

Electronic Commerce in Scientific, Technical and Medical Publishing

An industry analysis with focus on intermediation and
disintermediation

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Abstract

Electronic commerce is becoming one of the drivers of competition and is starting playing a role in industry structural change and in affecting the competitive advantage of companies. In this article it is showed how electronic commerce might affect the scientific, technical and medical (STM) publishing sector. More specifically the paper looks at the emergence of the electronic journal as a substitute for the paper journal and tries to provide some empirical evidence of the effects of disintermediation and electronic intermediation in the value chain of the STM industry. It is further argued that some actors of the STM industry value chain are reengineering for electronic commerce thus operating both in the marketplace and the marketspace as a result of the changes in the industry competitive forces and especially the potential threat of disintermediation. The paper also provides examples of established companies that are including electronic commerce in their business model and new fully Internet-based intermediary.

Keywords: Electronic Commerce, Strategic Management, Publishing Industry

Introduction

Technological change is one of the principal drivers of competition and plays a major role in industry structural change, as well as in creating new industries. In this paper the focus is on electronic commerce as a technological innovation. The definition of Kalakota & Whinston (1996) is adopted where “e-commerce is associated with the buying and selling of information, products and services via computer networks today and in the future via anyone of the myriad of networks that make up the “Information Superhighway (I-way)”.

Porter (1980) says that a technology will affect the competitive advantage of a firm if it can affect the relative cost position of a firm, can offer possibilities to differentiate, or a combination of both. Bloch et al. (1996) shows how the e-commerce technologies can support each one of Porter’s 3 generic strategies: cost advantage, product differentiation and focus. Moreover, according to Porter (1980) the development and the diffusion of a new technological innovation can affect the industry structure through a lot of forces: technology can change the entry barriers into an industry by raising or lowering economies of scale, by lowering or raising switching costs, etc. Technological change is responsible for the shift in the bargaining relationship inside an

industry, among its buyers or suppliers therefore changing the industry's boundaries. It also influences their backward or forward integration and might give rise to new substitute products. E-commerce, in addition to the effects of other technological innovation, might give rise to an intermediation and disintermediation effect in the value system of an industry (Benjamin and Wigand, 1995; Pedersen, 1997). The publishing industry boundaries are also changing as a result of mergers and alliances between the publishing houses and network providers, telecommunication companies, etc. (See for example the annual report of Munksgaard Publishing or Elsevier Science).

The aim of this article is to show how e-commerce technologies are reshaping the STM publishing industry, by giving rise to new entrants, new substitute products, new intermediaries thus having a disintermediating effect that could lead to a break in the value system of STM publishing. Moreover, the article argues that while electronic commerce could lead to disintermediation and consequent electronic intermediation, what is also happening in reality is that many actors of the industry value chain are reengineering for electronic commerce to avoid being bypassed and therefore starting operating both in the marketplace and the marketspace.

The paper is organized as follows: first Porter's 5 forces model adapted by Bloch et al. to electronic commerce is described, then a brief description of the publishing industry and in particular of STM publishing is given. This is followed by the application of the theoretical model to STM publishing. This section also discusses examples of innovative firms that are including electronic commerce in their business model as well as a new fully Internet based intermediary. Finally some concluding remarks are given.

Electronic commerce and competitive advantage

In this paragraph a theoretical model developed by Bloch et al. (1995) showing how electronic commerce can affect the forces of competitive advantage and the three generic strategies of focus, cost and differentiation is summarized.

Effect of electronic commerce on competitive strategy

Electronic commerce systems using Internet (or similar systems) will have an effect on a company strategy and the competitive advantage of companies and industries since they

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

This proposition emphasizes how the 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. As such, the Web 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 threatened by small, new entrepreneur that just establish a presence on the Internet and contract for example directly with editors to get the material to be published electronically.

Prop. A2: help a company to differentiate itself not only through price but also through product innovation, time to market and customer service.

The problem of price differentiation will exist in the market space as it has existed in the marketplace. For example a company that has more 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 than companies offering a lower service level, as it happens already in the marketplace.

Prop. A3: allow 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 this strategy for a larger number of specific segments, by using information technology for personalized service on a larger scale and mass-customization of products. For example in STM publishing, customer customization could be used to send e-mail messages to customers about articles of specific interest to them.

