, Web home page or other archiving services. It is important to interview the support personnel in order to write an exhaustive list of FAQs.

- Keeping track of new questions: such questions will be answered originally one at the time and later they will be added to the FAQs file. These questions also point out new problems or customers' preferences and interests.
- Creating a mailing list of customers: this can be used to quickly distribute important announcements such as special issues contents, new upcoming products, special pricing offers such as bundling etc.

Electronic registration forms are an important tool to collect information about the customers. This information can be used in many different marketing efforts such as sales patterns across the country and other demographic patterns. These forms can be provided at the beginning of the session or during the customer support sessions by specifically telling the customer that the information in the registration form will be used to give him/her a better customer support/feedback or a better customized product. Electronic registration helps also the company to keep track of their customers, understand how often they come back, what kind of information they buy, etc. In conclusion, making the sale to the customer must be considered only the beginning of a long-term relationship. Online customer support must have an important role in building such a relationship by making every effort to ensure that questions are answered quickly and courteously. As it can be seen from the previous strategies, the main technologies for the implementation of a customer support center are networking technologies such as e-mail and e-mail

systems, and databases necessary to store information about the customer.

10.9.2 Advantages of a customer support center

Advantages of building an online customer support center include (Janal, 1995):

- Increased loyalty from customer: consumers who are getting quick answers to their questions will remain happy and might see no reason to switch to another publisher or another provider of the information needed.
- Reduced bad word of mouth: some marketing studies have showed that the dissatisfied customer might tell more people about the episode then the satisfied customer, therefore it is important to reduce the number of dissatisfied customers.
- Faster response to customer questions: the online customer support center can in fact use libraries of stored files and software patches, helping the customer to find the information they want without speaking with an agent, without having to wait for a busy customer support staff member to be available.
- Lower support costs: customers can find information that addresses frequently asked questions by themselves, avoiding the costs of returning expensive telephone calls and the use of 800 numbers. Questions can be answered in a batch, making more effective use of service representatives. Finally, questions can be directed in an efficient way to people who are more competent to give the answer.
- Customers can help answer other customers' questions: this will reduce the overload of the customer service staff and it will build a community among the customers.

- Market research: customer complaints might lead to the company's learning about the customer needs and wants and to the development or introduction of new information products.
- Profit center: the support center can be turned into a potential profit center by trying to sell additional complementary or supplementary information to the customer.

For example Road Scholar Software, Inc. of Houston, a leading publisher of digital maps and some entertainment software, by establishing an online forum with its customers has both increased the customers satisfaction and decreased the customer support costs (Janal, 1995).

10.10. Conclusions

This chapter is the last one of the part on strategy of this thesis. This chapter has introduced a business value complementarity model of electronic publishing. While chapter 9 has focused on the discussion about complementarities between the variables of the model, the exploration of which should lead to a more sound strategy in organizing the transformation of the business from the marketplace to the marketspace, this chapter has showed what are the specific business processes corresponding to each activity of the value chain of electronic publishing. The corresponding supporting technologies have also been mentioned, while an in-depth description is given in the appendices. More specifically, the transformation of the production, distribution, marketing, sales and customer support activities from the marketplace to the marketspace has been discussed by illustrating the corresponding business processes and how they could be transformed for online business. The

discussion for the marketing activity is very extensive, as the Internet can revolutionize the way of doing marketing and lead to a new marketing paradigm that has not been well understood yet and is still in evolution. This implies that since all the activities of the value chain and the industry structure might be affected by electronic commerce, corporations and in our case the publishers in the Scientific, Technical and Medical publishing sector have to start acknowledge this. Eventually they should also formulate a strategy that incorporates electronic commerce. If they do so then it could be beneficial to explore complementarities among different variables in order to increase the business value that electronic commerce would bring to the corporation as showed in the business value complementarity model of chapter 9. Some companies are already exploring complementarities in their strategy formulation as Hax and Wilde (1999) show.

Part V: Critical Assessment of Theories and Conclusions

CHAPTER 11: Critical Assessment of Theories used in the Thesis

The main purpose of this chapter is to evaluate the theories applied in the thesis in relation to the research problem. First a brief summary of the research problem and research questions is given and the overall framework of diffusion—assimilation—strategy is briefly discussed. This is followed by a discussion of the limitations of such theories in addressing our research problem and by a comparison with other theories that potentially could also have been used to address the research questions. A discussion of whether the models applied in the theory are normative has also been included.

11.1 Introduction

The advent of the World Wide Web (WWW) has started a new era in the information and communications field, the "Internet era", that is having and might have profound implications in many other industries and sectors. The industries that might be more affected are those producing services and products that can be easily transformed into digital products. Among these there are the software industry, the publishing industry, the banking and financial services industry, the travel service industry. This thesis is an attempt to understand what is the impact of Internet-based consumer oriented electronic commerce for the sub-sector of the publishing industry dealing with scientific publications. The questions that this thesis tries to answer are the following:

1. What is the impact of Internet-based electronic commerce on the industry structure of Scientific, Technical and Medical (STM) publishing with focus on intermediation and disintermediation?

2. How is electronic commerce transforming the corporate value chain and the corresponding business processes from the marketplace to the marketspace in Scientific, Technical and Medical (STM) publishing?
3. How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage terms?

To answer the research questions above, several theories and models have been applied. First of all the framework of diffusion—assimilation—strategy of technological innovation has been developed. Each step of this framework corresponds to a research question as it tries to capture and summarize the implications of a technological innovation from its diffusion at industry level, to its assimilation by single organizations to the development of a strategy to deal with this new technology. The overarching framework of diffusion—assimilation—strategy, which characterizes also the structure of the thesis, has been the reason why several other frameworks and theories have been brought into the analysis, each one corresponding to a specific step of this overall framework. This framework could be seen as an interactive model of technological change at industry level and firm strategy. Technological change, in fact, affects the corporation through the changes that it causes at industry level. Viceversa, corporations can affect the industrial structure and the diffusion of technological innovations trough their strategy. The thesis, through the model of diffusion—assimilation—strategy also combines industry and firm level, thus interconnecting micro and macro levels of analysis.

11.2 The framework of diffusion—assimilation—strategy

The model of diffusion—assimilation—strategy finds its roots in the literature of technological change and innovation, which operates both at macro level (industry) and micro level (corporation). This literature tries to understand what innovation is, how it unfolds (for example the linear model and the linked chain model), what are the processes through which it diffuses in the society, what are the models explaining it, (for example market pull versus technology push). Moreover the innovation literature also tries to understand who are the promoters of innovations in the firms and the society as a whole (for example the entrepreneur according to Schumpeter, the manager in modern literature). As already said, the model of diffusion—assimilation—strategy tries to capture the whole life cycle of the diffusion of an innovation in an industry and its assimilation and management at corporation level. In fact, in the last decade technological innovation has been seen as major change agent in markets and industries around the world. The pervasiveness of technological change has led corporations and governments to accept technology as a major strategic variable (McGee and Thomas, 1994, p. 7). The OECD (1992a) report also says that technology diffusion implies not only industrial, but also organizational changes through acquisition and use of software, adaptation of work organization and managerial structures, etc. Finally strategy is emerging as an important mean to manage not only innovations developed within a firm, but also the adoption of innovations developed by other firms (Silveberg, 1988; Sundbo, 1995). This thesis shows how the framework of diffusion—assimilation—strategy can be applied in the Scientific, Technical and Medical publishing sector. This is

done by showing what are the structural changes that technological innovation (Internet-based electronic commerce) is causing in this industry both at industrial and organizational levels. Finally, this thesis develops a model that can be used for strategy formulation in the adoption process of a technological innovation in a corporation.

The literature on technological change and innovation has been started flourishing only in the second half of this century. Traditionally, technology and technological change have not played an important role both in micro and macro economic theory. At macro level, Solow was the first to make a direct connection between technological change and economic growth. Schumpeter was the first economist that made technological change the center of his theory of economic growth. Schumpeter also linked the macro and the micro level by looking at the entrepreneur as an agent causing economic growth and by recognizing that product innovations also contributed to economic growth (Coombs, 1987). At micro-level, the micro-economic theory of the firm and markets has not taken into considerations the production and utilization of the technology. Neoclassical economics describe the firm as a production function and the dominant approach has been one based on equilibrium models (Coombs, 1987). Therefore in these theories, the firm was considered as a "black box".

11.3 Economic theories that have had importance for strategic management

This paragraph is considered necessary because the main frameworks of the analysis (presented in section 11.5) belong to strategic management and because economic theories have had a profound influence on the strategy field. Foss (1995, p. 2)

identifies three major developments in economics that have had a major impact on the strategy field. They are first the modifications of industrial economics through the use of game theory; second the contractual approach to economic organization associated among others with Williamson and finally the attempts of economists to address in evolutionary terms the diversity of firms. In this paragraph, we briefly describe some economic theories that have had influence on strategic management. They are evolutionary theories of the firm, the resource-based view of the firm, transaction costs economics and the Structure-Conduct-Performance (S-C-P) paradigm of industrial organization. These theories are briefly discussed here because they have had an influence for the strategic management theories analyzed in the next section.

The evolutionary theories are often based on a comparison with theories of evolution in biology. One of the most important contribution of evolutionary theory is Nelson and Winter (1982) framework that incorporates innovation (variation and mutation), and the firm as a knowledge bearing entity. In this framework the firm is seen as possessing a path-dependence knowledge basis or bundles of hierarchically arranged ”routines”. The main focus of evolutionary economics is at industry level, even though they also try to establish a link with the micro or firm level.

The resource based view of the firm instead tries to look more narrowly at the firm. This theory sees the firm as a collection of resources rather then a set of product market positions (Foss, 1995). Therefore differences in performance among firms are seen as a consequence of results in efficiencies, rather then in market power. The resource-based view has not given much attention to technology. This instead has been a major factor in evolutionary theories.

Transaction cost economics deal with the dilemma of whether accumulating resources within a firm versus buying them on the market and study the incentives of hierarchical organizations and regimes of appropriability. This theory could also have been used in analyzing our problem. Publishers entering the field of electronic publishing are, in fact, facing the dilemma of either building-in house or buying on the market the technological base and capabilities required entering this market. Moreover they face the dilemma of whether to subcontract the system development and maintenance or to develop it in house.

