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Research Paper no. 12/01

The Impact of Electronic Commerce on Industry Structure-The Case of Scientific, Technical and Medical Publishing

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Research Papers from the Department of Social Sciences, Roskilde University, Denmark.

Working paper series

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Abstract

Electronic commerce is becoming one of the drivers of competition and is starting playing an important role in industry structural change. This article shows how electronic commerce might affect the Scientific, Technical and Medical publishing sector. More specifically the paper looks at the emergence of the electronic journal as a substitute for the paper journal and its implications for the industry structure, with emphasis on disintermediation and electronic intermediation. It is further given evidence that some actors of the industry value chain are reengineering for electronic commerce as a reaction to the potential threat of disintermediation thus operating both in the marketplace and the marketspace.

Keywords: Electronic Commerce, Disintermediation, Intermediation, Publishing Industry

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The Impact of Electronic Commerce on Industry Structure-The Case of Scientific, Technical and Medical Publishing

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Introduction

The publishing industry in general, and Scientific, Technical and Medical publishing, in particular, has been transformed over the last 40 years by the information and communication technologies and electronic information in the form of on-line bibliographic databases has been existing in the last twenty years (Mastroddi, 1996). The advent of the World Wide Web (WWW) might bring important new structural changes to this industry as it can speed up the publication process and decrease publishing costs (Panorama, 1997; CEC, 1996). In Scientific, Technical and Medical publishing, in fact, the present 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. As a result, in recent years new Internet-based academic journals that represent a break away from the former publishing models are starting emerging that might have profound implications for the industry structure. Examples are Itcon (http://itcon.fagg.uni-lj-si/), The Journal of Electronic Publishing (http://www.press.umich.edu/jep), Journal of the Association for Information Systems (http://jais.isworld.org/).

The problem with Internet-based publishing 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 (Kling and Covi, 1995). A survey conducted in 1998 by the International Council for Scientific and Technical Information on how researchers use Internet services found that 61 % of the respondents find interesting and easy to read electronic articles and journals, but only 14% would publish on electronic journals (Bjork and Turk, 2000). Similarly Sweeney (2000) and Palmer et al. (2000), the last ones for American business schools in particular, find that electronic publications are less desirable than paper counterparts for tenure, but electronic counterparts of existing journals would keep their legitimacy for promotion purposes. Bjork and Turk (2000) also find that researchers download half of the material they read from the Web, but they are not willing to pay for electronic publication. Nevertheless, the number of electronic journals is highly increasing since the World Wide Web has been used for electronic publishing, even though this number compared to the paper version is still very small (Wells, 1999). 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 (Collier, 1998).

The purpose of this article is to show how e-commerce technologies are starting reshaping the Scientific, Technical and Medical (STM) publishing sector. The analysis focuses mainly on the rise of new entrants and substitute products, the result of which might lead both to a disintermediation and an electronic intermediation effect (Benjamin and Wigand 1995, Sarkar et al. 1995). Moreover, the article argues that while electronic commerce could lead to disintermediation and consequent electronic intermediation, many actors of the industry value chain are reengineering for electronic commerce to avoid being bypassed by new Internet-based intermediaries, thus operating both in the marketplace and the marketspace.

The paper is organized as follows: the next section introduces the research method, then the theoretical framework is presented, followed by the industry description.

After the industry description, the industry analysis divided into new entrants, substitute products, disintermediation, electronic intermediation and finally reengineering for electronic commerce is given. The article concludes with the section on implications for theory and practice and conclusions.

Research Method

The study has been conducted as a case study of the Scientific, Technical and Medical publishing industry. The data collection has included the following sources: 1) 15 explorative elite interviews of managers of international publishers of academic journals, electronic intermediaries and electronic journals with the purpose of understanding the future trends. 2) 6 expert statements on the future of electronic publishing. 3) Pre-existing documents, such as journal articles, publishers' annual reports, European Community reports and reports from other associations in the field of Scientific, Technical and Medical publishing. 4) Internet Web Sites. Internet has mainly been used to identify and analyze the web sites of Internet-based journals or of commercial publishers of electronic journals. Triangulation has been used to identify and narrow down the search to the examples presented in the article.

