

MERIT-Infonomics Research Memorandum series

*Protecting The Digital Endeavour:
Prospects For Intellectual
Property Rights In The
Information Society*

Robin Cowan and Elad Harison

2001-028



*MERIT – Maastricht Economic Research
Institute on Innovation and Technology
PO Box 616
6200 MD Maastricht
The Netherlands
T: +31 43 3883875
F: +31 43 3884905*

<http://meritbbs.unimaas.nl>
e-mail: secr-merit@merit.unimaas.nl

International Institute of Infonomics

PO Box 2606
6401 DC Heerlen
The Netherlands
T: +31 45 5707690
F: +31 45 5706262

<http://www.infonomics.nl>
e-mail: secr@infonomics.nl

Protecting The Digital Endeavour: Prospects For Intellectual Property Rights In The Information Society

Robin Cowan and Elad Harison

September 2001

Keywords: Intellectual Property Rights; Patents; Copyrights; Trademarks; Open Source; Internet; E-Commerce; Intelligent Agents; Information Goods

JEL Classifications: K11, L51, L63, L86, O34

Abstract

The impacts of the New Economy are not limited only to recently developed technologies, but involve new opportunities for more “traditional” technologies to develop. Knowledge-based industries, and information technologies in particular, hold both promises and threats in many fields. However, as technical know-how is both an input to and an output of knowledge-based industries, IPR regimes may have a large effect on the pace of innovation in knowledge-based technologies. Knowledge is a stimulus for innovation, particularly in knowledge-based technologies where large shares of technical know-how are embedded in final goods. Information goods are described as public goods: if information is disclosed to the public, its originator loses the advantages of propriety, but a new generation of know-how and ideas is stimulated and expanded as a result of its publication. However, knowledge is not legally a public good because unauthorized reproduction can be monitored by IPR. Whether IPR regimes facilitate innovation or reduce its pace has been raised as a pressing issue by the emergence of new technological paradigms and recent economic changes, namely the New Economy. This paper discusses four technologies which are emblematic of the new economy, and which raise important issues regarding IPRs. The technologies presented in this report were selected for analysis on three criteria. First, they are predicted to see rapid evolution during the coming decade and to hold a major share of both economic activity and growth. Second, these technologies are knowledge-based and most have been developed since the mid 1980s. Third, in the context of the technologies discussed here, the current design of IPR regimes seems to conflict with their original aims, namely fostering innovation and technological diffusion by promoting knowledge disclosure and granting monopoly. This report also reviews alternative economic and business models that question the need to protect information goods by IPRs.

Acknowledgments

The authors gratefully acknowledge Anselm Kamperman-Sanders for bringing the case of eBay vs. Bidder's Edge to our attention.

This paper is drawn from a report commissioned by AWT (Adviesraad voor het Wetenschaps- en Technologiebeleid) published as an AWT Background Study No. 22 (June, 2001).

MERIT, Universiteit Maastricht, P.O.Box 616
6200MD Maastricht, The Netherlands
r.cowan@merit.unimaas.nl ; e.harison@merit.unimaas.nl

1. Introduction: Do IPRs Impede or Foster Innovation? Economic Perspectives in the *New Economy*

The *New Economy* is a term that recurs both in analyses of major technological sectors, and in descriptions of the emerging new, knowledge-based industries and their impact on legal and social regimes. While ICT industries are discussed in the context of advanced communication infrastructure and increasing reliance on computer-mediated production and services, the contemporary technological development in knowledge-based goods calls for an expansive framework for discussion. Namely, evaluating the shift from the traditional technological paradigm by which physical goods have prevailed toward an intangible, information-based economy.

Traditional industries have undergone vast changes during the 1990s. Information- and knowledge-intensive technologies have evolved and have continuously diffused to increasing numbers of applications in both emerging sectors and in more established industries. Fig. 1.1 shows that the expenditure on ICT equipment and services in *non-ICT* sectors captures 93% of the US market.

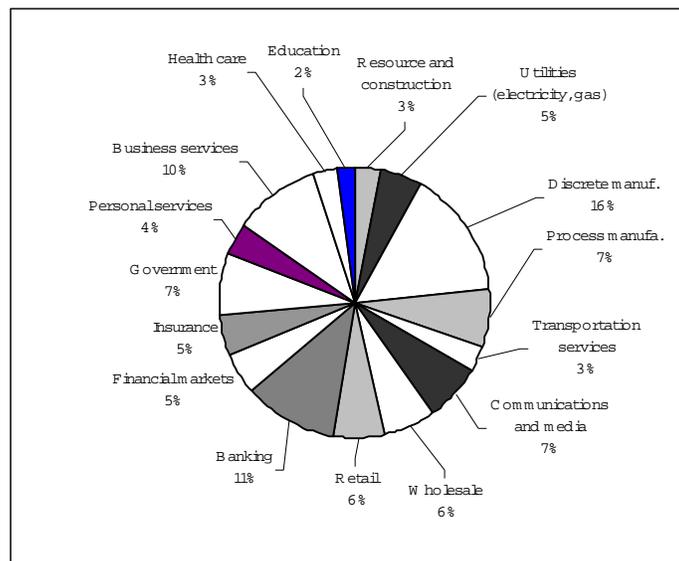


Figure 1.1: ICT expenditure by sectors in the US.

Source: OECD (2000a).

We can observe that the *New Economy* affects not only recently developed technologies (considering Internet and databases as common examples), but mainly affords new opportunities for more “traditional” technologies to gain efficiencies and competitiveness, by implementation of new applications and tools (e.g. communication platforms and e-commerce). Knowledge-based industries, and information technologies in particular, hold both promises and threats in many fields.¹ This report, however, reviews the perils for innovation that systems of intellectual property rights may present, and whether IPR regimes indeed hold a pivotal position in generation of technical knowledge and innovation. As technical knowledge is an output of

¹ Database management and security, gene therapy and global knowledge-sharing networks are among the most commonly mentioned subjects that accommodate both astonishing technological progress as well as potential hazards for the society (OECD, 1998).

knowledge-based industries and at the same time an input, we also evaluate whether IPR regimes lever or reduce the *technological dynamism* of knowledge-based technologies, when IPRs are put on the scale in the “*weight-less economy*”.²

1.1. Recently Evolving Industries and IPRs: New Challenges for Old Regimes

A large body of empirical and theoretical work in the economic literature has identified technical knowledge as a stimulus for innovation.³ In the new technological reality, large shares of industry are based not only on knowledge as an input in research and development processes, but also on knowledge-based outputs, embedded in final goods.