Even though the previous theories have had implications for strategic management, it has been the more traditional industrial organization paradigm of Structure-Conduct-Performance (S-C-P) that has had the most important implications for the strategy field. The Structure-Conduct-Performance paradigm, developed already in the 1950's by Mason and Bain, focuses mainly on the industry level to explain the performance and behavior of the firm. The S-C-P paradigm briefly states that the performance of the firm depends on the structure of the market and the conduct of the firms in it operating.

11.4 An overview of strategic management theories

The field of strategy has been taken shape around the SWOT (strengths, weaknesses, opportunity and threats) framework developed by Kenneth Andrews in the book, "The Concept of Corporate Strategy". This framework conceives the role of strategy as one of finding the match between what a firm can do, or strengths and weaknesses, within the possible things that a firm might do (environmental opportunities and threats). This

framework is used here in order to classify the different theories of strategic management according to their focus on the external environment (opportunities and threats) or on the corporation (strengths and weaknesses). Therefore, we could say that the strategy literature could be divided into two streams. One that takes the starting point in the environment for strategy formulation thus focusing on the opportunity and threat of the SWOT equation, and another one that looks at the internal capabilities of the firm for strategy formulation thus mainly concentrating on the strengths and weaknesses (Trott, 1998).

The evolutionary theories of strategic management have their roots in the evolutionary theory of economic growth. They focus primarily on the environment, but also on the firm, therefore having both a SW and an OT perspective. An example of evolutionary frameworks of strategy formulation is the one developed by Burgelman and Rosenbloom (1989).

In the 1980's the strategic management focus shifted on the exogenous variables of the firm competitive environment. This school headed by Porter (1980) and called the positioning school (Mintzberg, 1998) builds on the Bain-Mason paradigm (S-C-P) of industrial organization. It examines the structural forces in a firm's environment and how they influence the performance and strategy of the firm. Later, Porter (1982) also takes a look at inside the firm ("the black box"), by developing the framework of the value chain. By mainly focusing on the environment, however, the positioning school of strategic management tries to give an answer to the opportunity and threat variables (OT) within the SWOT framework.

The positioning school of strategic management states, that the industry sets the context for the strategy that the single company should follow and it can choose among different alternatives:

- Positioning the firm so that its capabilities provide the best defense against the existing array of competitive forces;
- Influencing the balance of forces through strategic moves, thereby improving the firm's relative position; or
- Anticipating shifts in the factors underlying the forces and responding to them, thereby exploiting change by choosing a strategy appropriate to the new competitive balance before rivals recognize it. (Porter, 1980, p. 30) in (Wegloop, 1996 p. 48).

It could be said that the approach of this thesis fits with the third of these alternatives. The purpose, in fact, has been to show how electronic commerce as a shift in external factors can affect both the competitive forces and the activities of the value chain thus changing both the structure of the industry and the structure of the corporation. Finally a business value complementarity model has been developed that can be used to formulate a strategy appropriate to the new competitive balance. As it can be seen from the previous statements, the concept of internal capabilities is present in the positioning school of strategy, but it is really not explored in detail. In fact, Porter (1982) mainly focused on the activities of the firm never really stressing the "capabilities of the firm" when he developed the value chain as a model of the firm.

The resource-based view of strategic management instead focuses mainly on the company's internal resources and capabilities as the focus of the analysis. Contributions by Wernerfelt (1984), Grant (1991), Pisano and Teece (1994) have been important to increase interest in the role of the firm's resources as the foundation for firm strategy. Grant (1991), for example, develops a framework of resource based view of

strategy analysis, that makes a connection between the environment and the capabilities of the firm. Moreover Hamel and Prahalad (1990) particularly stress the importance of management and the core competence of a corporation including also the technology base as a source of competitive advantage.

One of the weak points of the resource-based view of competitive advantage for strategy formulation however is the definition of resources and capabilities, which are often difficult to quantify, especially when taken in isolation (Foss, 1995). Grant (1991) distinguishes six major categories of resources: financial resources, physical resources, human resources, technological resources, reputation and organizational resources. Capabilities are instead defined as ”the complex patterns of coordination between people and between people and other resources” (Grant, 1991, p. 122). To better explain the concept of capabilities Grant (1991) uses Nelson and Winter’s (1982) concept of organizational routine. This definition of routines also leads to the literature on the knowledge based view of the firm (Grant, 1996), where the emphasis is on the knowledge of the single worker as a corporation asset and its implications for organizational learning. It could be said that the resource-based view of strategic management contributes mainly to the strengths and weaknesses (SW) of the SWOT equation and that this school of thoughts could be seen as complementary to the positioning school of strategic management in explaining the firm sources of competitive advantage Moreover, the resource-based view of strategic management does not give much importance to technology. Teece (1986) has acknowledged to some extent the importance of technology by recognizing the importance of complementary relationships between different sources, and therefore shifts in technologies might induce changes in the value of supporting and complementary assets.

What evolutionary theory and the positioning school of strategic management have in common is that they tend to operate at industry level and consider technology as an exogenous variable, while the resource based view of strategic management operates at firm level and does not really deal with technology. The positioning school, on the other hand, does not take into consideration aspects of organizational learning or social learning processes that characterize the evolutionary process perspective on strategy formulation. These theories recognize the importance of history, irreversibility, invariance and inertia as well as the effects of individual and social learning processes in studying social systems and in particular the behavior and the strategy making process of an organization.

The business value complementarity model (Barua, 1996) can be positioned within the strategy literature focusing on reengineering the corporate business processes. This strategy literature has mainly flourished in the beginning of 1990s. Hammer and Champy (1993) and Davenport (1993) have been the main exponents. This school of strategy is very practical and consulting oriented, as it is also the positioning school of strategic management. This literature especially emphasizes the importance of the technology base of the corporation as a strategic tool to increase efficiency and decrease costs. Moreover, it also stresses the importance of thinking the corporation in terms of business processes as the base of corporate strategy formulation as well as investments into the corresponding support infrastructure to create company's capabilities that transcend the traditional functional departments and are cross-functions (Stalk, Evans and Shulman, 1992).

11.5 The models used in the thesis

As already said, this thesis brings together many different theoretical frameworks and concepts, corresponding to the overall framework of diffusion—assimilation—strategy. The synthesis of these frameworks supported by some empirical material give answers to the three research questions summarized in section 11.1. The main theoretical frameworks that have been used are the following:

- Porter's (1980) model of the five competitive forces and Bloch (1996) model of business value of electronic commerce. These models are used to show how the diffusion of a technological innovation (in the specific instance electronic commerce) in an industry might lead to changes in the structure of the industry itself (diffusion level).
- Porter's (1982) framework of the value chain and the model of the virtual value chain. These models are used to show how the adoption of an innovation in a corporation might lead to changes in the structure of the organization itself (assimilation level).
- Barua's (1996) business value complementarity theory. The model of diffusion—assimilation—strategy points to the need for strategic management to recognize the importance of technological innovations for changes in the industry and corporate structures. This should be followed by the development of an adequate strategy to deal with the adoption of the technological innovation in question. Barua (1996)'s model has been used in the thesis as a basis to develop a framework to maximize the chances of success from adopting electronic commerce as a technological innovation (strategy level).

As already said, each one of the above mentioned frameworks corresponds to a specific level of analysis: the industry level, the corporation level and strategy level (or suggestions for the implementation of strategy). Given the fact that the resource based view does not deal much with the environment and especially with technology, and that evolutionary theories look more at path-dependency and history, a natural way to position the thesis was the positioning school of strategic management. This school explicitly deals with technological change as an exogenous variable and Porter (1980, 1982)'s models can be more easily used for descriptive purposes being analytical in nature. Finally, Porter's models have been considered more appropriate for this analysis also because the thesis focuses on the interaction between technological change at industry level, the organization and strategy,.

Bloch (1996) model and the virtual value chain framework are introduced because they describe the impact of electronic commerce on the models of the five forces of competitive advantage and the value chain. Therefore these models limit the focus of the analysis to the opportunities and threats aspects and to electronic commerce as a technological change impacting the industry and corporation, which is the focus of the research questions number 1 and 2 briefly summarized in the introduction (section 11.1). On the other hand, the existence of these theoretical models showing how electronic commerce affects the industrial structure and the value chain has been an important reason for choosing Porter's models and has made the whole analysis possible.

The business value complementarity framework (Barua, 1996) is used to give some hints for strategy formulation and to shift the focus from the external environment to the corporation, thus addressing question number 3 in section 11.1. This framework,

being based on the reengineering literature, fits very well with the development of strategies that have to deal with new, revolutionary technologies such as Internet. The main message of the reengineering literature is, in fact, the necessity to adopt new information technologies and to reorganize the corporation in a way to get the most out of them. The business value complementarity framework focuses on the corporation, on the specific technologies that need to be employed in the company to react to the changes in the environment, and in a sense on how to optimize the "technology—business processes—strategy" fit in order to optimize the business value derived by exploring a new technological innovation.

11.5.1 The five forces model of competitive advantage and Bloch Model

As already said, the use of Porter's (1980) model of the five competitive forces and Bloch's (1996) model of business value of electronic commerce is considered necessary in order to understand the consequences of the diffusion of an innovation for the structure of industries. According to Porter (1983), the competitive importance of a technological innovation depends neither on its scientific merits nor on the ability of the firm to serve the market needs, but on its impact on the industry structure. Porter (1983) develops a general model of how technological change can affect the specific forces of entry barriers, power of buyers, power of suppliers, and how it affects substitute products and the internal industry rivalry. Bloch (1996) instead develops a specific model of how the diffusion of electronic commerce affects the industrial structures, by considering the impact of electronic commerce on the five forces of competition, which, in turn, according to Porter (1980) represent the dynamics of an industry. Bloch (1996) model also

considers the impact of electronic commerce systems on the three competitive strategies, how affect the entry barriers, and how they facilitate the introduction of substitute products, thus setting the basis for a possible reconfiguration of the industry value chain or value system through electronic intermediation and disintermediation. This framework, instead, does not provide any explicit proposition about the impact of electronic commerce on the buyers and the suppliers even though this is indirectly addressed by the question of intermediation and disintermediation. This is a limitation of the model and an aspect where it could be improved.

Finally it has to be noted that not all the propositions of Bloch (1996) model have been explicitly considered in the analysis, but only some of them. The propositions that have been used in the analysis are specifically those that have helped to understand the impact of electronic commerce systems in Scientific, Technical and Medical publishing and were supported by enough empirical or secondary data. Therefore it can be concluded that only some parts of Bloch model can be used to describe what is happening in the electronic publishing field. However it is not unlikely that soon also other propositions could be applied as the diffusion of electronic commerce in publishing expands and enough empirical data can be gathered. Another limitation of Bloch (1996) model is that its scope is limited to the industry level and it does not derive any proposition about the impact of electronic commerce on the corporation and its internal value chain.