Theoretical Framework

The main theoretical framework used to analyse the industry structural changes is Porter (1980)'s model of the five forces of competitive advantage (See Fig. 1). Porter (1980)'s model states that the competitive dynamics of an industry can be represented by the five forces of power of buyers, power of suppliers, new entrants and new substitute products as well as by the competition between the industry players. Each industry player has available three generic strategies to pursue and obtain competitive advantage: cost leadership, differentiation and focus. The strengths of the forces vary from industry to industry and determine the ability of firms in an industry to earn, on average, rates of return on investment in excess of the cost of capital. The attractiveness and the structure of an industry and the competitive position of a firm change over time, as external factors can influence the dynamics of the industry. The most important generic factors influencing the publishing industry are technology, demography and regulation (CEC, 1996). In particular, technology is emerging as a major strategic factor in changing industry structure (Porter, 1980; OECD 1992a).

Many studies have been conducted also on the potential of Internet-based electronic commerce to alter the structure of markets in any industry (Bailey and Bakos, 1997; Steinfield et al., 1995; Adelaar, 2000). These studies have concentrated on two areas: the relationship between buyers and sellers and the role of intermediaries in the value chain (Steinfield et al., 2000). Moreover it has been argued that Internet enables the producers of goods and services to develop more direct relationships with their customers often bypassing their intermediaries (Choi et al., 1997). Porter (1983) develops a general model of how technological change can affect the specific forces of entry barriers, power of buyers, power of suppliers, substitute products and the internal industry rivalry. Bloch et al. (1996) develops a model that in particular shows how electronic commerce systems can impact the five forces of competitive advantage. This model suggests that, for example, electronic commerce systems can affect the competitive advantage of companies and industries by first affecting the three generic strategies. This is done by

- Offering a cost advantage through less expensive product promotion and cheaper distribution channels. This means that Internet allows small companies to act as much larger ones, by using a "free" or very low cost infrastructure to promote their products on a global basis. 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 get the material to be published electronically.
- Helping a company to differentiate itself not only through price but also through product innovation and customer service. The problem of price differentiation will exist in the marketspace as it has existed in the marketplace. For example a company that has more information about a product and offers a better on-line customer support has a more advanced and therefore more expensive system. It should be expected that its prices are higher then those offered by companies with a lower service level, as it happens already in the marketplace.

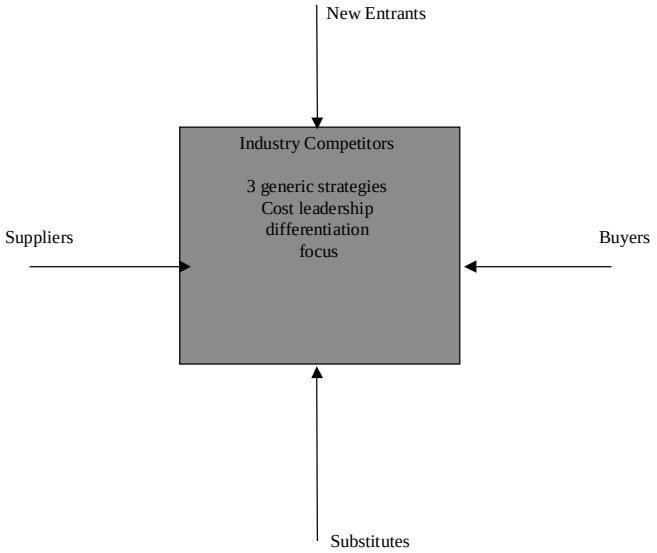

Fig. 1: Porter 5 competitive forces framework (Source: Porter, 1980)

- Allowing for customer focus strategies through better customer relationships implemented trough mass customization of digital products. In Scientific, Technical and Medical publishing, mass customization could be implemented by sending e-mail messages to customers alerting them about articles of specific interest to them.

Electronic commerce systems can change the industry structure by

- Influencing the force of entry barriers by allowing easier entry into traditionally hard to access markets, due to less expensive product promotion, new sales channels and reduced capital requirements. For example in case of Scientific, Technical and Medical publishing, a new entrant in the marketspace needs just access to the articles, an Internet connection and a sophisticated hardware and software system in order to sell or distribute the journals online. In the marketplace, it is 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, production and transaction costs.

- Facilitating the introduction of substitute products in a market. 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 present travel agencies, etc.
- Making it easier to bypass an intermediary in a distribution network, due to direct customer contact and the use of a publicly shared infrastructure. Disintermediation means that many functions done in the marketplace by some intermediaries can be suppressed by connecting directly the producer with the consumer. In reality it is likely that such functions cannot be suppressed completely, therefore new forms of intermediaries, this time based on Internet, will emerge (Sarkar et al., 1995) as the next point shows.
- Making 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. Often electronic intermediation will occur because the direct connection between the supplier and the buyer might not always be the optimum due to many reasons. One reason is the information overload, or the fact that the cost and the time required accessing multiple sites can increase notably, often preferring to have an intermediary that does the search. A second reason might be that 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.