Information goods are often described as *public goods* (Arrow, 1962). If some piece of information is disclosed to the public, the original owners would lose their proprietary rights, but a new generation of know-how and ideas would be stimulated and expanded as a result of its publication. In economic terms, knowledge based goods may involve high development costs, but the final products are produced and distributed at (almost) zero marginal production costs.

Information and knowledge-based goods are also influenced by the presence of network externalities. Users, sharing similar applications which are based on rival technologies (such as word processing or communication protocols) often cannot establish interfaces between various standards on which each network of users is based. As a result, new customers, wishing to select one technology among others are required to decide in which technology to invest, not solely on the basis of functionality and technical performance but mostly on the basis of the diffusion and “popularity” of the technology. Moreover, when network externalities are present, current users of a certain technology benefit from every new user that joins and expands their “network” of users.

The “New Economy” is seen as centrally located in sectors which have recently developed and which generate technological inventions and artefacts on the basis of *knowledge* (often called “knowledge-based goods”). In order to understand issues in intellectual property rights that arise from the shift from a predominately physical-goods-economy towards an economy based on intangible, information capital, we first review the attributes of the knowledge-based economy, and the benefits that it confers.

Knowledge based goods are described in the economic literature as intangible, non-rivalrous and non-excludable goods. *Non-rivalry* refers to the fact that knowledge is infinitely extensible — one agent’s acquiring a piece of knowledge does not mean that another agent has lost it, as is the case for physical goods. By *intangible* we mean that in information goods, different from physical goods, information and technical know-how embedded in the final products plays the major role, whereas the role of the physical part of the product is only minor. For example, software products digitally represent the advanced computer-science technologies and development, both of which are intangible knowledge goods, whereas their “physical” dimension is only the medium in which they are stored (i.e. floppy disks and hard drives).

As knowledge based goods are based on technical know-how (more so than on machinery and industrial processing), competing firms may easily imitate and reverse-engineer information products when introduced in the market, hence information products may be defined as non-rivalous. This *non-excludability* implies that their distribution in the population is

² Quah (1997) uses this term to describe the essence in which the new technologies, and in particular information technologies, shift toward non-physical basis of the goods.

³ See for instance David’s review (1993) of the development of IPR regimes; historical chronology is presented in Granstrand (1999), pp. 28-31.

difficult to control by their producers, stems from their peculiar essence. It is almost impossible to limit certain consumers from accessing and disseminating information products and letting others do so when the goods are present in the market. However, their unauthorized reproduction (duplication) can partially be monitored by legal means through IPR protection.

The appropriateness of IPR regimes as facilitators of innovation (or as something that reduces its pace) has been called into question by the emergence of new technological paradigms and recent economic changes. Scholars in legal, technological and economic faculties attempt to assess how market mechanisms behave in the complexity of the new technological realm, and recently, how IPR regimes affect technological evolution. While IPR regimes guarantee monopoly over disclosed knowledge, firms in several fields in new technologies in fact prefer to disclose their intellectual assets with no cost and with no application of legal means to protect this knowledge. Some of these firms are driven by the desire to create a market standard by an expansive use of their goods. Others benefit from supply of services and products complementary to the basic platform.

As a starting point for our discussion, the technologies presented in the next sections were selected for analysis on three criteria. First, all technologies are predicted to see rapid evolution during the coming decade and to hold a major share of both economic activities and growth. Second, all technologies are knowledge-based and most were developed since the mid 1980s. Third, the current design of IPR regimes seems to conflict with their original aims, namely fostering innovation and technological diffusion by promoting knowledge disclosure and granting monopoly, when one considers new technologies.

2. The *Creativity Paradox*: How IPRs are Challenged by the “Open Source” Movement

The rapid development of the Internet accelerated in the 1990s and confronted software users, developers and authorities with a wide variety of problems. The intellectual property rights regime, developed in an era in which physical goods dominated the economy, was in some ways not in keeping with the new realities of intangible, information goods, the ease of their reproduction, and, with the Internet, the ease and geographic scope of their distribution. One aspect of the evolution of software, and information goods in general, has been an attempt to commodify them in such a way that they fit into the old IPR paradigm. Thus, one movement has been towards applying strong property rights, such as patents, in this area. The natural evolution would seem to favour the development of “closed” software platforms, offered to the market with absolutely minimal disclosure of the embedded knowledge. Similarly, as we have seen, software patenting both as a means of protecting property and as a strategic means to preempt new entrants has become more and more widespread.

On the contrary, though, since the beginning of the 1990s we witness a significant increase in development of Open Source systems, which are publicly offered with a free-use license (e.g. *Linux*, *Apache* and *Sendmail*). Why do software developers and software firms offer their creative output at zero-price, even though current legalization allows software developers more means to claim property rights than even before?

Recent publications argue the existence of non-economic rents in the Open Source “business model”, which are based on altruism, ego-satisfaction or the ability to achieve a state-of-the-art scope for work and interest. Hence, from an economic point of view we try to propose an alternative explanation for the decision to release source code to the public domain as an economically-rational decision, based on a formulation of dominant and improved standards among software developers and users.

2.1. From IPR Protection toward Communal Benefits

Since the mid-1990s, two major trends in software economics have arisen. The first argued for strengthening intellectual property rights for software and information goods, whereas the second approach presented a progressive attitude, commonly known as Open Source, by which legal modus operandi to protect software goods and innovation should be only minor. In order to understand the background for the emergence of the two approaches the technological evolution which led to those changes should be first introduced.

Issues of intellectual property rights, copyrights and patent protection for software-embedded processes and later explicitly for software goods, appeared after the verdict in *Diamond vs. Diehr* (Supreme Court, 1986) in which software elements were recognized patentable. During the beginning of the 1990s, the US Patent Office (USPTO) decided to examine its guidelines for protecting software goods. The result of its efforts defined progressively more tolerant allowances for patenting.