11.5.2 The value chain and the virtual value chain

As already said, the model of the value chain and the virtual value chain have been used to analyze the effect of a technological innovation on an organizational structure when the organization tries to adopt it. This adoption phase corresponds to the assimilation stage of the model of diffusion—assimilation--strategy. In fact, when an innovation diffuses in a specific industry, corporations try to assimilate it and in so doing the structure of the organization itself changes as a result (Rogers, 1995). In this thesis, the corporation has been considered composed of the value chain activities interconnected by links as described by Porter (1982). The value chain model, contrary to other evolutionary models of the firm, helps to understand the impact of technological innovation on the specific activities of the firm. The model of the virtual value chain has been introduced to theoretically characterize the changes that might take place in the physical value chain as a result of the adoption of electronic commerce. This model captures how electronic commerce systems might change the value chain by taking into consideration the informational dimension of the electronic marketplace.

Both Bloch model and the virtual value chain model help to analyze the changes that the diffusion and assimilation of technological innovations might bring at industry and corporate levels. These models, however, do not give any suggestions about what a corporation should do to deal with the new competitive scenario, and even less they talk about the specific technological resources that a firm should build or acquire in order to deal with the diffusion of this technological innovation. Finally these models do not address the issues of what to do in

order to optimize the competitive advantage or profitability deriving from the adoption of a technological innovation. The business value complementarity model described in the next section addresses this issue. It has finally to be noted that Porter (1980) identifies three strategies that a company should pursue after having conducted an industry analysis, but they are very general.

11.5.3 The business value complementarity theory

The business value complementarity theory, which is based on the reengineering literature and the complementarity theory, has been chosen in order to address the stage of strategy in the framework of diffusion—assimilation--strategy. This theory gives some suggestions about how to best organize internally and how to select the technologies in order to "optimally" cope with changes in the external environment. In our specific case, the external change is the diffusion of electronic commerce. In Barua (1996)'s model, it is argued that to react to an external stimulus which might be technological in nature, it is important to reorganize the internal business processes and to adopt adequate supporting technologies. This way of organizing for change inside the corporation can be optimized with the use of the complementarity theory. The thesis main discussion instead of focussing on the level of strategy, therefore, goes a step further by looking more closely at the specific technologies that would be needed to make a transition to electronic publishing and to implement the business processes of electronic publishing (described in chapter 10).

The literature on business process reengineering, which is the base of this model, looks mainly at the firm as a bundle of

processes, and strongly suggests the use of technology (and especially information and communication technology) in the redesign of the corporation in order to improve its competitive advantage. This literature mainly focuses on internal cost reduction and on increased efficiency as the base to not only be a leader, but to survive in industries subject to increased competition due often to technological change. The complementarity theory as used in the business value complementarity framework (Barua, 1996) gives some suggestions about the adoption of a holistic approach in the redesign of the business processes in order to improve the chances of success or decrease the chances of failure of a reengineering project.

The specific instance of business value complementarity theory developed in this thesis, that is ”The business value complementarity model of electronic commerce” (See chapter 9), uses the logic behind the theory of business value complementarity developed by Barua (1996) to build a completely new theoretical model. This model is also the main theoretical contribution of the thesis and the main strength of the thesis. Weaknesses of the thesis are the broadness of the research field, justified by the broad overarching framework of diffusion—assimilation—strategy and the difficulty to clearly discern the empirical data. I believe, though, that this way of doing a Ph.D. thesis, (the use of more than one theoretical framework and the use of examples instead of an in-depth case study), might give a broader overview about more theories and literature. Moreover it might lead to more publishable results then the traditional case study oriented thesis, where the researcher might get locked-in a specific theoretical model and one or few case studies.

The business value complementarity model (both Barua's and my own in chapter 9) has however many limitations. One is that the variables of both models are not described very much in detail (even though an attempt to describe the technology classes of the business value complementarity model of chapter 9 is given in the appendices). Another limitation of the model in chapter 9 is the argumentation for the potential existence of complementarity between the different variables or boxes. This is done from a qualitative/theoretical point of view, without really getting into much of the literature on complementarity and complementors and without carrying out specific empirical studies to prove it. However, the scope of using the business value complementarity in this thesis is to give some suggestions about how to go to optimize the design of the technological systems and the business processes in the formulation of a technology strategy. It is not within the scope of the thesis to prove that complementarity does indeed exist among the different variables. This could be items for further research.
The concept of technology strategy implicit in this thesis is similar to the one mentioned by Burgelman and Rosenbloom (1989). They define technology strategy as a set of interrelated decisions encompassing, among others, technology choice, level of technology competence, level of funding for technology development, timely introduction of technology in new products/services, and organization for technology application and development. In this definition, technology strategy is much broader then R&D strategy (Burgelman and Rosenbloom, 1989, p.2).

The business value complementarity model can be seen as a methodology to guide technology strategy to acquire the necessary technologies and competencies as part of the overall corporate strategy in order for the firm to respond to the changing industry environment. The business value

complementarity framework could be used, for example, to increase the flexibility of the technology system and decrease the costs of updating it in order to support product, process or strategic changes. This could also maximize the profits from investments in technological innovation, thus implicitly increasing the likelihood of success of the technology strategy and consequently the success of the overall corporate strategy. This model therefore implicitly makes a connection between the external environment, the business processes and the technological resources of the firm stating the importance of exploring complementarities between technological resources and the business processes as a response to technological change.

11.6 Limitations of the theories and models in Scientific, Technical and Medical publishing

The combination of the models used in the thesis is though still limited to explain what is going on in the Scientific, Technical and Medical (STM) publishing industry. Many other political and power factors (besides technological change) might, in fact, affect the developments of electronic publishing. Among these factors we can mention the power of editors, the right to appoint editors, the fact that many journals are owned by small professional associations that might be less conservative then big publishing companies and therefore more interested to step into electronic publishing, etc. These factors will influence the decision of whether to adopt or not a technological innovation and therefore the industrial structure. These political and power aspects of decision making are not taken into considerations by the theories and models used in the thesis. In fact, there are a number of limitations of the models of the positioning school of

strategic management that, according to Mintzberg (1998), can be summarized as follows:

- too narrow in focus, in the sense that they are oriented toward the economic and quantifiable as opposed to the social and the political;
- have narrow context, in the sense that they are mainly directed toward big traditional businesses;
- the process by which strategy is often formulated is based on calculation, thus impeding not only learning and creativity but also personal commitment.

Therefore, as Hardy and Pettigrew (1985) also argue, the approach to strategy formulation as developed by Porter assumes a rational theory of choice and change, which does not take into account how decisions and changes are actually made, especially regarding the adoption of new technologies within the corporation. This rational approach is limited to describe and prescribe techniques for the identification of current strategies, for the analysis of the environment, for understanding and assessing strategic alternatives and for choosing and implementing a well worked-out set of choices, but not suited for other aspects such as politics and power.

Furthermore the exploitation of complementarities in the business value complementarity theory also has its drawbacks. Taking a holistic approach in designing the organizational structure and the technology system might be expensive, difficult to implement and once done, very difficult to change. It could therefore be concluded that this model would be much more suited for small and medium size corporations entering the field of electronic commerce, rather than big established companies, which is actually the opposite of what Porter's

(1980, 1982) models focus on. I would argue, though, that this framework could be easily applied to big corporations if the electronic commerce division were to be an independent business unit within the whole corporation. This is actually very often the case, at least right now, given the uncertainty associated with electronic commerce. Finally, this model also seems to be based on an implicit rational process, which does not take into consideration factors such as power and politics of decision making. Instead it mainly focuses on information technology as a major factor of success, even though the literature on reengineering shows that many reengineering projects end up into failure, if also other variables such as incentive systems, organizational structure, training, etc. are not taken into account.

Not having taken into consideration the issues of power, politics, etc. is a limitation of the thesis, but as already said it is important to put some limits to what has to be investigated given the amount of time allocated for a Ph.D. study. The implications of these factors for the development of electronic publishing could be items for further research.

11.7 Descriptive and normative approaches

The thesis through the framework of diffusion—assimilation—strategy combines both descriptive and normative models. Here the word model is assumed to take the meaning given by Machlup (1978). A model is therefore considered as an analytical apparatus or machine that serves the purpose of making a connection between the assumed change and specific assumption, regarded as a specific cause, and the deduced change or conclusion regarded as the outcome. In Machlup (1978)'s words, a model is a machine which

"Is a construction of our mind, while the assumed and the deduced changes should correspond to observed phenomena, to data observation, if the machine is to serve as an instruments of explanation or prediction (Machlup, 1978, p. 148)"

Machlup (1978) gives a comprehensive overview of the meaning of positive and normative in economics and social sciences. For our purpose here, we just mention that positive is often associated with description and explanation, while normative is often associated with prescription, recommendation, practice, policy, actions. In economics and social sciences positive models tell "what is", normative models help to formulate "what ought to be". Therefore, while descriptive models and theories explain what is happening, normative models and theories try to help to understand what to do and what ought to be done in a certain situation or how to behave. Many writers also use the word "normative" to denote all statements that are advisory or hortatory in effect or intent (Machlup, 1978, p. 428).

Machlup (1978) introduces a third definition by stating that according to Keynes economics can be positive and normative as seen above and they can also be practical in the sense that tell you "what you can do to attain what you want". Machlup (1978) finds however the "term practical" a little bit ambiguous, since it does not distinguish first between action and advice and then between advice for general situations and advice for specific situations. On the other hand he also argues that prescriptive instead of practical would not be very useful either, since when it prescribes general norms or standards becomes normative and when it prescribes actions becomes practical. In this case, even though normative and prescriptive assume the same meaning, it could be added the little distinction that while in the case of

normative models it is difficult to measure the result because it is only given an advice, in prescriptive models it should be possible to measure whether or not the suggestions has led to the results expected.

It is in this context that the models of the thesis have to be seen. The five forces of competitive advantage, Bloch Model and the value chain model are in this thesis seen as descriptive in the positivist sense since they try to describe the changes taking place at industry level and corporation level as a result of the diffusion and assimilation of electronic commerce. The business value complementarity framework is seen as a normative model since it tries to give some advice in order to get most out of an electronic commerce business or to maximize the profitability or success of an electronic commerce business. Finally, according to the above discussion, it could also be argued that this model is a little "prescriptive." However, since the model does not go very much in detail with the description of the variables and it is general in nature, I would still argue that it is just normative.