Effect of electronic commerce on new entrants and substitute products

Using electronic commerce systems on the Internet (or similar systems)

Prop B1: allows 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 the STM publishing industry, a new entrant in the marketplace 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 necessary to explicate a lot of functions such as binding, printing, physical distribution etc. that either have to be done in house or outsourced and in any case implies higher coordination and higher costs.

Prop B2: creates/raises entry barriers in some markets through extensive customer learning (which makes switching more expensive for customer), product differentiation and experience.

This proposition implies that a company that has experience in e-commerce for some time has a competitive advantage due to the experience acquired in this field as early adopter of the technology, through its market research data about what are the customer needs and wants, on the basis of which can offer better and more differentiated products.

Prop. B3: facilitates the introduction of substitute products in a market due to product innovation.

Electronic commerce systems 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 present travel agencies, etc.

Effect of electronic commerce on intermediation

Using electronic commerce systems on the Internet (or similar systems)

Prop. C1: makes it easier to bypass an intermediary in a distribution network, due to direct customer contact and the use of a publicly shared infrastructure

The hypothesis of intermediation and disintermediation as a consequence of electronic commerce has been discussed by many (Pedersen, 1997; Benjamin and Wigand, 1995, Sarkar et al.). Disintermediation means that many functions done in the marketplace by some intermediaries (e.g., the binders, the printers and the subscription agent in the case of STM publishing) can be suppressed by connecting the producer directly with the consumer. For example, in case of STM publishing the publisher sells the electronic journals directly to the customers, whether they are institutions or individuals. 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., <http://www.shum.huji.ac.il/jcmc/vol1/issue3/sarkar.htm>).

Prop. 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 said in the explanation of proposition C1, the direct connection between the supplier and the buyer are not always the optimum due to many reasons. A first reason is the information overload, or the fact that the cost and the time required to access multiple sites can increase notably, often preferring to have an intermediary that does the search.

A second reason is 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.

Prop. C3: makes 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 keep innovating in order to keep their competitive superiority (Bloch et al., 1996).

The STM publishing industry: background and trends.

The publishing industry has many sectors including magazines, newspapers, corporate publishing, books, research journals (CEC, 1994/4). It seems to have entered a stage of maturity and maybe decline, even though there is much contradiction in assessments of the growth rate of the sector. (Panorama, 1997, CEC, 1994).

These contradictions are 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 same is true for traditional forms of reproduction of recorded media (e.g. CDs and videocassettes). Higher growth rates are projected for newer electronic products even though: "The printed media are likely to remain the major players in the communication market. They currently represent around 60% by value of the total consumption of communications media in Europe. To date, information technology advancements have largely complemented rather than substituted for the written word. As businesses and other consumers become familiar with emerging information technology applications, the rate of substitution of electronic means of communication for paper based media will increase. The emergence of this new information-driven economic paradigm, however, remains sufficiently unclear to make firm predictions on its net impact on printing and publishing." (Panorama, 1997, p.6-27).

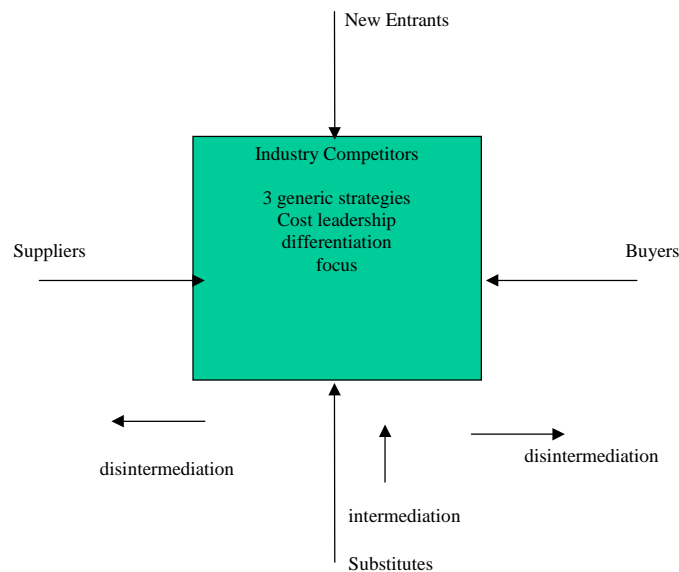


Figure 1: Porter's 5 competitive forces framework revisited (Bloch et al. 1996)