The main change in the USPTO policy is the ability to patent algorithms, which enabled the patenting of advances in software technologies (the “idea”), as a part of developed software, whereas the *final product* is protected by the Copyright Act (the “expression”) (USPTO, 1996). Hence, since the Courts’ verdicts and legal guidelines determined legal methods for protection of software goods, ideas, processes and algorithms have come to be protected by patent law. Consequently, the average growth rate in the number of patents in the category of “information processing” (the major classification for software application patenting), between 1992-1999, was 33%. To compare, the average annual growth in the total number of patents during this period was only 20%.

The other approach, the Open Source movement, was established in order to integrate and to coordinate an aggregation of skills of computer developers. While this movement was begun in the 1970s in academic institutes and public laboratories, the extensive diffusion of the Internet has changed dramatically the scope and feasibility of the movement and has involved larger parts of the population in open source development. This model involves the full life-cycle of software development in a cumulative and communal manner and is nicknamed the “Bazaar model”, in which the programmers are invited to take part at any time.⁴ The model is named to contrast with the prevailing methodology in the software industry – “the Cathedral model”, in which “closed” development teams have well-defined areas of responsibility coupled with structural processes and procedures for testing, debugging and non-frequent releases of versions (Raymond, 1999). The “Bazaar model” allows communities of users and developers to create a dynamic process, in which products are opened to changes, freely implemented and frequently updated, mastered and enriched by their users. In order to assure that programmers disclose their advances back to the community, and those are shared as public domain, unique schemes of “public licenses” were formed when the first open source projects were launched (*GPL*, *MPL*, *GNU* and others).

Numbers of Open Source applications have been growing exponentially since the beginning of the 1990s. The technological diffusion of the Internet has fostered the formation of programming teams over the Internet via discussion groups and message boards and has orientated talent toward joint development of network-based applications. To illustrate, USA Today predicts that the share of Linux, an Open Source operating system and a common example of a successful *bazaar*-type development, will be doubled within two years and exceed a 9%

⁴ The stages of the model include: development of the source-code, debugging, testing and quality assurance, documentation, version release and a continuous development of related features (as software “patches”).

market share.⁵ The Open Source Apache is the leading platform for Internet communication servers. It is estimated to have captured 57%-60% of the market for Internet hosts.⁶

Economists and social scientists have recently begun to examine the rationale behind the “altruistic” behavior of software developers, sharing their intellectual and professional output at “no cost” with other users. Initial conclusions distinguish among contributors to Open Source projects and divide them to three groups:

- *Participants* in Open Source community are involved mainly in software documentation and testing via regular use. Their incentives include satisfaction and expertise in state-of-the-art software technologies.
- *Programmers* develop source code of Open Source applications. They benefit, to a large extent, from adoption of relevant procedures and algorithms in other projects in which they are involved, and from relationships with other actors in their professional circles. Their incentives also include “learning by doing”, gaining expertise from development of new software and from knowledge spillovers by other programmers in the project.
- *Project leaders* initiate development of Open Source applications mostly as a “call for solution” of engineering problems they confront in commercial projects they perform (for example: development of unique email protocols as a part of communication project). Later, when the number of participants and their interest in the project exceeds a critical mass, and the initial specification expands, project leaders continue to coordinate the development efforts or hand over their role to one of the active participants. They are driven by reputation and by recognition in the “Open Source” community and among software firms and by the ability to signal future trends in the ICT market and to recruit genuine programmers to their commercial activities.

(Raymond, op. cit.; Lerner and Tirole, 2000)

One aspect of a firm’s decision to embrace Open Source involves the expectation that by disclosing the software technology to the public domain, other complementary activities, offered by the firm, can be commercially exploited and will expand through a rapid diffusion of the proposed technology. Hence, release of a source code for free use is perceived as a method to foster adoption of core technologies and to turn them to a market standard. Small and medium firms that cannot compete with market leaders may apply the Open Source strategy to improve their positions in the market and promote extensive implementation of their technologies. Red Hat Linux is an example of a successful business model which is fully based on Open Source applications. The company distributes Open Source applications, which can be downloaded for free from the Internet, but provides its customers full guarantee and technical support. Red Hat acquires the source code at no cost, tests and improves the software, and then sells it in the market. Although Red Hat Linux may be installed and used for free (both are permissible by Linux licensing terms), most of its customers prefer to buy an original copy of the software, as an “insurance premium”, and enjoy the firm’s guarantee (Young, 1999).

Examining Red-Hat’s success, one should cautiously conclude about the possibilities for other firms to profit by adoption of a similar model for their business activities. Indeed, Open Source software is available to distributors at no cost and in many cases offers consumers superior solutions than “closed applications”,⁷ and their application as a purchased copy reduces the implementer’s risk. However, the formation of communal cooperation in development of

⁵ Available at: <http://www.usatoday.com/life/cyber/tech/cth076.htm>

⁶ Based on estimations of Inktomi and the NEC Research Institute (<http://www.inktomi.com/webmap/>); Netcraft (<http://www.netcraft.com/>); E-Soft (http://www.securityspace.com/s_survey/data/index.html).

⁷ Users are able to copy parts of open source systems for implementation in other systems, modify them according to their needs or distribute them to others at no cost.

advanced applications and their use by computer experts and, recently, by home users questions the need for extensive frameworks of intellectual property rights in software technologies and whether legal protection by patents and copyrights may be reduced.⁸

At the same time that highly protective legal intellectual property regimes for software have been criticized as destroying the balance between incentives to invent and the diffusion and use of technological knowledge, alternative models of intellectual property use, based on the tradition of Free or Open Source, in which openly available software is used as the basis of a profit-making venture have developed.⁹ Recent research in economics has attempted to explain the rationale for participants, both firms and individuals, in Open Source. A development method, which originally started with the Free Software Foundation to foster an endogenous growth in innovation for software technologies (Stallman, 1999), has developed to become a profitable business model, in which a reliance on legal intellectual property regimes is (almost) prohibited, by legal means.

The Open Source model indeed demonstrates a creativity paradox, in which an advantageous market position can be granted, through the design of IPR regimes, to inventions in software technologies. Nevertheless, dramatic software development can take place without this over-riding concern for short-term profits or monopoly rights over the results of development efforts.

A preference to develop did not rely on a short-term profit, as may be concluded from life cycles of software goods, but on more complex motives, let altruistic behavior be left out of the framework of our discussion.

Finally, although the echoes of former debates in software economics have not yet dissolved, technological developments in the field and progressive communication platforms may confront us, due to evolving abilities and functionality, with new levels of complexities, far from the traditional economic and legal models, as currently known.