An Industry Outlook of Scientific, Technical and Medical Publishing

The Market

The European market for electronic publishing in the Scientific, Technical and Medical sector is estimated at circa 625 millions Ecus (Mastroddi, 1996). The worldwide market for the same sector should be circa 1800-2000 Millions Ecus in year 2,000. Institutional subscribers such as libraries, corporations and research institutions represent 80 per cent of this market. Single individuals such as doctors and researchers represent circa 20 per cent of the market. Tenopir and King (2000) find circa 100,000 journals, while Ulrichs CD-ROM lists circa 143,068 journal titles worldwide. Of these journal titles, 35.4 per cent are produced in 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). Scientific societies and academic institutions such as universities and research centers produce some of these journals. However, there are also a considerable number of commercial publishers. Reed-Elsevier, Springer Verlag, International Thompson, Elsevier Science, Longman, Chapman and Hall, Blackwell Science, Sage Publications are among the most important in terms of revenues and market share. The journal subjects 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 (http://www.swets.nl/). The Scientific, Technical and Medical Publishing Association (http://www.stm.springer.de/members) represents 250

individual publishing companies and learned societies in 27 countries around the world. The main concentration of publishers is in the United States, United Kingdom, Germany and the Netherlands.

There are at least 60 traditional Scientific, Technical and Medical publishing members that have established a presence on the World Wide Web (http://www.univ-reims.fr/Labos/SciencesExa/ChimiePhysIndus/stm1.htm).
Some have started offering electronic journals on Internet. The Institute of Physics Publishing has 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, also expects to publish 15% of their product in electronic form (both CD and on-line) by year 2000 (Collier, 1998). Other companies that are experimenting with Internet-based electronic publishing are Blackwell Science, Munksgaard Publishing, Sage Publications. In addition there are many new start-up companies, editors and universities that are starting delivering the electronic only version of journals and articles.

There are several thousand science sites on Internet. The most popular subjects are engineering, computer science, medicine, biology, earth science and physics. Most of the sites carry mixed information such as articles, news, references to documents, publicity, announcements, job seeking, call for papers (Mastroddi, 1996). However, much confusion exists about the number of electronic journals. There have been few surveys trying to understand the development of peer-reviewed (or at least scholarly) electronic journals and most data are outdated. Wells (1999) finds circa 400 free electronic journals, while Hitchcock (1997) summarises the surveys until 1997 in table 1 below. Problems with comparing the results of these surveys are the criteria used to collect the data, and the definition of electronic journal. This term, in fact, 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 (Mastroddi, 1996).

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 1: Surveys data on number of electronic journals (Source: Hitchcook, 1997)

Furthermore, regarding the break down of the electronic journals according to the discipline, few data have been found, which show contrasting results. For example, Harter and Kim's (1996) survey finds that most of the journals are in the social science, while Hitchcook's (1997) study shows that most of the journals are in

mathematics with the first math journal appearing in 1993. Generally Hitchcook (1997) 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. It should be expected that as these technological issues are solved the number of electronic journals in the technical fields should be higher then the ones in the social science.

Actors of Scientific, Technical and Medical Publishing

The publishing market can be categorized in terms of the type of customers: 1) individuals affiliated with professional association that get the journal for free; 2) individuals that are regular subscribers to the journals; 3) institutions, both public and corporate libraries and other types of institutions. According to Page (1997), the main actors and activities involved in the production and distribution of a journal are as follows (See fig. 2):

- The suppliers/authors: are usually parts of a research institution. In the scholarly journals there is often a substantial overlap between the author community and the reader community. Moreover authors are willing to put considerable effort into preparing articles for publication without compensation (Page, 1987).
- The editor/editorial board: are responsible to check the quality of the article and to send it to the reviewers. Editors have a mediating function between the author and the referee.
- The reviewers: provide the referees' reports. Usually they are not paid and it is difficult to find them because they can be overburdened with papers.
- The publisher: transforms the different articles into a specific format and creates the journal and distributes it. During this process the publisher has to do functions such as copyediting, typesetting, printing and binding, which can be done in house or may be outsourced.
- Copyediting: it is commonly done by the publisher either in the publisher's production department or by using freelance copyeditors. Sometimes it is done at the journal's editorial office. The copyeditor's task is to ensure that the material which goes to the printer is clear, consistent, unambiguous and well organized in order to make it easy for the reader to follow and understand while changing as little as possible of the author's text.
- 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, before sending 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.
- Printing: the printing department (often outsourced) has the function of producing 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.