STM Publishing

This paper focuses on Scientific, Technical and Medical (STM) Publishing. This is a niche sector within the publishing industry and not one of the biggest in terms of revenues (CEC, 1992). Nevertheless it is a very interesting field to study. Many sources describe it as one of the sectors where e-commerce and Internet could have some of the biggest implications for the competitiveness and survival of the present actors, (Panorama, 1997) and a sector where the actors are obliged to enter electronic publishing (CEC, 1994). This is due to many reasons. The reader community of the STM journals are researchers or industry people that need the information as fast and as updated as possible, while right now it takes considerably long time to get research results accepted and published. This is the main reason why researchers are putting on Internet the draft versions of their articles and use e-mail lists as forum to discuss their subjects. Moreover, Internet and the WWW can revolutionize the way of conducting research and can change the role of a publisher into a community organizer (CEC, 1996). In the last few years many STM publishers have been entering the e-commerce arena. For example the leading publishing group 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 (Page, 1997). Munksgaard Publishing has 6 journals on-line, Elsevier Science is strongly expanding into the electronic publishing environment with the objective of offering their 1200 journals online (see also the PEAK project at <http://www.umich.lib.peak>), and Springer Verlag has developed the LINK system that will offer about 400 journals on-line.

Actors and activities of STM Publishing

The STM publishing market can be categorized in terms of the type of customers: 1) individuals affiliated with some 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. The main actors involved in the production of a journal are: the suppliers/authors, the editor/editorial boards, the reviewers, the publisher, the distributor and the subscription agents.

The suppliers/authors of the journal articles: are usually part 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, p. 3).

The editor/editorial board: are responsible to check the quality of the article and sends 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. Sometime 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 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.

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 a typical library has 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, and

learn the differences in trade practices between publishers. These are all functions done by the subscription agents, whose role is difficult to be taken over by each single publisher (Page, 1987, p. 55). The agent also does other functions such as collect information on existing journals, particularly regarding changes of price, title, frequency, new journals. The agent collates orders by publisher, sends payments in the appropriate currency and 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, p. 56). The agent is paid for his service by a discount from the publisher, which are usually around 5% of the list price, by a service charge to the library or by a combination of both.

The Publishing industry and Porter's 5 forces framework revisited

In this section, the 5 forces framework is applied to the STM publishing industry. The analysis takes the point of view of a publisher and describes how electronic commerce is affecting the different competitive forces of Porter's model and the publisher itself. The focus is on the publisher because it is the main actor in STM publishing, being responsible for the production of the journal and therefore the center of many functions such as binding, printing, distributing etc. However, even though the focus is on the publisher, the implications of electronic commerce for the subscription agents are also discussed. Specifically, the analysis focuses on the threat of new entrants, threat of substitute products and the bargaining power of suppliers. Moreover, the consequences of substitute products for electronic intermediation and the effect of disintermediation are also discussed. It is also argued that while the theory of disintermediation and electronic intermediation suggests that some actors will be bypassed and others, fully electronic, will step into the industry value chain, empirical insights suggest that some of the actors threatened of being bypassed are reengineering for electronic commerce in order to also function as electronic intermediaries, thus competing both in the marketplace and the marketspace. The analysis is substantiated by examples of corporations that are either reengineering to also compete in the marketspace or are fully Internet-based electronic intermediaries.

New Entrants

Internet gives the opportunity to many groups of actors to enter the publishing business and therefore be potential threats to the publisher. In this paragraph we briefly describe them.

1. Innovative researchers and scholars: 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). External economic conditions may push scholars to start networked electronic journals instead of paper ones. Given rather high subscription costs of paper-based journals, scholars will have an incentive to create electronic journals since substantial cost savings can be realized if the new journal is electronically distributed on networks.

2. University-based electronic publishing: Nowadays the Universities publishes at most about 15% of their faculty's output. This includes discussion papers and periodicals emanating from individual academic departments as well as formalized university outlets like university presses and publication offices. 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. It is very likely that especially in scientific fields such as mathematics and physics the university-based electronic publishing will flourish extensively.

3. Computer conferences as electronic journals. "Many scholars and librarians begin to take seriously the scholarly computer conferences (known as "lists") as well as 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. It is certain 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 (Okerson, 1997, p.591)".

4. New organizations (or new intermediaries) that distribute the journal electronically such as OVID Technologies (<http://www.ovid-tech>) that potentially could provide direct contract with the editors to get the journals for on-line publication.