3. IPRs and the Challenges for E-Commerce

3.1. E-Commerce: From the Evolution of *EDI*¹⁰ Technologies toward a *DOT.COM* Revolution

Electronic commerce, or E-Commerce as it is called in short, is not a brand new idea. The use of the Internet as a medium for information and the widespread span of its computer mediated communications have indeed levered the diffusion of E-Commerce systems, but

⁸ Not only that software producers hardly rely on IPR regimes to prevent unauthorized duplication, most of them rarely implement technical means for this purpose (Stolpe, 2000).

⁹ In contrast to many opinions in the field (for these mainstream views see Reichman, 1994; Samuelson et al., 1994; Schumm, 1996), Cohen (1999) argues for a stronger IPR regime. The idea is that if property rights were stronger, dominant standards for core technologies would emerge more quickly, and by reducing resources expended on competing technologies, more resources would be available for more rapid development of applications.

¹⁰ Electronic Data Interchange; the electronic communication of business transactions, such as orders, confirmations and invoices, between organizations (www.techweb.com).

business transactions via digital information networks originated in the US transportation sectors in the early 1960s.

The transportation industry in the US proposed to address the needs of its members by developing central medium for communication and data retrieval to simplify the transmission of reservations and freight status reports between service providers and large firms. The development of EDI aimed to reduce search costs involved in acquiring information about prices and capacities and to substitute delivery of manual mail and generation of forms and reports integrated in business processes of transit firms. Transmission and storage of electronic transactions via information systems and the VAN¹¹ communication networks supported by standard protocols were, according to the heads of the industry, the sound solution for some of the major problems that service providers and customers had confronted.¹² Moreover, policy makers expected that presentation of delivery fees and contents online by a uniform system for data exchange would help to raise market efficiencies by increasing the competitiveness of service suppliers, lowering the levels of unutilized capacities, and reducing consumers' search costs.

Throughout the 1970s three different protocols for EDI communications have been applied: the American ANSI X.12 has become a norm in US firms, the UN EDIFACT protocol was adopted by European firms, and the TRADACOMS protocol was employed by British and Asian companies. Although specific standards were developed to address needs of other industries, the total number of organizations implementing EDI technologies was far below expectations as a result of the "clustering" of firms to one of the protocols. Moreover, "*standards wars*" in adoption of competing protocols and technical difficulties to develop interfaces between different systems have increased uncertainty whether and which systems should be implemented among firms and have discouraged potential adopters from investing in the technology.¹³ Though institutional efforts to promote the adoption of the technologies were conducted in many countries,¹⁴ the failure of EDI to exceed a critical mass of users and generate benefits in a form of *network externalities*¹⁵ has prevented the wide adoption of the EDI technology. Other scholars mention that the architecture of EDI networks based on inflexible and non-adaptable standards (closed platform)¹⁶ may be the reason for the slow diffusion process, as difficulties in implementation of EDI communications as an integral part of information systems have appeared in many organizations (David and Foray, op. cit.; Bjorn-Andersen and Krcmar, 1995).¹⁷ However, the ownership of rights to key technologies of EDI and the coordination of their standardization were granted to public committees worldwide. Taking those steps, policy makers have assured that no

¹¹ VAN - value-added networks, established for the transmission of EDI data, alone.

¹² Later, during the 1970s and the 1980s, implementation and use of EDI systems have expanded to other sectors, such as health care and the food industry for which specific protocols were developed.

¹³ David and Foray (1994) consider the adoption of EDI protocols as a *path-dependent* technological change in which a dominant market standard would emerge over time and remove its competitors from the market.

¹⁴ See for example the case of the RHCNET in the Dutch healthcare sector (Ribbers, 1995) and the case of IndustriLink in Denmark (Bjorn-Andersen and Nygaard-Andersen, 1995).

¹⁵ Network externalities emerge when the number of users increases and so do their utilities and the possibility for interaction using a single standard. Further, increasing population of users attracts new participants joining standardized networks.

¹⁶ Application of new standards or modifications to support new business processes in firms was possible only after approval by a public standardization committee and publication of a description of the changes. However, apart from the aspects of revealing business strategies, firms had to wait up to a year to receive agreement for modifications in the EDI protocol and in the VAN servers, in annual standardization meetings.

¹⁷ Although success stories of implementation projects of EDI systems in major European firms are expansively described (Krcmar et. al., 1995) such cases seem to be an exception and not the norm, as David and Foray (op. cit.) conclude in an analysis of the technological diffusion of EDI.

private organizations would gain monopoly over technologies and information networks, which would have restricted development and prevented rivals and new entrants from accessing contents.¹⁸

The evolution of the Internet and its diffusion to commercial use during the 1990s have presented superior alternatives to the traditional dependence of firms and supply chains on expensive VAN facilities and on the rigid standards of EDI. The Internet as a medium for electronic commerce in a vast range of sectors and fields has overcome the disadvantages of EDI systems in three major dimensions and eventually has destroyed EDI as *the* leading technology for electronic trade. First, the Internet is an open platform for communication and exchange of diverse information files without dependence on the format in which information is transmitted, accessed and shared. The flexibility beyond the technological architecture enabled the integration of E-Commerce and Internet-based software platforms into the present information systems in various organizations. While modifications in EDI protocols performed by firms to address peculiar needs were perceived as “standard polluting”, the Internet platform supplies a technical environment that fully supports the development of systems *taylor-made* to organizational needs (O’Callaghan and Turner, 1995). Second, the rapid diffusion of the Internet and its expansive use by private consumers have extended the accessibility of consumers to commercial offers from merely a business-to-business (B2B) source of information towards business-to-consumer (B2C) marketing channel. Third, while EDI systems supplied limited information *about* the purchase and delivery of physical products, the Internet as a new medium for distribution has extended the concept of E-Commerce to the online purchases *of* information goods and software products.

E-Commerce via the Internet continues to expand rapidly, overcoming weaknesses of prior electronic trade systems. Consequently, it is predicted to be a pivotal technology in the global economy in the coming years.¹⁹ However, while the position of E-Commerce in worldwide markets has continuously been strengthened since the mid-1990s, the ability of IPR regimes to cope with the technological change is under debate. Their ability to strike the balance between protection of intellectual property by means of monopoly and yet preserving the pace of innovation by dissemination of technical know-how remains unclear when electronic trade is considered.