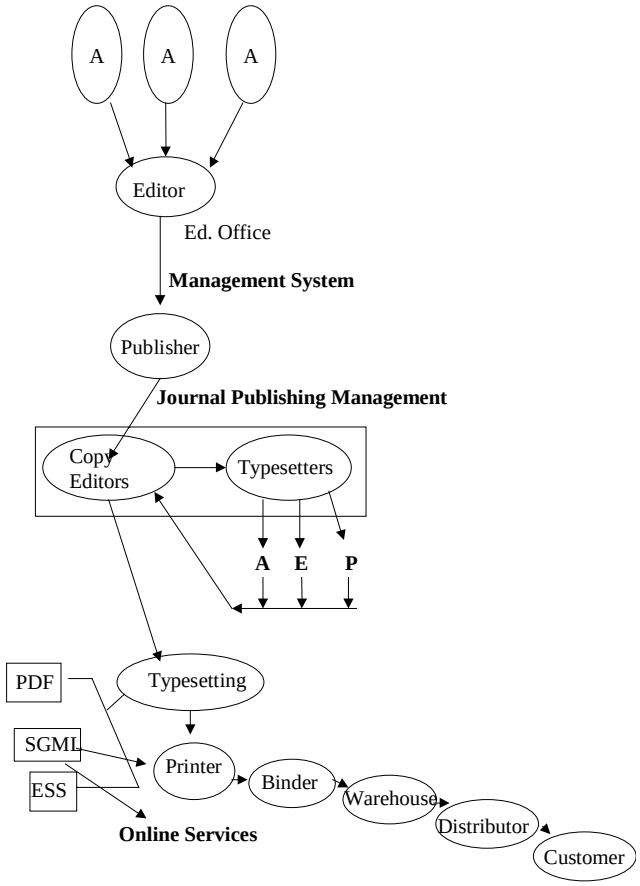

Fig. 2: The flow of a journal article

- Binding: this is the function of making the collection of printed pages into a journal. 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. using surface or air mail. The distribution costs are usually fairly high, which is also due to packaging costs. Also the distribution function can be done in house or can be subcontracted.
- Subscription agents: are intermediary organizations that have an important role in selling the journals. In fact for a typical library it takes time to track the journals down, deal with different currencies, learn the differences in trade practices between publishers. The subscription agent is in charge of these and other functions such as collecting information on existing journals, as for example changes of price and titles (Page, 1997). The agent collates orders by publisher, and acts as a buffer for claims and queries (Page, 1987). There are circa 18-20 subscription agent worldwide and they are paid for their service by a circa 5% discount of list price from the publisher, by a service charge to the library or by a combination of both.

Structural Changes in Scientific, Technical and Medical Publishing

The theoretical frameworks described above are applied in a descriptive fashion to show how electronic commerce systems might change the structure of the Scientific, Technical and Medical publishing sector. The analysis takes the point of view of the publisher because the publisher is the main actor in the publishing value chain, exploiting or coordinating many functions such as binding, printing, distributing. Furthermore, the main focus is on the threat of new entrants and of substitute products and their consequences for electronic intermediation and disintermediation. This is because the bargaining power of suppliers (the author) and buyers are very low in Scientific, Technical and Medical publishing since the author usually writes the article for reputation, personal advancement, carrier purposes and the buyers need the journal articles to conduct their own activity (Page, 1987).

New Entrants

Internet, given the low entry costs, gives the opportunity to many groups of actors to enter the publishing business and therefore to be potential threats to the publisher. Entry costs are low because the present use of academic networks seems to be free, but even though this should not be the case, the communication costs should be as cheap as long distance calls (Okerson, 1997). The potential new entrants in the field of electronic publishing could be:

- Innovative researchers and scholars. External economic conditions may push scholars to start networked electronic journals instead of paper ones. Given rather high subscription costs of paper journals, scholars will have an incentive to create electronic journals since substantial cost savings can be realized if the new journal is electronically distributed. Examples 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).
- Universities entering electronic publishing. Nowadays the universities publish at most 15% of their faculty's output. This includes discussion papers and periodicals emanating from individual academic departments and formalized university outlets like university presses. Some electronic publishing initiatives are already taking place especially in the field of pre-prints. For example, the Stanford Linear accelerator has supported a pre-print 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 Pre-print). This project consists in maintaining a database of abstracts on a network computer in a major university. The abstracts will also be searchable on "e-math", the American Mathematical Society's member service (Okerson, 1997).
- Computer conferences as electronic journals. Many scholars and librarians begin to take seriously the scholarly computer conferences (known as "lists") and more and more academics view them as a new kind of journal. Benefits of these lists include accessing important informal information; sharing ideas and critique all over the world in a matter of minutes; finding new colleagues and learning about whom is pursuing the same interests in another discipline.