11.8 The implicit assumption about technology and technological leadership of the thesis

Throughout the analysis the implicit focus is on technological leaders rather then followers since Internet-based consumer-oriented electronic commerce is at a very beginning stage of diffusion. The companies and the specific journals taken as examples in the thesis are the electronic publishing pioneers that with their moves are already starting changing the industry structure through electronic intermediation and disintermediation. Since the purpose of the thesis is to understand the structural changes that technological innovations

might bring to industries and corporations, the technological leaders are used to understand what these changes are. However, the reccomandations implicit in the business value complementarity model developed in chapter 9 are not specifically directed to leaders, but to any organization that is interested to enter the field of electronic commerce.

Generally the firm's choice between technology leadership and followership is the match between the type of competitive advantage that leadership or followership aim to achieve and the industry structure. It will be attractive for a company to be a technological leader if the technology offers the opportunity to improve the product or process in ways that lower cost or enhance differentiation within the overall company or in particular business segments. This is the case for electronic commerce as showed by Bloch's (1996) propositions. The technological leadership or followership has also an implicit timing of entry into the industry or adoption of a new technology.
Finally, from a competitive advantage point of view, technology and therefore information technology as any other technology, can take both a defensive and an offensive role. It can be used offensively as an instrument of expansion, to create new advantages in established lines of business or to open the door to new products and markets. Information technology can be used in "a defensive role" to sustain achieved advantage in product differentiation or cost. Porter (1983) more clearly associates information technology to create enhanced value in its products and services and to gain sustainable advantage in relation to its rivals.

11.9 Conclusions

This chapter has put the models and the theories used in this thesis in perspective, by evaluating them in relation to the research problem. This has been done by showing their strengths and weaknesses in relation to the research questions and by comparing them with other theories. It has been argued that this thesis establishes a link between technological change at macro level and the organization and strategy at micro level. Finally it has been argued that this thesis combines both a descriptive and a normative research approach.

CHAPTER 12: Conclusions

12.1 Introduction

The thesis has dealt with Internet-based consumer oriented electronic commerce as a specific type of technological innovation that is spreading into the social system. In so doing, electronic commerce is impacting and changing the structure of industries and the value chains of corporations giving rise to virtual value chains. The need to formulate a strategy to deal with this innovation has been pointed out, therefore positioning the project within the strategic paradigm of innovation theory. The purpose of the thesis, however, has not been to formulate a strategic framework or a strategic option that companies could use, but rather to develop a normative framework (based on the complementarity theory) that can be used for a "better" formulation of strategies by companies wanting to enter the field of electronic commerce. By writing the thesis we have kept in mind the digital products, which in our definition are products that can be produced, distributed and sold over digital networks (and specifically on Internet). We have considered, as a case study, the sector of Scientific, Technical and Medical Publishing. This choice has been motivated by the fact that this industry produces a product (the research journal) that can be easily transformed into a digital product according to our definition and by emerging evidence that this industry is being transformed by electronic commerce technologies. The research questions that this thesis has tried to answer have been:

1. What is the impact of Internet-based electronic commerce on the industry structure of Science, Technology, and Medical

Publishing with focus on intermediation and disintermediation?
2. How is electronic commerce transforming the corporate value chain and the corresponding business processes from the marketplace to the marketspace in the Science, Technology, and Medical Publishing industry?
3. How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage firms?

Table 12-1 below summarizes the results of the study.

Research Question	Findings	Implications for future research
What is the impact of electronic commerce on the industry structure of Scientific, Technical and Medical Publishing?	Electronic commerce is impacting the Science Technology and Medical Publishing Industry through new substitute products, new entrants, intermediation and disintermediation and repositioning of some actors to operate in the marketplace and the marketspace	Study the impact of electronic commerce on other industries such as banking, travel, etc. Conduct case studies of electronic intermediaries or companies that have reengineered for the marketspace. Further develop the theoretical hypothesis of intermediation and disintermediation
How is electronic commerce transforming the corporate value chain and the corresponding business processes in the Science, Technology, and Medical Publishing industry?	Electronic commerce can impact the activities of the value chain by transforming them into on-line activities. In STM publishing the activities of production, distribution, marketing, sales and customer support can be	In depth case studies of corporations that have reengineered the value chain partially or completely for the marketspace (e.g. the production department at Elsevier Science). Case studies of customers (e.g.

	transformed. Marketing is particularly impacted as Internet is giving rise to a new marketing paradigm.	libraries) to see what they think of it and how they are in turn affected.
How can the business value of electronic commerce to a corporation be optimized either in profitability or competitive advantage firms?	Development of the business value complementarity framework of electronic commerce that can be used as a guiding methodology for strategy formulation when reengineering for electronic commerce	Apply the framework to test if complementarity does indeed exist between the value chain activities, the complementary business processes and the supporting technologies in electronic publishing and other industries (e.g. banking) by conducting surveys or by conducting single qualitative case studies whose objective is to test the complementarity in strategy formulation

Table 12-1: Summary of the results of this thesis

12.2 Results summary of question 1 and research implications

Electronic commerce is impacting the industry structure of the Scientific, Technical and Medical publishing sector. This is mainly due to the fact that electronic commerce is giving rise to new substitute products for the paper version of the research journal. The main substitutes identified in the thesis are the electronic journal and the electronic mail lists that through their on-line discussion could take the place of the journal publication

process. Electronic commerce is facilitating the entrance into the publishing industry of new players. This thesis has identified for example the universities as potential entrants into the electronic publishing business, not giving out their papers to the publishing houses, but putting them on computer servers at the originating university and therefore becoming publishers of electronic journals or collection of articles. Examples have started emerging especially in physics, where the Los Alamos Lab. has created a database of reports or articles accessible through Internet from anywhere and at anytime. Other new entrants could be innovative researchers and scholars (as for example journal editors) that start distributing the electronic journal themselves. Another important category of new entrants is new organizations (electronic-only intermediaries) that could contract with the universities or the editors and then sell and distribute the articles over Internet. In this thesis we also have found that what is suggested by the theoretical hypothesis of intermediation and disintermediation, that is that electronic commerce will disintermediate some intermediaries of the marketplace and will replace some of them with new electronic only intermediaries (due to extensive search costs) of the marketspace is actually taking place in the Scientific, Technical and Medical Publishing sector. In fact, the use of electronic commerce systems for the distribution of the journals in electronic form will eliminate the need for binding, printing and physical distribution of the product with subsequent elimination of the actors explicating such tasks. On the other hand, in this thesis we also have found evidence of new electronic intermediaries operating only in the marketspace such as OVID Tech as already described above. Finally, in this thesis it has been shown that many companies, in response to the threat of intermediation and disintermediation, are reengineering for electronic commerce thus operating both in the marketspace and the marketplace. Examples of publishers that are starting

operating in the virtual and the physical world are Elsevier Science and Springer Verlag, while OCLC is an example of a subscription agent (intermediary) that is also reengineering for the marketspace and operating in both worlds: the physical and the virtual.

The main implications for future research that come from answering question number one are:

- Impact studies of electronic commerce on other industries. Examples could be service industries such as banking, financial services, travel industry, etc.
- Conduct in-depth case studies of corporations that are fully electronic-based intermediaries or that have reengineered some activities (and possibly all) of the value chain for the marketspace. It could be companies that have reengineered production, the customer support function, the marketing function (the most common one) or the distribution function or any combination of these.
- Theoretically further develop the issues of intermediation and disintermediation and the implications of electronic commerce for Porter's five forces framework of competitive advantage. That is: refine Bloch (1996) model.

12.3 Results summary of question 2 and research implications

Electronic commerce is impacting also the value chain of the Scientific, Technical and Medical Publishing, by giving rise to a virtualization of the activities of the value chain and the business processes into which each activity can be decomposed. In case of companies that produce products that can be easily transformed into digital products, all the activities of the value

chain, that is production, distribution, marketing, sales and customer support can be transformed for the marketspace. For companies producing physical products such as wine, selling flowers etc., only the value chain activities of marketing, sales and customer support can be virtualized. We have found that there are some commercial organizations and some journals that are transforming the production activity for the marketspace (or at least some of the business processes) as for example the Decision Support Journal at the University of Texas at Austin.

Moreover, we also have found that the Internet allows for customization of electronic journals. That is Internet allows the customer to make a customized version of a journal containing, for example, articles from different issues or by just buying one article at a time. Harvard Business Press On-line presently offers this kind of customization. Regarding marketing, we have found that the Internet is revolutionizing the way of doing marketing allowing for target marketing and one-to-one marketing at a level not permitted by the more traditional marketing channels. On-line sales in publishing is also starting becoming a reality, however big barriers in terms of copyright problems (especially with electro-copying of documents), security and payment systems exist that limit the diffusion of the value chain activity in the marketspace. Finally we have found that the customer support activity can also be advantageously carried out on-line and that companies that are starting doing so are saving a lot of money both in terms of telephone calls and customer representative expenses.

The thesis has showed that the on-line business processes corresponding to the production activity in the Scientific, Technical and Medical journal publishing are electronic authoring, electronic submission, electronic reviewing, document formatting, electronic storage. The processes of on-

line distribution are electronic search, electronic selection and retrieval, electronic transmission of the product in question. The processes of 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. The business processes of on-line sales are information gathering/recognizing a need, negotiation/search for solutions and settlement/making a purchase. Finally the thesis has showed that the business processes of on-line customer support can be decomposed into customer inquiries and answer to customers. Moreover this thesis has argued that the complementary technologies that can be used for the transformation of the business processes from the marketplace to the marketspace have to be chosen within their technology classes in such a way as to optimize the design of the system that has to be used for on-line commerce. These complementary technologies can be divided into three groups: networking and communication technologies, database technology and Database Management Systems (DBMS), and application software. Each group includes some technology classes. For example networking and communication technologies include Internet, the WWW, Client/Server computing, Web-Database integration. Database technology and Database Management Systems (DBMS) include repositories, object-oriented databases, inverted file and relational databases, query languages, datawarehouses. Application software include search engines, user interfaces, browsers, push and pull technology, profile matching, data mining tools, payment systems, mailbots, mailing lists, discussion forums. Moreover, in the case of Scientific, Technical and Medical (STM) publishing it could include authoring systems, while in case of the software industry it might include programming languages. The detailed description of these technologies has been given in the appendices, since the main focus of the thesis has been on changing industrial

structures and value chains due to the diffusion (in a particular industry) and adoption (by a specific company) of electronic commerce as a particular instance of technological innovation. Finally, each activity of the value chain has as complementary technologies a subset of all the technology classes. For example, the complementary technologies of on-line customer service are Internet, the World Wide Web (WWW), Client/Server computing, relational databases, mailbots, mailing lists and discussion forums.