The Internet provides a new medium over which E-Commerce can be conducted. That it is new implies that technologies are developing and will be built on foundations currently being laid. If these foundations (or foundation technologies) are controlled as protected intellectual property by a few agents, it is possible that the future development of E-Commerce is, if not put at risk, subject to control by few agents who will be in a position to extract many of the rents associated with it.

3.2. Owning E-Commerce: Strategic Patenting of Technical Standards

Common opinions among legal and economic scholars perceive the present regimes of IPRs as an imbalance between private interests and social welfare when patenting knowledge-based technologies are considered. The current legal framework enables the formation of “monopoly over technology” in recently developing fields, such as ICT. Although arguments

¹⁸ Yet, private interests may influence standardization by intervening in the decision-making process of public committees (Farrell and Saloner, 1988).

¹⁹ Nevertheless, a few suggestions have been made to utilize current EDI systems embedded in organizational and business processes of firms through their implementation in web-based EDI by using progressive network tools, such as XML and Java (see for example: Segev et. al., 1997; Fu et. al., 1999).

against expansion of the patent doctrine to information technologies are well-known,²⁰ the main standpoints in the US doctrine, as stated in the *Framework for Global Electronic Commerce* (White House, 1997),²¹ somehow surprisingly supports patenting as a major institutional means to stimulate innovation in information technologies and telecommunications in the long run.²² The recommendations of the Framework emphasize the needs to master technological skills and assisting information systems in the examination process of ICT patent claims, but the report holds an opinion that patenting inventions is the most effective method to foster E-Commerce technologies. Indeed, such a conclusion demands further analysis from economic and legal perspectives.

Recent literature introduces evidence to the use of patents as a strategic means to preempt new entrants and competitors from evolving technologies and to a much lesser extent as sources of technical know-how for innovation (Granstrand, op. cit.; Arundel, 2000). On the other hand, firms attribute only a minor importance to the role of patents in protecting their online technologies (OECD, 2000b).²³

Patenting, indeed, is a well-known mechanism to stimulate production of new technical know-how and to facilitate its exploitation by granting monopoly over inventions disclosed to the public domain (David, op. cit.). However, monopolies over key inventions in infant technologies empowered by Patent Law might grant ownership over wide “technological avenues” to single firms for elongated periods, hence represent a dangerous potential for incumbents to deter other firms from further development of those technologies. This is particularly the case as technologies are generally characterized with evolutionary rather than revolutionary patterns for development. Information technologies, in particular, are distinguished by the emergence of a single technology as a market standard (Arthur, 1987; Antonelli, 1999), hence patenting technologies in their very first stages may define their future technical paths to develop and to diffuse.

Using a common typology, E-Commerce systems can be identified as *generic technologies* whereas the Internet can be regarded as their platform or *infra-technology*.²⁴ Both in many respects are core technologies for new business models and organizational processes conducted over the net. However, extensive allowances to patent software and information technologies in the EU and in the US²⁵ permit a few agents to dominate new technologies that are employed in E-Commerce. The Framework aspires to achieve standardization of E-Commerce systems to decrease difficulties of interoperability between legacy systems in firms and B2B suppliers and to generate economic efficiencies by fostering the adoption of online technologies. The Framework does not mention the need for standardization in a general manner, but explicitly draws its

²⁰ The debate was driven by the publication of *Examination Guidelines for Computer-Related Inventions* by the US Patent and Trademark Office (USPTO) in 1996. Contrast, for example, Schumm (op. cit.) with Cohen (op. cit.).

²¹ Also known as the “Magaziner Report”.

²² “*Development of the Global Information Infrastructure will both depend upon and stimulate innovation in many fields of technology, including computer software, computer hardware and telecommunications. An effectively functioning patent system that encourages and protects patentable innovations in these fields is important for the overall success of commerce over the Internet*” (Framework § 4, Patents).

²³ The OECD report mentions the Italian innovation survey (Sirilli and Evangelista, 1998) in which only 2% of the firms in the Internet service sector, including E-Commerce and ICT, perceive imitation as an important obstacle to innovation.

²⁴ Industrial technologies can be classified as the following: *generic technologies* that supplies a technical base for the development of new products and services; *infra-technologies* which create a technical infrastructure that supports generic technologies and market applications; *proprietary technologies*, or applications, that implement generic and infra-technologies in products and services (Tassey, 2000).

²⁵ The EU Directive on the legal protection of computer programs (EU, 1991); *Examination Guidelines for Computer-Related Inventions* (USPTO, op. cit.).

conclusions with reference to the following fields embodied in electronic commerce: electronic payment systems, security and encryption, online contracting, communication infrastructure and data interchange. However, the Framework standpoint should be also assessed not only due to its intentions to promote E-Commerce but also regarding the extent to which its policy recommendations are able to fulfill them.

The contradiction between the aims of the Framework to co-ordinate E-Commerce technologies via private sector regulation and sector agreements (as happened in the case of EDI) and its recommendations by which the government should play a role in regulation of online technologies (mainly encryption) are widely criticized by legal scholars. Lemley (1999) perceives the concepts presented in the Framework as intentionally vague, and somewhat misleading, whereas in their place clearer borderlines between public governance and *laissez-faire* agreements for electronic trade had to be drawn. To his mind, hazards to furthering the position of E-Commerce as a common marketplace and a reduction in the benefits from its economic efficiencies have originated by broad allowances to patent software and lately business methods too, in the US. Attempts to promote the formation of “open standards” and to take advantage of network effects do not sit well with the recommendations of the Framework in which strengthening and extending the patent regime is seen as the best way forward as regards intellectual property in cyberspace.²⁶ Ownership of standards by private firms, rather than by public committees or government organizations may provide economic incentives to inventors in the short term, but would deter competitors from free competition and innovation in the long run. Lemley’s arguments are supported by the fact that patents granted to key technologies of E-Commerce are held by relatively a small number of firms and used against rivals and market entrants (see table 3.1 below).²⁷

The case of *Amazon.COM vs. BarnesandNoble.COM* (Washington District, 1999) demonstrates the tangible threats of the dominance of single firms over key technologies of E-Commerce²⁸ by applying *strategic patenting*. The plaintiff, a leading online book retailer, has submitted a lawsuit of infringement of the online purchase patent commonly known as the “1-click” technology against its largest competitor.²⁹ Although the case has been settled out of court, the lawsuit illustrates the obstacles that strategic patenting in IT technologies may put in front of the evolving industry.