Okerson (1997) states that the widespread participation and ownership of this new method of communication have the potential to transform scholarly writing and publishing far more dramatically than the motivation to unbundle journals, publish quickly, or even reduce subscription costs.

- New organizations distributing the journal electronically only such as OVID Technologies (http://www.ovid-tech) that potentially could directly contract with the editors to get the journals for on-line publication, thus bypassing the publisher.

Substitute Products

In Scientific, Technical and Medical publishing, the main substitutes for the paper journals are the electronic journals and the mailing lists described above. According to Collier (1998) these substitutes have many value-adding characteristics in comparison to the paper versions of the scholarly journal, among which:

- The possibility through the hypertext function to instantaneously make a link to references or other literature.
- The possibility of quickly searching for a specific article, author etc. in a database.
- The possibility of customization by delivering and selling for example just one article or one section without the customer having to buy the whole issue.
- The immediate delivery over a 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 propensity to change behavior. If the price that can be charged for the electronic version can be substantially less than the paper version then people would have the tendency to switch to the electronic version. This should be the case given the fact that there are no warehousing, binding, printing and distribution costs for the electronic version. In reality, however, the price of the electronic-only version sold by traditional publishers is equal or higher then the price for the paper version. The electronic version as an add-on to the paper version usually implies a price increase of 10-30% respect to the paper version only (Munksgaard International Publishing price catalogue, 1998). This means that the publishers are very conservative and prefer to keep the status quo as long as possible, by discouraging the electronic-only versions of the journals. Customers' switching costs also affect the diffusion of the electronic journal. In fact, if 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 printer, a modem, access to Internet and the database where the journal is stored. This might not be a problem for corporate customers or institutions, but it could be a problem for single individuals. An increase in the buyer propensity to switch to the electronic journal can be foreseen, however, in light of trends such as increasing PC literacy of youth and rising electronic media literacy (CEC, 1996) as well as in the nature of the journals market. This is mainly made of highly literate, specialized people usually using computers and networks as daily breads.

Disintermediation

The hypothesis of disintermediation states that Internet-based electronic commerce might lead to a disintermediation of some players of the value chain (Pedersen, 1997, Benjamin and Wigand, 1995, Sarkar et al., 1995). This is also the case in Scientific, Technical and Medical publishing mainly due to the diffusion of the electronic journal and the establishment of new entrants. Such disintermediation should lead to cost reduction and time reduction from submission to publication. For example, a look at a typical journal schedule shows that with electronic commerce the time can be reduced minimum by 4 weeks (the time for printing and binding) plus the shipment time (Page et al., 1997). Here three main hypothetical disintermediation scenarios are identified:

- The authors/editors decide to publish their own articles on Internet or just distribute them trough the different "mailing lists". This scenario is the most radical one and as a consequence all the actors of the industry value chain would be disintermediated, that is the publisher, the printing house, binders, physical distributors, the subscription agent. Copyeditors and partially typesetters could be necessary also for articles in electronic form. Examples of editors/authors that publish the journals themselves thus bypassing the rest of the value chain and connecting directly to the customers are represented by editors of ITCon, The Journal of Electronic Publishing, Journal of Association for Information Systems.
- The university, singularly or together with other universities, publishes the articles online without sending them to the publisher. This scenario is very similar to the previous one, where all the actors are disintermediated. An example is the Stanford Accelerator Database (Okerson, 1997).
- The article gets to the publisher that delivers it on Internet to the customer and as a consequence the printers, binders, physical distributors, and subscription agents would be disintermediated. An example is firstmonday (www.firstmonday.dk).

Common to the above scenarios is that printing, binding, warehousing, packaging, physical distribution and subscription agents would disappear if there were only the electronic version of the journal. In these scenarios the publisher can be seen as an intermediary between institutions as "parents" of the author and institutions as "parents" of the consumer. In fact, the market for journals is a special kind of market. One party (the publisher) gets his material for free (or for a small fee paid to the editor) while another party, the institutions, pays really for the consumption and the creation of the product (Line, 1995). If the first two scenarios should prevail, the journals would probably give way to databases of unpackeged individual articles, which should be cheaper than paper journals. This is not only due to savings in printing, binding, etc., but also to the institutions not trying to make a profit. However the answer to whether it would be more cost-effective is not known yet (Line, 1995). Presently the situation is a hybrid one where all three scenarios are starting appearing, coexisting with the traditional paper journal.