Diminishing costs of technology, the flattened learning curve by early adopters and the low capital requirements to make an electronic version of a journal facilitates these new entrants. The cost factor is important as the editors or libraries could have the necessary inputs and means to create and distribute an e-journal. Presently, the use of academic networks appears to be free, but even though this should not be the case anymore, the communication costs should be as cheap as long distance calls and faxes (Okerson, 1997).

Substitute Products

In STM publishing, the main substitutes for the paper journals are the electronic journals, the electronic versions of the paper journal and the mailing lists described above. The electronic version of the journals have big implications for the publisher since new corporations that contract directly with the suppliers/authors could step into the publishing market and sell and distribute the journal directly on Internet, thus taking market share away from the traditional publisher. 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 all issue.
- The immediate delivery (over a network) of the product (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 general 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 is substantially higher than the price for the paper version. The electronic version as an add-on to the paper version usually implies a price increase of about 30% respect to the paper version only (See e.g. the price catalogues of Munksgaard International Publishing). 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. Switching costs could make a difference in the adoption rate of the electronic journal. In fact, to get a paper version all what is required is to subscribe to the journal, while 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 big corporate customers or institutions, but it could be a problem for single individuals. An increase in the buyer propensity to substitution can be foreseen in light of the demographic trends such as an increased PC literacy of youth, rising electronic media literacy, and increased competency of users (CEC, 1996; Sect. 1.1), and in the nature of the STM market, which is mainly made of highly literate, specialized people using computers and networks as daily breads.

Bargaining Power of Suppliers and Entry barriers

These factors are not very important because the power of the suppliers (authors) is very low in STM publishing since the author usually writes the article for reputation, personal advancement, carrier purposes (Page, 1987). 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 because the supplier could hypothetically decide to charge a price for the journal articles and also because the format in which the file is received has a direct influence on the typesetting and copyediting costs incurred by the publisher. The entry barriers are very low, mainly due to technological advances, especially in DTP (Desktop publishing) which are also making it extremely easy to enter the publications market with little capital outlay.

Diffusion barriers to Electronic Publishing

The development of the electronic publishing market is currently impeded by high infrastructure usage costs and quality of content. Besides the telephone costs, major barriers to the widespread use of electronic publishing are costs of multimedia PCs, limited user friendliness of interfaces, lack of attractive content, lack of secure online transaction systems, uncertainty about user acceptance. On top of this comes the problem of downloading the article. Generally the success of electronic publishing has to be found in the mass-market adoption of electronic commerce systems (CEC, 1996).

Intermediation and Disintermediation and implications for STM publishing

The introduction of the 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). In the following discussion, as already mentioned, it is argued that electronic commerce not only gives rise to intermediation and disintermediation, but as a result many actors of the present industry value chain are repositioning themselves to enter the electronic market thus operating both in the marketplace and the marketspace. These actors are for example the publishers and the subscription agents that are entering the electronic commerce arena to avoid being bypasses by potential new entrants.

Intermediation

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. 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, p. 35). In the STM publishing industry, the subscription agent explicates the role of the information collector and facilitator (as the travel agent). The increasing number of publishers that offer electronic versions of journals will increase the search costs for electronic articles. Therefore it might be desirable to start paying an electronic intermediary to do the search (Bloch et al., 1997). The number of new companies (electronic intermediaries) that start licensing articles from different publishers and distribute them only electronically (e.g., 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 to provide also on-line services (interview with a major publisher).

There are two types of electronic intermediaries: the gateway agents and the agent that maintains a copy of the journals on its own databases and sells it to the customers. They are illustrated in Fig. 1 and Fig 2 respectively.

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, since in the other business model 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).

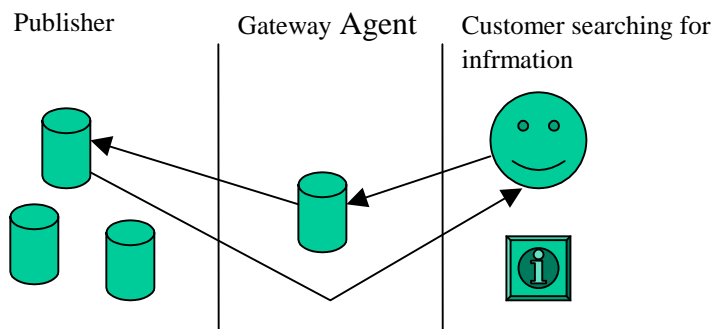


Figure 1: Gateway Agent

The following section gives an example of a fully Internet-based intermediary that could constitute a threat both to the traditional subscription agent and to the publisher and operates only in the marketplace.