There are several policy implications regarding how to cope with issues of ownership over standards. First, governments should avoid increasing the scope of patenting to new non-patented areas and re-examine the impact of current patent policies on the evolution of Internet industries and E-Commerce in particular (Lemley, op. cit.). Second, promotion of “open standards” in software by the government (by providing financial schemes to public research institutes and “open-source” organizations) would foster adoption of non-private and free standardization by firms and users (Lessig, 1999). An often-mentioned example is the formation

²⁶ Granting monopolies over key inventions by strengthening IPR regimes may foster the formation of technological standards and reduce the need to allocate resources to development of interfaces and converters rather than to applications (Cohen, op. cit.). However, the assumption behind Cohen’s arguments that inferior technical merits of standard technologies would not limit the qualities of their applications is far from being realistic in many technologies, such as ICT (for example, the performance of desktop applications is strongly influenced by the design of the operating system).

²⁷ Yet, legislators in the US and the EU have not recognized rejection to license patented technologies as an anti-competitive behaviour (“anti-trust”); see also Cowan and Harison (2000), section 2.3.

²⁸ Amazon’s lawsuit mentions standard technologies which are commonly used by many E-Commerce sites, including organization methods of online catalogues, the “electronic shopping cart” interface, encryption techniques of credit card information and the “Cookies” technology for recognition of Internet users approaching a website.

²⁹ “*Method and system for placing a purchase order via a communications network*” (US Patent no. 5,960,411, 1999).

of the “Internet Engineering Task Force” (IETF) as a non-profit organization, open to all (Bradner, 1999), drawing upon an analogous need for a parallel institution, pro-active to technological trends, in standardizing E-Commerce platforms.

Patent holder	US patent no.	Patent subject	Description/status
Amazon.com	5,960,411	One-click purchasing	<i>Amazon.com</i> has used its patent to force changes to Barnes & Noble’s Web site.
CyberGold	5,794,210	Attention brokerage	Patent covers rewarding web surfers for paying attention to online advertisements.
E-Data	4,528,643	Download-based sales	Court has rejected <i>E-data’s</i> attempts to enforce this pre-Internet era patent.
Netcentives	5,774,870	Online incentives	One of the reward systems for Internet purchasing.
Open Market	5,715,314	Electronic shopping carts	This patent is eventually being “infringed” by most of the E-Commerce websites.
Priceline.com	5,794,207	Buyer-driven sales	<i>Priceline</i> has sued <i>Microsoft</i> and its <i>Expedia</i> travel site for copying its patented business method.
Sightsound.com	5,191,573	Music downloads	<i>Sightsound</i> has demanded royalty fees from online music sellers and has sued <i>Time Warner’s CDNow.com</i> music site for patent infringement.

Table 3.1: Patents granted to E-Commerce core technologies in the US.
Source: Shulman (2000).

3.3. Trademarks as an Intellectual Property in Cyberspace

Background

Trademarks are defined as “*any sign that individualizes the goods of a given enterprise and distinguishes them from the goods of its competitors*”.³⁰ This definition compounds two functions of the trademark regime: First, trademarks indicate the source of a product or service by identifying its producers (or suppliers) and providing potential customers basic information about the origins of goods. Second, trademarks aim to distinguish one enterprise in the market from its rivals, by allocating **unique** commercial signs to firms, products and services.

Trademarks, to be recognized as such, should distinguish the goods they represent within their context, and to avoid misleading consumer choices.³¹ However, the use of commercial signs is the major criterion that underpins them as trademarks, while their registration only strengthens those rights. Therefore, it is not the first-to-register but the first user of a trademark to obtain ownership over it as intellectual property (WIPO, 1998).

³⁰ In this section we also include “service marks” in the definition of “trademarks”.

³¹ To illustrate, “Apple” as a brand name in the computer market is distinctive enough to be recognized as a legitimate trademark. On the other hand, “Hard-drive” is a *generic term* that would not enjoy legal protection if applied as a brand name **in this industry**.

The valuation of trademark is affected by brand awareness, loyalty of consumers, reputation and coverage of market segments by the brand name. As shown in Table 3.2 hereinafter, the importance of trademarks in recognition of products and services and their derived economic value as intellectual assets of the firms are continuously increasing.

Trademarks are geographically based legal entities. Firms can share similar commercial signs as long as their geographic location creates a sufficient distinction between their brands (as in the trade-names of cafés for example). Nevertheless, being aware that trademarks cross borders by the emergence of globalization in trade and by the widespread operations of multinational firms, WIPO has established the Trademark Law Treaty in 1994 in order to define uniform guidelines for regulation of trademark laws among its member states, including the US and the EU.

Rank 1992	Trademark	1992 value (billion USD)	Rank 1995	1995 value (billion USD)	Domain name/s
1	Marlboro	39.47	1	44.6	Phillipmorris.com Phillipmorrisusa.com Pmintl.com
2	Coca-Cola	33.45	2	43.4	Coca-cola.com Cocacola.com
3	Intel	17.81	10	10.5	Intel.com
4	Kellogg	9.68	7	11.4	Kelloggs.com Kellogg.com
5	Nescafé	9.68	9	10.5	Nescafe.com
6	Budweiser	8.24	8	11.0	Budweiser.com
7	Pepsi-Cola	7.50	14	8.9	Pepsico.com
8	Gillette	7.15	11	10.3	Gillette.com

Table 3.2: World's most valued trademarks, by a trademark's value.

Source: Granstrand (op. cit.).

The architecture of domain names in the Internet

As electronic commerce and its acceptance as a virtual *bazaar* among increasing numbers of private and commercial consumers evolve, the importance of Internet domain names dramatically increases. In order to contemplate issues of trademark infringements over the Internet, we first review how web-addresses — the key method to locate and access websites — are represented and technically organized.

Every entity that participates in Internet activities and services, such as files, email addresses, webpages and even online users, is granted (sometimes temporarily) a unique *Internet Protocol Address* ("IP Address") by which it is managed, stored and identified online. IP addresses are represented by a sequence of four numbers (such as 122.228.34.5). During the 1980s, when Internet use expanded rapidly among public, military and academic institutes, the representation of IP addresses was re-organized and overlaid by a friendly system of easy-to-remember *domain names* as identifiers of web addresses and emails.