Electronic Intermediation

The hypothesis of electronic intermediation states that electronic commerce might give rise to new electronic-based actors that replace traditional players in the value

chain (Sarkar et al. 1995). Generally, in order to find out about the different products, 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). It should be expected that the increasing number of actors that offer electronic versions of journals would increase the search costs for electronic articles and therefore it might be desirable to start paying an electronic intermediary to do the search (Bloch et al., 1997). Thus the number of new companies (electronic intermediaries) that start licensing electronic articles from different Internet-based publishers, editors or universities, add value and distribute them electronically to the consumer should also increase.
An example of such an electronic intermediary is Ovid Technologies Inc. (http://www.ovid.com). Ovid Technologies is an electronic agent that establishes partnerships with different content providers to offer online access to many databases. These databases are updated weekly, monthly or quarterly depending upon publication frequency and/or user needs. Ovid also provides a Full Text Collection. This is its own implementation of the electronic full text of more than 80 leading biomedical journals. Annals of Internal Medicine, Journal of the American Medical Association, Science are some examples. 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 has now circa 30,000 licensed customers that include academic and medical libraries, pharmaceutical firms, research facilities, consortia and governmental agencies. Ovid system platform is based on Internet and the World Wide Web, which enable browser searches from any desktop and ensure complete platform-independent access (http://www.ovid.com).

Reengineering for Electronic Commerce

The hypothesis of disintermediation and electronic intermediation states that as a result of electronic commerce some of traditional value chain actors might be disintermediated and new electronically based actors might appear. In Scientific, Technical and Medical publishing what is also happening is that the traditional intermediaries are reengineering for electronic commerce to compete with and avoid being bypassed by the Internet-based intermediaries. In doing this they have to find optimal business models to compete both in the marketplace and the marketspace (Rayport and Sviokla, 1994). Today Internet is overloaded with journals, 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 (Bloch et al., 1997). It is likely therefore that established, well known publishers will also dominate in the marketspace if they enter it at the right moment. Copyright laws will influence these trends. The two main intermediaries of the publishing value chain reengineering for electronic commerce are the publishers and the subscription agents.
Among the subscription agents that are reengineering to provide also on-line services there are OCLC Online (http://www.oclc.org) and Swets and Zeitlinger (http://www.swets.nl). The electronic subscription agents can be divided into two

types: the gateway agents, which only make a connection between the publisher and the customer and the non-gateway agent that also maintains a copy of the journals on their own databases and sell it to the customers. They are illustrated in Fig. 3 and Fig. 4 respectively.

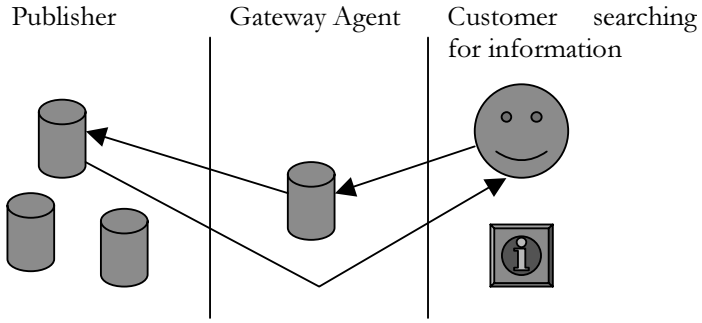

Fig 3: Gateway Agent

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 from 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,

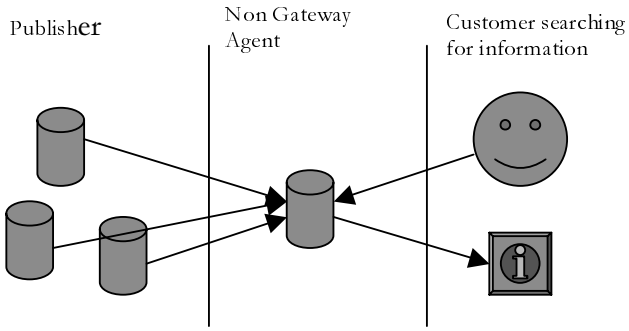

Fig 4: Non Gateway Agent

thus avoiding to maintain a subscriber list and to send changes to each subscriber. Likewise, the consumer should be informed by the broker of any changes to avoid the consumer to poll each producer periodically to detect changes (Byte, 1997). The publisher usually prefers the gateway agent, since the non- gateway agent by maintaining a copy of the articles on its database, take the control away from the publisher on the subscription lists and number of copies sold.
Among the publishers that are reengineering for the marketspace there are Elsevier Science and 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 offer online versions of journals and books at the customer's desktop. To do this Springer Verlag has developed LINK, a digital library created for the Internet

(http://link.springer-ny.com/). LINK will also include 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 (Hagel and Harmstrong, 1997). A customer profile service will also be created that will send users information on new publications according to personal needs or upon request. The users of LINK will have access to the electronic versions of the articles and journals before the print versions come to the market. From a technology point of view LINK consists of a web server, a firewall as well as a high performance database and file server.