The results that have been found in answering question number two are just the preliminary results of the investigation on how electronic commerce can transform the value chain activities and corresponding business processes for the marketspace. Further research is necessary to:

1. Follow the development of the new marketing paradigm that is evolving as a result of using the World Wide Web as a marketing tool.
2. Follow the theoretical development of the payment systems, copyrights issues in the electronic environment and network security.
3. In depth case studies of corporations that have reengineered one or more activities for the marketspace. For example in Scientific, Technical and Medical Publishing it could be interesting to conduct a case study of Elsevier Science that has reengineered the whole production department to adopt SGML as a mark-up language that allows both print and electronic versions of journals from the same database. Smaller corporations that are starting pilot projects could also be interesting.
4. Study what the users think and how the transformation of the publisher's value chain is indirectly also impacting the users (mainly libraries).

12.4 Results summary of question 3 and research implications

The answer to question number three has led to the development of a normative framework that can be used as a guiding methodology when entering the field of electronic commerce. In fact, given that electronic commerce is impacting industrial structures and corporate value chains (especially of digital product industries), companies need a strategy in order to plan and manage the diffusion of electronic commerce and its assimilation within a specific firm. The model developed here is based on the business value complementarity theory. This theory is based on techniques of hierarchical business value modeling and the complementarity concept. In the specific instance of business value complementarity theory that is built in this thesis, it is argued that companies wanting to reengineer partially or completely the value chain for the marketspace should explore potential complementarities between the value chain activities to identify all those that would maximize the business value of electronic commerce if simultaneously reorganized for on-line commerce. Furthermore, it is argued that it is important to explore potential complementarities among the business processes constituting each activity in order to maximize the business value derived by reengineering the business processes of any specific activity. Finally, it is argued that complementarity between business processes and supporting technologies should also be explored to maximize the overall business value of electronic commerce and to design an electronic commerce system that has the optimal configuration given the strategy (and possible changes) of the company. The model developed here is a theoretical normative one. Hax and Wilde (1999) however have found examples of corporations that

pursue the idea of complementarity or a holistic approach in pursuing their strategic options.

The answer to question number three also leaves open a number of unresolved issues. Some of them are as follows:

1. Apply and test the model in some industries (for example electronic publishing, software industry, banking, etc.) in order to test whether complementarities really exist between the variables of the model. This can be done with the development of a survey.
2. Conduct a case study of corporations to see if they have been taking into consideration complementarities in making their strategic choices.
3. Theoretically develop the idea of using the complementarity theory in strategic management and strategy formulation and develop more clear guidelines on how corporations could use the complementarity theory to formulate their strategies without incurring in the many problems that the adoption of a holistic approach might bring.

12.5 Conclusions

Technological innovations have always been having a strong impact on the society. Among the technological innovations that have characterized the last couple of decades, the information and communication technologies (ICT) have definitely an important place, and especially the networking revolution, which since the beginning of the 1990's has been identified with the Information Superhighway and with the information society in general. This is mainly due to the coming of the Internet and the World Wide Web (WWW) in the spring of 1993, that has made the use of networks accessible almost to anyone who has a

computer and a modem. As a result, many corporations are starting to use the Internet for different business applications, involving both internal operations and relationships with buyers and suppliers. It is in this context that this thesis can be positioned, as it tries to explore company-to-consumer electronic commerce on the Internet as opposed to business-to-business electronic commerce or EDI. The focus of this thesis is on the impact of electronic commerce on the industry structures and corporate value chains. A normative model that can be used by corporations in the formulation of strategies to plan and manage the assimilation of electronic commerce has also been developed. Since Internet-based electronic commerce, and especially consumer-oriented electronic commerce is very new and not many corporations have included it in their business model yet, this thesis can be considered as a small brick of a building that is still under construction and development. Further research is necessary to understand this field and especially its development. This thesis sets the basis therefore for further research in different directions among which: study the impact of consumer-based electronic commerce on other industries, as for example the software industry and the service sector; broaden the study to include also EDI or business-to-business electronic commerce on the Internet; conduct in-depth case studies of corporations that have re-engineered one or several of the value chain activities for electronic commerce; apply the normative framework developed in the thesis (or part of it, for example only production, marketing etc.) to quantitatively check whether or not complementarities exist between business processes and the technologies supporting that specific activity; study diffusion patterns of Internet-based electronic commerce.

Resume

Denne Ph.D.-afhandling, som er gjort mulig med et stipendium fra Institut for Samfundsvidenskab og Erhvervsøkonomi ved Roskilde Universitetscenter, giver indblik i det nye område "Internet baseret forbrugerorienteret elektronisk handel" og i hvordan dette område kan få indflydelse på industristrukturer og ændre virksomhedsværdikæder. Forbrugerorienteret elektronisk handel betragtes som en speciel type af Komunikations- og Informations-Teknologi (på dansk KIT men ICT for Information and Communication Tecnology på engelsk), eftersom tenologien er baseret på brugen af "World Wide Web" (www) som først opstod i foråret 1993. Denne type af elektronisk handel er stadig i opstartfasen, og omsætningen er begrænset, men forudsigelser indikerer, at omsætningen vil vokse kraftigt i den nærmeste fremtid specielt set i lyset af den hurtige udvikling af informationssamfundet. Afhandlingen giver svar på følgende spørgsmål:

1. Hvilken indflydelse vil internetbaseret elektronisk handel have på industristrukturen indenfor videnskabelig (STM) forlagsvirksomhed (STM er kort for Scientific, Technical and Medical), især hvad angår "spillere" og "udelukkelse af spillere" ("intermediation" og "disintermediation")?
2. Hvordan ændrer elektronisk handel værdikæder og virksomhedsprocesser indenfor STM-forlagsvirksomhed ved overgangen fra "markedspladsen" (før www) til "markedsrummet" (efter www, i analogi med betegnelsen "cyber-*space*" der bruges om "livet" på www.
3. Hvordan kan værdien af elektronisk handel optimeres for en STM-forlagsvirksomhed, med hensyn til enten profit eller konkurrencefordel?

Resume

Afhandlingen giver et overblik over forbrugerbaseret elektronisk handel, med henblik på hvilken værdi området kan have for en virksomhed og hvordan elektronisk handel kan ændre industristrukturer og værdikæder. Målet er, at forme en basis, hvorfra fremtidige, mere fokuserede studier af specifikke delspørgsmål kan tage udgangspunkt. Det empiriske materiale, der mest bruges på en beskrivende/forudsigende måde, er hentet fra STM-forlagsindustrien. Eksempler fra andre industrier bruges undtagelsesvist for bedre at klargøre koncepterne.
Hovedbidraget fra afhandlingen er at give en forståelse for implikationerne af elektronisk handel for STM-forlagsindustrien. Mere præcist udvikles en "virksomhedsværdi komplementaritetsmodel" for elektronisk handel; effekterne af indførelse af elektronisk handel på STM-forlagsindustrien beskrives, inkluderende en detaljeret analyse af virksomhedsprocesserne i forbindelse med publicering i markedsrummet.; og endelig analyseres den potentielle effekt af fremkomsten af internetbaseret elektronisk handel på STM-forlagsindustrien.

Afhandlingen er en udvidelse og mere fuldstændig præsentation af materialet i 3 artikler der også er resultater af Ph.D.-forskningsprojektet.

Den første artikel, "The Impact of Electronic Commerce on the Publishing Industry: Towards a Business Value Model of Electronic Publishing", er publiceret i marts 1999 udgaven af "Journal of Information Science". Artiklen beskriver virksomhedsprocesserne i forbindelse med "on-line" aktiviteter i værdikæden, nemlig on-line produktion, distribution, markedsføring, salg og kundeservice, og viser, hvordan de ændres fra markedspladsen til markedsrummet. Desuden argumenteres der i artiklen for, at komplementariteterne mellem de forskellige aktiviteter i on-line værdikæden,

virksomhedsprocesserne og støtteteknologierne skal udnyttes, når en virksomhed ønsker at udnytte elektronisk handel.
Den anden artikel, "Electronic Commerce in Scientific, Technical and Medical (STM) Publishing: An Industry Analysis with Focus on Intermediation and Disintermediation", er publiceret i "Proceedings of the IRIS 22 Conference, Turku, Finland, 7-10 August 1999", og er under review for publicering i et internationalt tidskrift. Artiklen analyserer, hvordan fremkomsten af www ændrer strukturen af STM-forlagsindustrien. Det argumenteres, at ændringerne har mange årsager, heriblandt (a) Introduktionen af nye erstatninger for papir publiceringerne, for eksempel det elektroniske tidsskrift, on-line tjenester og e–mail lister. (b) Ankomsten af nye deltagere i STM-forlagsindustrien, for eksempel universiteter der begynder at publicere elektroniske versioner af deres tidsskrifter selv. (c) De nye elektroniske "spillere", der kunne føre til udelukkelse, især for fysiske distributører, printere og indbindere. Artiklen konkluderer, at nogle spillere på markedspladsen, for eksempel sælgere, har påbegyndt træning (re-engineering) med henblik på elektronisk handel, som et resultat af den potentielle trussel fra "udelukkende elektronisk" handel, og således opererer såvel på markedspladsen som i markedsrummet.

Den tredje artikel, "What is the Business Value of Electronic Commerce? How can it be optimized?" er blevet præsenteret ved "MICT (Management of Information and Communication Technology)" konferencen i København d.14-17. september 1999, og vil blive publiceret i en international artikelsamling med titlen "e-commerce and Intelligent Management", "S. Junghagen, K. Friedman, J. Olaisen (Eds.)". Denne artikel præsenterer en virksomhedsværdi komplementaritets model for elektronisk handel, som er en generalisering af modellen udviklet i artikel 1. Modellen er baseret på værdikædeanalysen

og virksomheds komplementaritets teorien Den kan benyttes som metode for strategiformulering i processen med at indføre elektronisk handel i en virksomhed. Hovedideen i modellen er, at det er vigtigt at udnytte komplementariteter mellem forskellige aktiviteter i værdikæden, de tilsvarende virksomhedsprocesser, og støtteteknologier, når man skal forberede virksomheden for on-line handel. Udnyttelsen af disse komplimentariteter skulle føre til en bedre strategiformulering, en maximering af virksomhedsværdien af elektronisk handel, og et bedre "system design".