Domain names, being virtual locators, have a great importance in navigating on the Internet, just as street signs are significant for our orientation in the physical world. However, different from other types of locators such as street names and telephone numbers, domain names are registered for a period of one to three years (which can be extended) on the sole basis of "first come, first served". The registration takes place without any preference to geographic

location, ownership of trademarks or examination of their similarity to domain names that were registered beforehand or their future uses. After its registration, domain name can be linked only to a single web-address. But this link may be changed to another IP address at any time, or not be used at all (Burk, 1995).

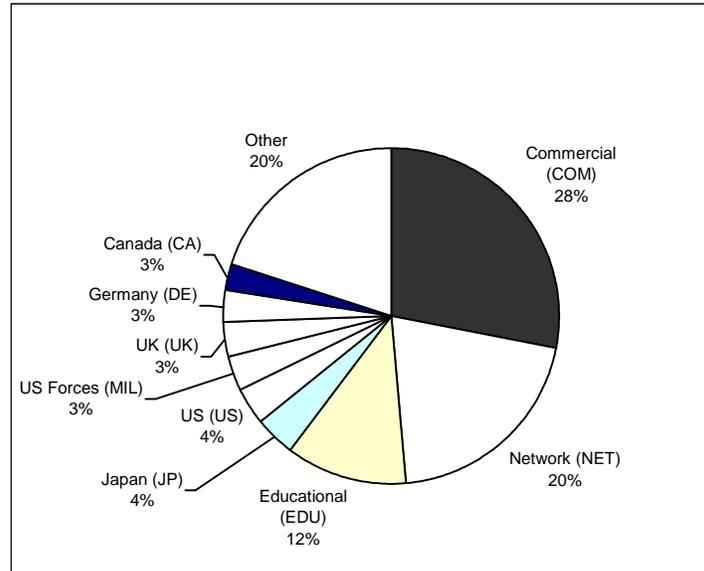


Figure 3.1: Distribution of generic top-level designators (gTLD) used in domain names.

Source: UNESCO (1999).

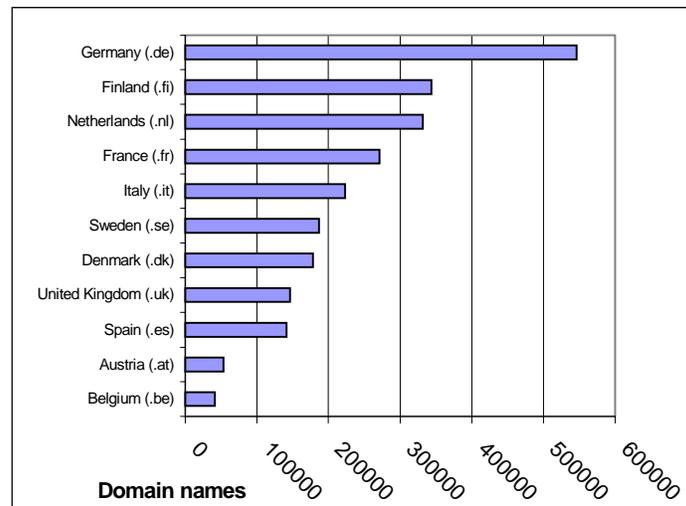


Figure 3.2: Registered domain names in the EU – selected member states (July 1998).

Source: OECD (op. cit.).

Domain names also serve as an indicator for the rate of diffusion and readiness for E-Commerce operations. The total number of Internet domain names was estimated by 43.2 million names in 1998. Among them, the general commercial designator (.COM) has become the most registered, holding a share of 28% of the total number of domain names (12.1 million domains - see Fig. 3.1). A comparative survey has found that that the total number of registered domain

names in the EU is very low in comparison to the US: only 2.53 million domains in the EU in comparison to 11.0 million domains in the US (see Fig. 3.2). However, a growth of 177% in secured web-servers in the EU between Sep. 1997-Aug. 1998, in comparison to 122% in the US and 129% worldwide, indicates that the EU is making substantial investments to “catch up” in establishing infrastructure for E-Commerce (OECD, 1999a).

The structure of domain names combines a *Second Level Domain* (“SLD”) requested by the registrar in the beginning of a web-address, with a *generic Top Level Designators* (“gTLD”) as a suffix that recognizes the category of a website.³² Both *gTLD* and *SLD* have facilitated debates over the use of web-addresses as *cybermarks*, and have caused the definitions of trademark infringement in cyberspace to undergo modifications and to be enforced by technical means.

Can domain names violate trademarks?

Issues of trademarks over the Internet have originated from two aspects of web-address registry: First, web-addresses (and not IP addresses in their numerical format) are the main method for searching and accessing commercial websites. Users wishing to acquire more information about a trademark intuitively type a trade name followed by the designator “.COM”. Memorization of trademarks and their application as an integral part in web-addresses is therefore a key element in online marketing strategies. Second, domain names are not a subject-matter for trademark protection and as such cannot violate the rights of current trademarks in the “real” markets by being registered and held by party other than the trademark owner.³³ However, a uniform policy that offers priority to trademark holders in registration of domain names and analogizes an unauthorized use of trademarks as a part of web-addresses to their disputes does not exist. The registration of domain names was built merely upon a competitive basis, namely “first to come, first to be served” and holders of domain names not only acquire advantage in registration of generic terms, but may also “free-ride” on well-known trademarks as a part of their web-address.

Indeed, similarities between domain names and existent trademarks create potential for violation of intellectual property rights in the Internet by misleading consumers and/or creating a fraud about the origin of services and goods, when users attempt to link to commercial websites. Nevertheless, scenarios that are defined and treated as trademark disputes by law on *physical grounds* are hardly recognized as such when they occur in the “virtual bazaar”, as regulation lacks legislative guidelines, definitions and remedies for trademark violation in the Internet. The right to own a domain name is therefore granted, merely on technical grounds, to the first to register it as his domain name, different from the definitions of Trademark Law in which trademark ownership is obtained by the “first to use” and not by the “first to register”.