Elsevier Science (http://www.elsevier.nl) is another publisher 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 Elsevier Electronic Subscriptions (EES). This service offers libraries complete electronic editions of any titles from Elsevier Science's list of 1,200 journals, as a substitute or addition to the paper version. Science Direct is another major online service, which makes available many journals as on-line full text. Elsevier Science has also established a Contents Alert Service, which sends via e-mail the prepublication of the table of contents of each journal the user is interested in. Examples of online journals with full hypertext capabilities are Immunology Today Online (ITO) and Vaccine Online. The company is also reengineering the journal production to store the journal articles in (media-neutral) databases, from which they can be supplied on-line, on CD-ROM or print form (Elsevier Science Annual Report, 1998).

Implications for Theory and Practice and Conclusions

Electronic commerce technologies are developing at a fast pace and it is not possible to foresee the full implications of this development. Scientific, Technical and Medical publishing is especially affected by this evolution since the academic journal can be easily transformed into a digital product and transmitted on telecommunication networks. In this paper an analysis of how electronic commerce might affect this sector has been conducted, some examples of pioneering companies that are trying to incorporate electronic commerce in their business models have been presented and examples of new electronic journals and electronic intermediaries have been provided. The article has both showed that electronic commerce systems are starting shifting the industry dynamics (Porter, 1980) mainly through new entrants and substitute products as well as intermediation and disintermediation (Bloch et. al., 1996). It has also been argued that while the theoretical models only discuss how electronic commerce might impact the forces of new entrants, substitute products, power of buyers and suppliers with consequent disintermediation and electronic intermediation, what is happening in reality is that some actors are reengineering for electronic commerce thus simultaneously operating in the marketplace and the marketspace. In this way they can compete with the new electronic intermediaries. Therefore the actors of Scientific, Technical and Medical publishing need to monitor very carefully these industrial changes and try to adjust their business strategies and business models accordingly to avoid being by-passed by innovative start-up companies, innovative

researchers, or traditional publishers reengineering for electronic commerce. However, it might be expected that the present actors and new electronic based actors will coexist and that the electronic journal will be complementary to the paper journal, all to the advantage of the user community. Right now it can be concluded that further research is required to understand both the status quo and the potential evolution of electronic publishing in the Scientific, Technical and Medical sector. Items for further research include industry studies to find out precisely how many electronic journals presently exist, how they are distributed by scientific discipline, in depth case studies of new electronic intermediaries, as well as of journal publishers and subscription agents that have reengineered for the marketspace. Finally, analysis of other industries producing digital products could be conducted to study the impact of electronic commerce on these industries.

References

Adelaar, T. (2000) Electronic Commerce and the Implications for Market Structure: The Example of the Art and Antiques Trade Sales. Journal of Computer Mediated Communication*,5(3). Available: http://www.ascusc.org/jcmc/vol5/issue3/adelaar.htm.*

Bailey J.P. and Bakos J.Y. (1997) An exploratory study of the emerging role of electronic intermediaries. International Journal of Electronic Commerce, Vol.1, No. 3.

Benjamin R. and Wigand R. (1995) Electronic Markets and Virtual Value Chains on the Information Highway. Sloan Management Review. *Winter.*

Byte (1997) Data delivery when you need it, June.

Bloch M., Pigneur Y. and Segev A (1996) On the Road of Electronic Commerce, A Business Value Framework, Gaining Competitive Advantage and Some Research Issues. in Proceedings of the Ninth International EDI-IOS Conference, Bled, Slovenia, June 1996.

Bloch M, Pigneur Y and Segev A (1997) The Impact of Electronic Commerce on the Travel Industry, Proceedings of the 30th Haway International Conference on System Sciences (HICSS), January 1997.

Bjork B C and Turk Z (2000) How Scientists Retrieve Publications: An Empirical Study of How the Internet IS Overtaking Paper Media, *Journal of Electronic Publishing*, http://www.press.umich.edu/jep.

CEC (Commission of the European Communities). Electronic Publishing: Opportunity and Trends. Report, 1996.