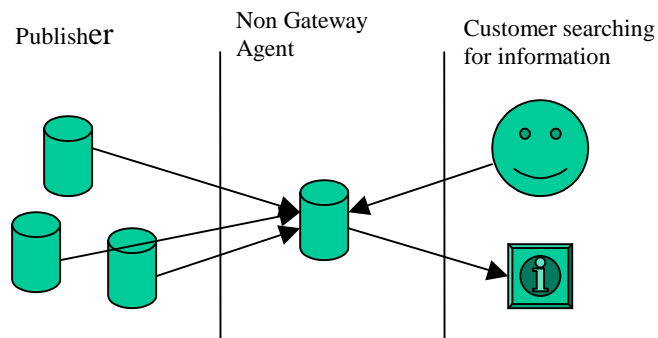


Figure 2: Non Gateway Agent

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 has now 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 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>)

Disintermediation

A consequence of using Internet for distributing the electronic version of the journal is that printing, binding, warehousing, packaging and physical distribution of the journal are not done by the publisher. Accordingly the price can also be cut by the cost of printing, binding, physical distribution and, partially, typesetting. This is the disintermediation effect or a break in the value system of STM publishing. Such disintermediation also brings cost reduction and time reduction (from submission to publication). For example, a look at a typical journal schedule (Page et al., 1997, p. 48) shows that with on-line services the time 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 STM publisher and subscription agent have to operate simultaneously in the marketspace and the marketplace (Rayport and Sviokla, 1995). 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 more optimal business models to gain a competitive advantage both in the marketplace and in the marketspace. Today the 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. 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 also influence these trends.

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 consumer, in which capacity they pay via the library or department, all of his/her costs of consumption. In fact, the market for STM 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 pays really 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 (Line, 1995). Because of this intermediary position of 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. "As part of this change, the packages we call journals would probably give way to databases of unpackaged individual articles (Line, 1995)". 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 the article production costs. 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 are presented that are reengineering for electronic commerce as a result of the pressures from the substitute products and the threat of being disintermediated by new Internet based entrants.

Examples of STM Corporations reengineering for the marketplace

Many STM publishers are experimenting with Internet and many are already offering electronic-only journals (e.g., Munksgaard Publishing, Blackwell science). This paragraph focuses on two leaders that are among the pioneers of the electronic commerce frontier in 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 challenging: "Online versions of journals and books at your desktop; current issues as well as back issues, combined in a digital library and presented on a high level online server (<http://link.springer-ny.com/tutorial/haupt1.html>)". 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 by 1999 all 400 journals offered by Springer can be accessed on LINK (<http://link.springer-ny.com/tutorial/service.htm>). LINK will also offer 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 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. 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. 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

Elsevier Science (<http://www.elsevier.nl>) is a leading STM publisher that is 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 developed with Lexis Nexis, which makes available many journals as on-line full text. It is possible to use Internet to access Elsevier Science Home Page System through which it is possible to access ESTO (The tables of Contents Service) to browse through the table of contents of circa 1,200 journals. Elsevier Science has 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 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 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.

Research method

The research design has been both deductive and inductive, the main aim being “to join together inductive and deductive analysis in order to lay the foundation necessary for empirical analysis” (Carlsson, 1989). The study has been conducted as a case study of the publishing industry. The data collection has included the following sources: 1) Analysis of pre-existing documents found in the library catalogs, in CD ROM such as ABI Inform, original sources such as annual reports of corporations and reports from other associations in the field of STM publishing. 2) Internet searches. The Internet searches have been of two types: to find relevant articles and to find home pages of corporations doing electronic publishing on Internet in the field of STM publishing. These home pages have then been analyzed by using observational techniques. 3) Elite interviews of key representants of international STM publishers and electronic intermediaries to understand the future trends.