Som konklusion, er denne afhandling udformet, så den kan danne grundlag for en forståelse dels af internetbaseret, forbrugerorienteret elektronisk handel som en teknologisk nyskabelse, der vil brede sig ind i det sociale system, og dels af de implikationer dette vil have for virksomheder og industrier. Fremtidig forskning kan for eksempel undersøge implikationerne af udbredelsen af internetbaseret, forbrugerorienteret elektronisk handel i andre industrier, der producerer digitale produkter eller i service industrier. Også en dybdegående undersøgelse af virksomheder, der allerede har påbegyndt udvidelsen eller skiftet til on-line handel, er et muligt interessant, fremtidigt forskningsemne.

APPENDIX I: Technologies Enabling Electronic Production

The purpose of appendices I, II, III and IV is to give an overview of the technologies that can support the transformation of the value chain activities and corresponding business processes in publishing (See fig. 10-1) from the marketplace to the marketspace. These technologies that can be used in the design of a system for electronic publishing have been briefly mentioned in the illustration of the business value complementary models of chapter 9 and 10. In these models they were the independent variables that influence both the intermediate variables and the overall dependent variable. However, since the focus of chapters 9 and 10 was on complementarity and business processes, not much attention has been devoted there to the technologies. The purpose of these appendices is to describe these technologies in detail. The appendices are divided by value chain activity, each appendix describing the information and communication technologies (ICTs) needed for the transformation of a specific activity from the marketplace to the marketspace. These appendices follow the sequence of the value chain activities. Therefore, first the technologies supporting production are described in appendix I, then the technologies supporting distribution are found in appendix II, those supporting the transformation of marketing are presented in appendix III and finally the technologies supporting online sales are described in appendix IV. The technologies enabling on-line customer support have not been included in the appendices having been briefly dealt with in chapter 10 (See section 10.10).

In this appendix, a detailed description of the technologies that can be used in the transformation of production in scientific, technical and medical (STM) publishing from the marketplace to the marketspace is given. The technologies enabling electronic production can be classified into authoring systems useful in the initial document preparation and the formatting stage, communication technologies such as the Internet, for submission and reviewing processes, repository and databases technologies for the storage of documents ready to be published or distributed to the reader.

1. Authoring systems

Authoring systems can be generally classified into low level language systems such as WordPerfect and generalized or descriptive mark-up language systems such as SGML and Latex. At author level it is very important to have word processing packages that facilitate the process of preparing the article in a format that can be either published on a network such as the Internet or stored in databases. These packages should identify the standard elements of an article in a standardized way. This is not the real case right now, since the most common word processors such as Microsoft Word, WordPerfect and plain Tex use embedded mark up, but only for typesetting instructions such as change fonts, indent, center and so forth. Only few authors use sophisticated mark up languages such as Latex or SGML. Most commonly authors use just plain word processors, thus identifying only the simple logical components of the manuscript such as title, author, abstract, section, subsection, references, etc. This format is edited by the publisher during the stages of composition and typesetting and then translated during the production stage into the typesetting language that is used to print the journal. It is this final format that allows different

functions of electronic publishing among which extracting text for online abstract, collecting bibliographic data for citation databases, online searching and finally articles retrieval with the use of search engines. As already stated, authoring systems are an important first step in the electronic publishing process. Since they are not as powerful as it is desired them to be, there are a number of requests placed on authoring systems such as:

1. High level language tools to create user interfaces for a document.
2. Support for the full range of electronic media for documents.
3. Cross-platform development support for a wide range of user systems.
4. Access to documents both locally and across networks.
5. Support for a full set of browsing and indexing tools for documents.
6. The ability to perform traditional computation in the document.

1.1 Low level procedural mark-up languages

Procedural mark up languages employee commands within the document to produce changes of font, indent, underline, bold, etc. They emphasize the appearance or layout of a document. They are print-centric software, in the sense that they turn documents intended for print into a distributable format while in a sense preserving the original printed way of looking or layout. This format is independent of the hardware platform, operating system and application software. Examples of such products are Adobe Acrobat and Novell's Word Perfect Envoy. The procedural mark-up languages have though several problems in the electronic publication process such as: inflexibility, in the sense that if a user decides to change the layout, he needs to

repeat the mark up procedure to incorporate the desired changes; it is difficult to explicate low level activities, even though several macros can be defined, as for example it can be done in plain Tex. The procedural mark-up languages do not provide any interactivity function and the information accessed cannot be manipulated, limiting therefore the advantages of electronic publishing. Moreover, low level procedural mark-up languages do not allow the incorporation of the document information necessary to on-line publishing such as specification tags to identify who is allowed to look at a document or security permissions in general.

1.2. Generalized or descriptive mark-up languages

According to Kalakota and Whinston (1996), generalized or descriptive mark up languages work on the basis of a logical description of documents and they are based on the following assumptions:

1. Mark up should describe the logical structure and attributes of the document rather than specify layout processing to be performed on it.
2. Mark up should be flexible so that techniques such as search and retrieval can be used for processing documents.

The author, therefore, indicates the logical structure of the document, but does not specify the layout that is left to the document formatter at the publishing house. One of the most important advantages of the generalized mark-up languages are that documents can be used in many ways without having to convert or to manipulate the format.

1.2.1 SGML as an example of generalized mark-up language

There are many file formats and typesetting systems that can be used by the author to write the document. Some of them are Tex, XyVision, proprietary word processors such as Word Perfect, Microsoft Word, text interchange formats such as ASCII, Rich-Text-Format, and mark-up languages such as Latex and SGML. The choice of a standard format for document authoring as offered by SGML is very important to be able to use the new electronic files not just as a basis to produce the paper journal, but also as a basis to store and distribute the information in electronic form. The ultimate goal of these systems is to create publications that can be viewed, navigated, annotated and distributed over a network, CD-ROM or on-line services. This is becoming a necessity in later years with the upcoming of electronic delivery and the business need to publish in many different electronic formats, without having to maintain different versions of the document for each medium.

SGML offers great flexibility in handling documents in electronic format and is the foundation of standard electronic publishing. It has been around for many years, even though it has been only after the advent of the World Wide Web (WWW) that it is becoming very popular. SGML is a set of rules to describe the structure and to manage the content of a digital document. Moreover, SGML has an architecture that can also support media objects such as audio or video, has non restrictive links with print publishing as well as an ability to handle exceptionally long documents (about 1,000 pages) in an efficient way. In electronic publishing, SGML is very important because it allows the publisher to have a bigger control over display styles such as font, size, color, etc. Moreover, it offers the possibility to search for content such as a title or a table, and allows sophisticated linking such as two-way linking, graphic-

to-graphic linking, one-to-many linking and finally it gives the feature of linking to specific content within documents owned by others.

SGML is well suited for text databases, hypertext, CD-ROM, and electronic books and journals. SGML documents are not dependent on any hardware, software, formatter and operating system. SGML provides a way to describe and validate the structure or hierarchy of a document through a document type definition (DTD). This is important for text databases, because it makes possible to search selected portions of the text as for example, the footnotes, display equations, headings, references, etc. To use SGML, one has to have a suitable SGML document type definition (DTD) and the most used is Hypertext Mark-up Language (HTML).

1.2.2 HTML as a type of document type definition of SGML

An important type of SGML document type definition for electronic publishing on Internet is HTML (Hypertext Mark up Language). This language is based on the concept of hypertext. The hypertext concept has its roots most likely in the "memex" concept developed by Vannever Bush in the article entitled "As we may think", published in the Atlantic Monthly, 1945. The hypertext concept was first popularized by Macintosh with Hypercard. Even though there are many definitions of hypertext, it can be seen as a system that allow for storage of ideas or documents in a way that links and associations can be created between and among them in an unconstrained manner. The result is the creation and delivery of documents that are in a sense "intelligent" or "infobases" that can be searched and navigated. The production of a document into HTML format can be done into three different ways:

1. The author writes the document into HTML format;
2. An HTML editor is used to assist in the production of the document;
3. The document prepared in other word processing format is translated into HTML format by using systems such as HTML Assist or other macros that are designed to transform documents from Microsoft Word or WordPerfect formats into HTML format.

Hypermedia is an extension of the hypertext concept, and it means that instead of incorporating only text, the system would also include different media types such as graphics, images, sound, digitized video or a combination of them.

The main components of hypertext and hypermedia systems are nodes and links. The nodes are the basic unit of text (e.g. references, annotations), graphics or even computer programs. Links represent the interconnections between such nodes and typically in an associative manner so that the user can access and navigate information in an interactive, non linear form. Links, when activated, can produce a variety of results: transfer to a new topic, show a reference, provide extra information, display some graphics, display an index, run another program (Spring, 1991). Links can then be unidirectional or bi-directional and hierarchical or non-hierarchical. To better understand hypertext systems from the perspective of a user, it is important to define the following concepts:

- Browsers: provide the user with a graphical depiction of the nodes and the links. In some systems, the browser can also be used to add and delete nodes, as well as to change, add or delete links. In this respect the browser becomes a tool which allows the user to manipulate information at a macro level (Spring, 1991).

- Indexes: provide a more direct way of looking for information in a hypertext database, and are quite similar to key word and text strings searches provided by object-oriented databases. Searching is useful when users know the topic for which they need more information.
- Paths or tours: are predefined routes through the nodes created by the author.
- Bookmarks: are ways to mark specific locations while one traverses the database or when one is interrupted while reading a document. In some systems, bookmarks can be given a name to help users remember where they left off. When a bookmark is activated, the system displays the marked pages.
- A path history: is a capability that allows users to keep track of the previous nodes which have been viewed and reduces the amount of disorientation users might experience while traveling from node to node. Moreover, this history facility allows the user to go back and forth through the serialization of the hypertext that the user has produced during the search section.

2. Repositories

Once the document has been marked-up into SGML or Postscript file, World Wide Web (WWW) objects, etc. it needs to be stored in a way that can be changed by the publisher and can be accessed by the user. This implies the building of a repository system, the basis of a digital library, to store the documents and let them to be retrieved over a network. In this section we give a description of a repository's architecture, a definition of a digital object and its components, an overview of

the handle system and finally we briefly mention the interfaces of the repository's system with the user and the publisher.