Choi S Y, Stahl D., Whinston, A. (1997). *The Economics of Electronic Commerce.* Indianapolis, IN:Macmillan Technical Publishing.

Collier H (1998) *The Electronic Publishing Maze, Strategies in the Electronic Publishing Industry,* Infonortics, England, 1998.

Elsevier Science (1998) Annual Report.

Hagel III J and Armstrong A G (1997) *Net Gain: Expanding Markets Through Virtual Communities,* Harvard Business School Press.

Harter SP and Kim HJ (1996) Electronic Journals and Scholarly Communication: A Citation and Reference Study in Proceedings of the MidYear Meeting of the American Society for Information Science, San Diego, CA, May 1996. Also vailable at http://php.indiana.edu/~harter/harterasis96midyear.html.

Hitccock S, Carr L, Hall W (1997) Web Journal Publishing: A UK Perspective, *Serials,* Vol. 10 No. 3.

Kling R and Covi L (1995) Electronic Journals and Legitimate Media in The Systems of Scholarly Communication, *The Information Society,* 1(4). Also available: http://www.ics.uci.edu/~kling/klingeej2.html

Line M (1995) Who Pays for Information and Why Should They? In *Information Superhighway: The role of Librarians, Information Scientists and Intermediaries* (HELL AH and WEISS J, Eds.), 262-275, Publications of Essen University Library.

Locksley G. (1992) in *Understanding Information, Business, Technology and Geography* (ROBINS K Ed), Bellhaven Press.

Mastroddi FA (1996) Electronic Publishing in Science: Trends and User Demands. A European Union Perspective in *Electronic Publishing in Science* (SHAW D and MOORE H, Eds.).

Munksgaard International Publishing, Price Catalog,1998.

OECD (1992a) Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, Oslo Manual (OECD Paris).

Okerson A (1997) The Electronic Journal, in *Information Society and Computerisation*, (KLING R. Ed.).
Page G and Campbell R (1987) *Journal Publishing, Principles and Practice*, Butterworths & Co.
Page G, Campbell R and Meadows R (1997) *Journal Publishing, Principles and Practice*, Butterworths & Co.
Palmer J, Speir C, Wren D, and Hahn S (2000) Electronic Journals in Business Schools: Legitimacy, Acceptance, and Use. *Journal of Association for Information Systems*, Vol.1, http://jais.isworld.org/
Panorama of EU Industry (1997) Vol.1, Chapter 6 (Office for official publications of the European Communities).
Pedersen M Khyn (1997) Electronic Commerce: An Introduction, Working Paper, SIC Project, Roskilde University.
Porter M (1980) *Competitive Advantage*. The Free Press.
Porter M (1983) The Technological Dimension of Competitive Strategy in *Research on Technological Innovation, Management and Policy* (ROSENBLOOM RS Ed) Vol.1.
Rayport JF and Sviokla JJ (1994) The Electronic Marketplace. *Harvard Business Review*.
Sarkar MB, Butler B and Steinfield C (1995) Intermediaries and Cybermediaries: A continuing role for mediating players in the electronic marketplace, Journal of Computer Mediated Communication, http://shum.huji.ac.il/jcmc/vol1/issue3/sarkar.htm
Steinfield, C.W., Chan A.P., Kraut, R E (2000) Computer Mediated Markets: An Introduction and Preliminary Test of Market Structure Impacts, Journal of Computer Mediated Communication, http://shum.huji.ac.il/jcmc/vol5/issue3/steinfield.html
Steinfield, C.W., Kraut, R E , Plummer (1995) The impact of electronic commerce on buyer-seller relationships. Journal of Computer Mediated Communication, 1(3), http://shum.huji.ac.il/jcmc/vol1/issue3/steinfield.html
Sweeney A E (2000) Should You Publish in Electronic Journals?, *Journal of Electronic Publishing*, http://www.press.umich.edu/jep.
Tenopir C and King D (2000) Towards Electronic Journals: Realities for Scientists, Libraries and Publishers. *Special Libraries Association*, Washington, DC.
Vouttas and Cetto (1996) Electronic Publishing: Will IT Reach the Whole World? in *Electronic Publishing in Science* (SHAW D and MOORE H, Eds.).
Wells A (1999) Exploring the Development of the Independent, Electronic, Scholarly Journal, M.Sc. in Information Management, Electronic Dissertations Library, Department of Information Studies, University of Sheffield, UK.
http://www.elsevier.nl/
http://www.ovid.com
http://www.link.springer-ny.com
http://www.firstmonady.dk
http://www.itcon.fagg.uni-lj-si/
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