Conclusions, limitations, and future research

Electronic commerce technologies are developing at a pace, which no other industry has been progressing at until now. Companies have to take this into consideration and try to adjust their business strategies and business models accordingly. The publishing industry and in particular STM publishing is especially involved in this information society evolution since their primary product can be easily transformed into a digital product and transmitted on telecommunication networks. Therefore the actors of the value system of STM publishing need to monitor very carefully these changes and try to reorganize accordingly to avoid being by-passed by new innovative start-up companies. In this paper an analysis of how electronic commerce might affect the STM publishing industry has been done and some examples of pioneering companies that are trying to incorporate electronic commerce in their business model have been presented. It has been argued that as a result of the potential threats of substitute products, disintermediation and electronic intermediation, some actors are starting reengineering for electronic commerce thus simultaneously operating in the marketplace and the marketspace.

This article is a small building block to understand the empirical implications of the hypothesis of intermediation and disintermediation in general and for STM publishing in particular. Further research is required to both understand the evolution of the electronic journal and electronic publishing of the STM journal as well as to find more empirical evidence of the hypothesis of intermediation and disintermediation. Items for further research could be in depth case studies of STM publishers and subscription agents that have reengineered for the marketspace or of fully electronic intermediaries. Furthermore, analysis of other industries producing digital products could be conducted to study the impact of electronic commerce on these industries.

The main limitation of this study consists in using only the Porter model of the five competitive forces as theoretical framework. Other approaches such as the

transaction costs approach could be used both in this study and similar studies of intermediation and disintermediation.

References

- Benjamin, R. and Wigand, R. Electronic Markets and virtual value chains on the information highway. *Sloan Management Review*. Winter 1995.
- Byte. Data delivery when you want it, June 1997.
- Bloch, M., Pigneur, Y. and Segev, A. On the Road of Electronic Commerce, A Business Value Framework, Gaining Competitive Advantage and Some Research Issues, Fisher Center for Information Technology and Management, University of California at Berkeley, 1996.
- Bloch, M., Pigneur, Y. and Segev, A. The Impact of Electronic Commerce on the Travel Industry, Fisher Center for Information Technology and Management, University of California at Berkeley, 1997.
- Carlsson, B., Flexibility and The Theory of the Firm, *International Journal of Industrial Organization*, 7 (1989), pp. 179-203.
- CEC (Commission of the European Communities). Strategic Developments for the European Publishing Industry towards year 2000, 1992
- CEC (Commission of the European Communities). An Overview of print publishing markets in the European Commission, IMO Working Paper, 94/4.
- CEC (Commission of the European Communities). Electronic Publishing: Opportunity and Trends. Report, 1996.
- Chellappa, Barua, A., Oetzel, J. and Whinston, A.B. Electronic Publishing versus publishing electronically, In *Readings in Electronic Commerce* (Kalakota, R. and Whinston, A. Eds.) 1996.
- Elsevier Science, Annual Report, 1998.
- Line, M. Who pays for information and Why should they? In *Information Superhighway: The role of Librarians, Information Scientists and Intermediaries* (Hell, A.H. and Weiss, J., Des), PP. 262-275, Publications of Essen University Library, 1995.
- Locksley, G. in *Understanding Information, Business, Technology and Geography*, (Robins K. ed.), Bellhaven Press, 1992.
- Kalakota, R. Whinston, A.B. *Frontiers of Electronic Commerce*, Addison Wesley, 1996.
- Munksggard International Publishing, Annual Report, 1997 and 1998.
- Okerson, A. The Electronic Journal, in *Information Society and Computerisation*, (R. Kling ed.), 1997.
- Page, G. and Campbell, R. *Journal Publishing, Principles and Practice*, Butterworths & Co., 1987.
- Page, G., Campbell R, Meadows. *Journal Publishing, Principles and Practice*, Cambridge University Press, 1997.
- Panorama OF EU Industry. Vol.1, Chapter 6 (Office for official publications of the European Communities), 1997.
- Pedersen, M., Klyn. *Electronic Commerce: An Introduction*, Working Paper, SIC Project, Roskilde University, 1997.
- Porter, M. *Competitive Advantage*, The Free Press, 1980.
- Porter, M. *Competitive Strategy*, The Free Press, 1982.
- Rayport, J.F., Sviokla, J.J. The Electronic Marketplace, *Harvard Business Review*, 1997.
- Sarkar, M.B., Butler, B., Steinfield, C., *Intermediaries and Cybermediaries: A continuing role for mediating palyers in the electronic marketplace*, JCMC, <http://shum.huji.ac.il/jcmc/vol1/issue3/sarkar.htm>
- <http://www.elsevier.nl/homepage/about/profile>
- <http://www.ovid.com>
- <http://www.link.springer-ny.com>
- <http://www.umich/peak>