2.1 Definition and architecture of a repository

Repositories are network-accessible systems that store and manage digital objects and other information. The repository has also mechanisms to add new objects to its collection (depositing), and to make them available (accessing). The repository may then contain information related to the object, services and the management systems.

The interface with the repository is usually called the repository access protocol (RAP) and it explicates functions such as depositing of digital objects, accessing of digital objects and verification of user attributes to access the repository (Arms, 1995). Three layers in the architecture of a repository can be distinguished: the repository shell, the persistent store and the object management layer.

The repository shell is that part of the repository that interfaces with the outside world. This part is responsible for the repository access protocol (RAP) protocol, for the conversion of the digital objects between external and internal forms as well as for managing the rights and permission to access the repository.

The persistent store is the place where all the repository's information is stored. The architecture of the persistent store is independent of the repository's architecture. The repository shell can usually interact with many different types of persistent stores and these can even be modified without changing anything in the repository.

The object management layer is the interface between the services provided by the persistent store and the functions that are required by the repository. This layer has a general mapping function between digital objects and the location where they are stored in the repository.

2.2 The digital object

A digital object is the basic unit of the repository and the fundamental unit of an electronic publishing system. A digital object can be seen as formed by the content or data, and associated information often called metadata. A digital object may contain text with SGML mark-up, Postscript files or a record from an abstracting service. In general, digital objects may also contain less traditional published material such as computer programs, music, video, or a combination of them. Usually, the digital object created by the originator is different from the digital object that is stored in the repository and the digital object that is distributed to the users. For example, the digital object distributed to the final user is the result of executing a program on the stored object. This program can be a simple file transfer or a complex program that for example generates an image from the basic bits of information, which then is transmitted over a network to the user's computer, where it is displayed or even further processed.

The structure of the digital object has to be fully transparent to the general user, who is only interested at a higher level of abstraction such as reports, articles, and references. Therefore even though different objects have different formats and different content, they may represent the same object for the final user. Often, a digital object that has been stored in a repository gets associated a transaction record that keeps track

of all the transactions that involve the digital object. The transaction record may contain entries such as the time and date of the deposit of the object, the time and date of each request for retrieval of the object, the identity of the requesting party and finally the conditions under which the object has been retrieved including amount and method of payment. Transaction records will only be made available to authorized parties (Arms, 1997). A digital object can be "mutable" if it can be changed after it has been placed in the repository or "immutable" if it cannot be changed. Accessing or depositing of digital objects are often just virtual processes that computes the digital objects on the fly in response to a request to access a particular digital object, even though often the actual storage or retrieval takes place.

2.3 Handle and the handle system

The concepts of the handle and the handle system are very important for retrieving information over a network. Handles are general purpose identifiers that can be used to identify Internet resources such as digital objects and to manage material stored in a repository or database. Handles are often called Uniform Resource Names (URN) because they identify Internet Resources by the name in contrast with the Uniform Resource Locator (URL) that identifies resources by location. Even though in the electronic publishing field handles identify digital objects and repositories, they can however be used to identify any type of Internet Resources, as for example the Web pages (Arms, 1997).

2.4 User interfaces and database management systems

User interfaces are very important both for maintaining and updating the publisher repository system and for the user access to the system. Each user interface has two parts, the user interface and the publisher or originator interface. The user interface should provide a user-friendly screen to enter the search queries and to browse matched documents. The publisher interface has to allow for manipulation of the data in the repository such as adding and deleting new objects or modifying existing ones.

The repository architecture is based on the database, which is the core of the repository. There is often confusion between databases and databases management systems. Databases can be defined as a collection of related data stored together, with the minimum of duplication and providing a common pool of information to serve one or more applications. The database is the information itself, not the software or tools used to manage and manipulate the information stored. The Data Base Management System (DBMS) is software that link data together in a relational or hierarchical structure that allow fast and efficient access to particular fields, without having to process the entire file. The classical Data Base Management Systems (DBMS) are seperatedinto hierarchical, relational and inverted file. Recently, powerful, object-oriented databases are emerging. For electronic publishing, the two most important ones are the relational database systems and the object-oriented databases.

Relational Data Base Management Systems (DBMS) lack of support for non-traditional data types such as images, documents

and video/audio. This can usually be accommodated by extensions such as pointers to files containing the objects. The object-oriented databases, instead, consider complex data such as documents and images as native objects and can support the extensive data structures found in an object-oriented environment. These object-oriented Data Base Management Systems (DBMS) therefore accommodate not only special data types but also the processing methods that are unique to each type of data.

Object-oriented Data Base Management Systems (DBMS) are more suitable to provide customized information products, such as a magazine consisting of a set of articles that address the specific user need or preferences. In fact, as we are moving beyond the era of mass production in the manufacturing arena, so it is reasonable to move beyond mass production of magazines and newspapers and to move towards document customization to create documents on the fly. Document databases is a new approach to document storage that stores component parts of a document in a database-like structure thus allowing for a new, customized production of the documents themselves.

Databases provide also a method for accessing, manipulating, and changing the same data, but it requires that the database records (or objects) are identical in form, even tough the content can change. New standards and new mark-up languages for document creation make it easier to see the document as a more structured entity. These languages allow the smallest relevant informational entity within each document to be identified and stored as an independent record in the database. The document, stored in the database, carries with it the structural information necessary to understand it, such as author, title, length, etc.

It is important to analyze and decide on the structure of the documents to be stored before choosing the most appropriate database systems. In fact, even though documents are usually considered as a single entity and are created and read in a linear fashion, there are still many ways that documents can be organized in a database for further access, manipulation and cross referencing. For example, documents could be accessed based on information such as the subject, author or the date of publication or could be broken into components such as abstract, title page, body, conclusion or references. Furthermore, the body of the document often has many parts including graphics and tables which add more complications in the storage. The main idea therefore in creating a database for documents is to take into consideration the requirements of dynamic documents or documents that may be conceived as a collection of parts that can be gathered together on demand or on the fly. A document database has special requirements to be met that differentiate this kind of database from the more traditional databases such as inventories, employee records and catalogs. A document database must in fact be able to:

- Store various types of data such as text, image, graphic and eventually audio and video.
- Store unstructured data that varies in size.
- Store and execute instructions or computer programs.
- Handle documents that are constantly changing and provide both updating and versioning services based on this information.
- Flexibly combine and use the entities in the database, minimizing negative interactions. Access must be also modifiable in real time, a problem for some database models (Spring, 1991).

Finally, the Data Base Management Systems (DBMS) must provide for effective manipulating and protecting of the documents, preserving data integrity by controlling duplications and inconsistencies among the document data. It should also be able both to facilitate the sharing of documents while preserving documents independence, and enabling a quick and economical response to publication requests by end users.

3. Conclusions

This appendix has briefly illustrated the classes of technologies that can support the transformation of the production activity from the marketplace to the marketspace in the Scientific, Technical and Medical Publishing. Here we have mainly focused on authoring systems with special focus on SGML as high level mark-up language that is the basis of electronic publishing on Internet and repositories and Database Management Systems as the technologies that allow for data storage and retrieval over a network.

APPENDIX II: Technologies of Online Distribution

In this appendix, an overview of the most important technologies for the transformation of the distribution activity from the marketplace to the marketspace is given. Apart from the repository and database technologies already discussed in Appendix I, important technologies for the electronic distribution of documents are application software such as search engines and browsers, telecommunication networks such as the Internet, the World Wide Web (WWW), and client server technology.

1. Networks and Internet

The networking technologies and especially the Internet are very important enablers of the distribution of electronic documents. The history of the Internet lies in the concept of distributed computing, which in few word means more computers located at a distance from each other and interconnected through a network of telephones wires. Such computers can therefore interact with each other and share common resources such as databases. The Internet, from a configuration point of view, is a global network of networks enabling computers of all kinds to directly and transparently communicate and share services throughout much of the world.

The most common Internet services are e-mail, file transfer program (FTP), World Wide Web (WWW), remote computer unloading (telnet), and discussion groups. E-mail is electronic correspondence and there are at present a lot of software programs that handle e-mail and are compatible for most

operating systems. File transfer program (FTP) allows the retrieval of many formatted documents and software. Remote login or telnet allows connection to library catalogs, search services and databases specialized on the more different subjects. Discussion groups or newsgroups are a world of debate, news and arguments and are generally known as USENET.

The World Wide Web (WWW) has been one of the biggest catalysts in Internet growth. The World Wide Web (WWW) is a global information-sharing architecture that integrates online content and information servers in a fast, cost effective and easy to use manner. The main concepts that have made the World Wide Web (WWW) so popular are: global hypertext publishing, allowing anybody with a connection to publish anything on Internet; universal readership, meaning that any type of information can be retrieved from any computer in any country; and client/server interactions, allowing the World Wide Web (WWW) to grow without any centralized control. The World Wide Web (WWW) is based on a three part architecture: HTML, the hypertext markup language, providing both formatting and hyperlinking; HTTP, the hypertext transfer protocol, used for the communication between Web servers and browsers; CGI, the common gateway interface, that finds programs from World Wide Web servers. In publishing, the World Wide Web can be seen as a complementary technology to organize, filter and distribute information (Kalakota & Whinston, 1996).

The number of services that can be offered by the Internet in the near future are many more, including real time interactions between two computers located hundreds of miles away, audio and video conferencing, information discovery services, directory services. Generally, the service offered at a particular

site depends very much on the computer software available and the bandwidth of the telecommunication cables.

1.2 Client-Server technology

The client/server architecture is the basis of electronic commerce and therefore it is very important in production, marketing, sales and in customer support. This model has replaced the mainframe computing model. The client/server model is mainly represented by two computers, the server and the client, that interact with each other and exchange messages of the type request and reply. The client, which can be a simple PC and handles the user interface sends the request, while the server, usually a big computer that manages application tasks, handles storage and security, and sends the reply.

2. Application software

Among the application software used for search and retrieval of documents in a networked environment, very important are user interfaces, search engines and browsers. The focus of this section is on search engines and browsers.

Search engines are sophisticated software programs that find every item of the repository that matches a given query. The problems with search engines are that often they find too much information that matches the query, most of which may be irrelevant to the end user. Recently, filtering systems are added to search engines in order to filter the information retrieved by the search or to rank order the items in order of importance. Search engines can use different search techniques. They can use techniques such as keyword searching, keyword and information, context-based searching. The context-based search

systems try to guess the content of the document on the base of the context of the words and not only the words. The system results therefore may be searches including documents that have the same general meaning, but do not contain the words of the initial query. Examples of search engines are Topic, a search engine used in Adobe Acrobat, which is based on key word and information search, Architext, a context-based search engine and WAIS (Wide Area Information Service Engine). Publishers that are entering the electronic publishing business, as for example Springer-Verlag often use WAIS. This system is very popular because it uses natural language questions to find relevant information. These documents can then be sent back to the system to refine the search. Moreover, searches can be run automatically to alert the user of the availability of new documents of interest to him.

Browsers are client applications that allow users to manipulate the information located on different servers. Web browsers integrate the function of fetching the remote information, figuring out what the format is and displaying it. These browsers contain detailed, hard-wired knowledge about many different data types and protocols necessary to navigate the World Wide Web (Kalakota and Whinston, 1996).

3. Conclusions

This appendix has briefly illustrated the classes of technologies that can support the transformation of the distribution activity from the marketplace to the marketspace in the Scientific, Technical and Medical Publishing. Here we have mainly focused on Internet, the World Wide Web and search engines

since technologies such as repositories and databases have been described in Appendix I.

APPENDIX III: Technologies Enabling Online Marketing

In this appendix, the technologies supporting the transformation of the marketing activity from the marketplace to the marketspace are described. They are cookies, database management systems (DBMS), profile matching, data mining and push and pull technology. Other technologies such as Internet, the World Wide Web, etc. are important in marketing, but they are not considered here because they are described somewhere else.

1. Cookies

Cookies are the enablers of targeted or one-to-one marketing and customized advertising. Technologically speaking, a cookie is a small file located on the client side of the Internet connection, which allows a site to tag the browser with a unique identification. When a person visits a particular site, the server at that site requests a unique ID from that person's browser. If that person does not have an ID associated with that site yet, the server delivers one. This process is called passing a cookie. The cookie concept is not really a big revolution, since it is very similar to the caller ID feature that has existed on the telephone systems for a long time. Examples of applications enabled by the use of cookies are: targeted marketing, tracking consumer purchase patterns, customized promotions, cross selling and promotions, test banner advertising effectiveness, consumer tailored content, collecting and reselling consumer data (often done from third party advertising agencies), refining navigation and content of the web sites and monitoring consumer sessions on the web sites (Http://www.vanderbilt/project2000).

Infoseek, for example, uses cookies to capture behavioral information in order to provide more direct future searches. Lycos uses cookies to tailor advertising to specific users. It customizes advertising banners based on the terms that a particular customer has searched on the net in the past. Cookies prevent the user from being shown the same ad repeatedly if he is not interested in it. There are also problems in using the cookie technology to track information on the customer. Software programs exist that give the option to turn off the capability to receive cookies. Finally, cookies are associated with browsers and not with specific users. This is a problem especially in educational or corporate environments, where a workstation is shared among different users.

2. Database management systems and marketing

In order to implement target marketing, micromarketing and relationship marketing, it is necessary to identify the customer and his profile when he visits the site and to store such profiles. Databases and database marketing can be used to:

- Identify the best customers
- Develop new customers
- Deliver a message consistent with product usage
- Reinforce consumer purchase decisions
- Cross-sell and complementary-sell products
- Improve delivery of sales promotion
- Refine the marketing process
- Increase the effectiveness of distribution channel marketing
- Conduct customer, product, and marketing research

- Personalize customer service
- Provide program synergy and integration

As already said, Database Management Systems (DBMS) fall into the three general categories of hierarchical, inverted file and relational (Please refer to Appendix I). The following is a brief description of how the different Data Base Management Systems (DBMS) can support the implementation of on-line marketing:

1. Hierarchical Database Management Systems (DBMS): they are designed for efficiency in high-volume transaction environments, but their structure can often limit the types of ad hoc queries that marketing end users normally need. Many companies are using them to support customer service or airline reservation. Ad-hoc systems have also been developed to load data from hierarchical systems to relational database environments.

2. Inverted file Database Management Systems (DBMS): these database systems are well suited for marketing applications because they are good at providing quick counts of records that meet specified conditions (or queries), by creating indexed versions of the data stored in the files without really reading the actual record content.

3. Relational Database Management Systems (DBMS): these are usually a little inefficient for marketing and especially direct marketing operations, nevertheless they are very much used in marketing. This is mainly due to two reasons: their structure is very similar to how the marketers view their data; it is easy to extract the desired data from the numerous other elements. An important type of relational database

system is Oracle, which can run on any hardware and operating system. Database systems that are built for the Unix environment are Sybase, Informix, Ingres. The core Database Management System (DBMS) in these systems performs as a data repository that allows data manipulations using a query language. It also supports on-line transactions and provides a variety of locking features for implementing concurrent updates from simultaneous users (Shepard Associates, 1995).

Finally, databases can be organized into data warehouses. Data warehouses can be seen as big marketing repositories, that consist of the logical and physical structure of the warehouse database plus the services required to operate and maintain them (Wheldon, 1997).

3. Profile matching

Another technology that is very useful in on-line marketing (and especially electronic publishing) is profile matching. Each user has a personal profile that resides on her computer or on the central server (better if it is a client computer). This is a file indicating users' interests and parameters for customized interaction (Chandler, 1995). The personal profile regulates alerting of new material as it arrives in the system. This alerting is accomplished by e-mail messages to the customer. The profile has usually two components: the components that alert the customer when a specific product (in our case the research journal) is added to the list and a component which alerts the users about articles containing keywords specified and of interest to them.

4. Data mining techniques

One of the most powerful competitive tools in interactive marketing is to understand and to target each customer's individual needs. Data mining is an intensive search for new information and new combinations pursuing defined paths of inquiry and allowing unexpected results to generate new lines of analysis and further exploration (Watterson, 95). Data mining can be used to analyze customer preferences and buying patterns, to better target the customers with products (or articles) and promotional offerings. Data mining implies the use of analytical tools such as intelligent agents, more traditional querying and reporting tools, multidimensional analysis (MDA) tools and on-line analytical processing (OLAP) tools to find patterns in the data collected interactively about the customers and stored in databases.

5. Push and pull technology

Push technology should deliver proactively the customized information needed, when needed, directly to the user computer, thus avoiding the lengthy searches for information that often characterize the online retrieval and sale processes (Cortese, 1997). Push technology works in such a way that the client software and its server counterpart negotiate a delivery based on some preset parameters or preferences (Andrews, 1997). Push technology is used for example by Pointcast to deliver specialized information to the desktop, picking its content from general interest and specific media (Verity, 1994). There are many companies that are entering the field of push technology. Examples are Ifusion, focused on multimedia delivery with highly dynamic elements, DataChannel, Verity, Diffusion. Pull technology means that a user pulls information to its PC through

a search. This is basically how the web works today: a user with a web browser "pulls" information, usually in the form of Hypertext Markup Language pages, to his or her own PC from a Web server, where the information is stored. Advantages are that the client software is now cheap and easy to get; disadvantages are that users have limited customization ability and can waste a lot of time by looking at the results found by the search engines (Byte, 1997).

6. Conclusions

This appendix has briefly illustrated the classes of technologies that can support the transformation of the marketing activity from the marketplace to the marketspace in the Scientific, Technical and Medical Publishing. Here we have mainly focused on Cookies, Data Base Management Systems and the way they support one-to-one marketing and target marketing. Furthermore, technologies such as profile matching, data mining techniques, and push and pull technology have also briefly been touched upon.

Appendix IV: Technologies Enabling Online Sales

1. Introduction

In this appendix the technologies supporting the sale activity in the marketspace are briefly illustrated. There are many technologies that enable on-line sales: networking technologies, application software such as user interfaces and search engines (necessary to find and select the wanted information in the big realm of information available online) and finally electronic payment systems. Since a discussion of the other technologies has been given in the previous appendices, here we give a short overview of the electronic payment systems. Such systems can be distinguished as follows:

1. Token-based payment systems
- Electronic cash (e.g., DigiCash)
- Electronic checks (e.g. NetCheque)

2. Credit card-based systems
- Plain credit card (The card is just used as in the traditional market place)
- Encrypted credit cards (e.g. World Wide Web form-based encryption)
- Third party authorization numbers (E.g. First Virtual)

2. Electronic cash

Electronic cash should be the replacement of the traditional cash in the consumer oriented electronic business. Even though there

are different ways of implementing an electronic cash system, they all must support the following characteristics:

- Monetary value: in the sense that the electronic cash has to be backed up by either currency, bank-authorized credit or a bank-certified cashier check;
- Interoperability: this means that e-cash must be exchangeable for other e-cash, checks, real currency, goods or services, deposits in bank notes.
- Retrievability: the e-cash must be remotely storable and retrievable from a computer or terminal physically located far away from the cash server.
- Security: this property implies that it should be secure to involve into e-cash transactions, without risks of counterfeit, double spending and duplication.

3. Electronic checks

Electronic checks should work exactly like the normal checks, and they are intended for people who would like to pay on credit, just like in the marketplace. An account holder (the equivalent of a bank) issues an electronic document (the check) that contains the name of the payer, the name of the financial institution, the payer's account number, the name of the payee and the amount of the check. Moreover the check will carry a digital signature, similar to the signature on the real check. Advantages of electronic checks include suitability for micropayments and minimizing the payee's financial risk, which is born by the third party financial institution.

4. Credit-card based systems

The credit card-based payment systems in the marketspace function exactly like the ones in the marketplace, except that the credit card number and other information are sent over the network. This can be done in three ways:

1. Send the plain credit card details over the network: this is the easiest method of credit card payment over a network. Problems associated with it are usually security and authentication, which means that the vendor is responsible to make sure that the person using the card is the real owner, but without encryption this is almost impossible.
2. Send encrypted credit card details: this method uses encryption technology to make it more difficult to steel credit card information on the network. One big problem of this method is that the cost of processing the credit card transaction might be too high for small payments.
3. Third party verification of the credit card: the third party company has the function of collecting and approving the credit card transaction thus minimizing security and verification problems. There are a number of companies entering this kind of business, among which First Virtual Holding and Visa Interactive.

5. Conclusions

This appendix has briefly illustrated the classes of technologies that can support the transformation of the sale activity from the marketplace to the marketspace in the Scientific, Technical and Medical Publishing. Here we have mainly focused on Internet-based payment methods as it is believed that it is these

technologies that are one of the major barriers to diffusion of consumer-based electronic commerce. Among the payment methods we have distinguished electronic cash, electronic checks and creditcard based systems.

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