As a result of the present registration method and the architecture of the domain name system, the preservation of trademarks as intellectual properties is diluted when those appear as part of web-addresses. Legal scholars (Burk, op. cit.; Dueker, 1996; Dommering, 1998; Abel, 1999) point out that the following issues have reduced the ability to regulate trademark (or “*cybermark*”) protection in cyberspace, according to significant legal and technical difficulties:

- Registration of domain names similar to existing web-addresses (by adding hyphens to trade names) or domains designed to capture typing mistakes of users exceeding well-known websites is permissible. Registrars, unless obliged to by Courts, do not examine domain names when obtained and do not deter registrants from obtaining domains similar to trademarks.

³² For instance: COM for commercial uses; NL for websites registered in the Netherlands.

³³ For example: Nissan, the Japanese automobile producer, does not hold the rights to use <http://www.nissan.com> as a web-address for its homepage.

- This problem is further emphasized by the allowance to register a similar SLD with other gTLD designator by different parties. For example, obtaining the domain name “AMAZON.COM” does not prevent others from performing a *name arbitrage* by acquiring domain names such as “AMAZON.NET”, “AMAZON.NL” or “AMAZON.CO.BR”, if those domains have not yet been registered.
- The geographical distinction between trademarks has dissolved by the essence of the Internet as a border-less medium. As a result, trademarks that could have enjoyed protection, being located in far regions or in other countries, have come into conflict over the priority to obtain a web-domain similar to a firm’s mark or to a brand name.³⁴
- The recognition of desired web-addresses as commercial assets has driven the phenomenon of professional “*web-squatters*” that register trademarks, firm names and generic terms as domain names and then sell them to firms. However, US Courts are continuously attempting to reduce the scales of *web-squatting* by granting ownership of domain names to trademark holders and, when commercial intentions of wrongful use are proven, Courts recognize the acts as trademark infringement.³⁵

In the contemporary Dutch jurisdiction, the case of *Labouchere v. IMG Holland* (President District Court Amsterdam, 1997)³⁶ emphasizes issues that have emerged by applying trademark and firm names in domain names, and often presented as a keystone in determining a doctrine for trademark disputes worldwide. IMG Holland N.V., a stock brokerage, was sued by leading Dutch banks and insurance companies for using each plaintiff’s name as its domain name. The defendant’s web-addresses contained trademarks of rival firms accompanied by the common suffix “.COM” and linked to web-documents that described IMG’s relevant services (for example: the web-address <http://www.snsbank.com> presented information about **IMG’s** banking services). Court has found IMG’s acts wrongful, concluding that despite mentioning that information in the websites were published by IMG, consumers were likely to be misled, assuming that the contents came from the plaintiffs. Additionally, the defendant enjoined the plaintiffs from establishing their own websites under their domain names. IMG’s argument that the plaintiffs could obtain similar domain names followed by the gTLD “.NL” was rejected by Court, as “.COM” is the most commonly-used gTLD in electronic commerce (Stimson, 1998).

Meta tags and trademark infringements

The technological development of *search engines* enables search, “exploration” and presentation of links related to contents and keywords that users define. The information search and retrieval of web-documents are based on the text and on *meta tags* – “hidden” keywords which are programmed to invisible fields in webpages and enable their inclusion in search results without mentioning the terms in the visible parts of a website. Web designers often add meta tags with connotations and synonyms to the content to improve the probability that potential customers using search engines would view their pages. However, the widespread exploitation

³⁴ In the representative case of *Fry’s Electronics vs. Octave Systems Inc.* (California District, 1997), an electronics retailer (“Fry’s”) has submitted a lawsuit against a manufacturer of kitchenware (holding the brand name “Frenchy Frys”) for using the domain “FRYS.COM”.

³⁵ Among lawsuits submitted against web-squatters, in three lawsuits filed against Dennis Toeppen, Courts have ruled that trademarks have been diluted by their use as web domains and therefore web-addresses should become the property of trademark holders. See Court’s rulings in: *American Standard Inc. vs. Toeppen* (US District Court, 1996); *Intermatic Inc. vs. Toeppen* (Federal Court, 1996); *Panavision International vs. Toeppen* (9th Circuit, 1998).

³⁶ President District Court Amsterdam, May 15, 1997, Rechtspraak van de Week 1997, no. 193.

of the meta tag technology has also confronted policy-makers, courts and trademark owners with a new set of demurs towards the protection of trademarks in cyberspace.

Trademark violation as a result of meta tags being used are of a complex nature and require implementation of integrative juridical tests by courts to evaluate to what extent the inclusion of a meta-tag was intended toward rent-seeking, and to what extent the tags were for informative purposes (Fair Use Law). Courts assess whether consumers basing their search on a well-known brand name have been confused or have developed a “*bad faith*” while linking to a website other than the one operated by the trademark’s owners (this type of ruling falls under Trademark Law). The role of meta tags as important website locators has been recognized by courts vis-à-vis the expansion of search engines as the most preferred method to organize and to reveal contents online.³⁷

US Court has presented the most advanced approaches towards assessment of trademark violations mentioned in meta-tag lists in websites. The first lawsuit over meta tagging trademarks and firm’s names was in the case of *Oppedahl & Larson vs. Advanced Concepts* (Colorado District Court, 1997). The defendant has used the plaintiff’s trade name as meta tag in its website, so that engine-based search would direct Internet users to its website. The decoding of the plaintiff’s trademarks was wisely performed and prioritized Advanced Concepts’ websites to be presented at the first places of the result, after a search of “Oppedahl” or “Larson”, pushing the links to their official website to the bottom of the list. The parties have reached an out-of-court settlement after which Oppedahl’s trademarks were removed from the Advanced Concepts source codes (Kuester and Nieves, 1998). In more recent cases Court has recognized that meta tags are not only virtual *watermarks* in the Internet, but also a technology that accommodates tangible perils to trademarks as intellectual assets of firms and their potential damages to famous trademarks should be judged according to the Fair Use Law and to unfair competition.

Juridical decisions in meta-tag infringements demonstrate the familiar path in which legislation follows the technical trajectories of information technologies and, in particular, E-Commerce: while courts attempt to resolve issues of, for example, trademarks in domain names, Internet technologies confront policy makers with new, progressive and far more complex challenges.

3.4. A Need for Framework for Global Electronic Commerce

Internet industries are rapidly evolving, expanding the applications of new communication channels in advertising, merchandizing and purchasing products and knowledge-based goods online. Since the rapid diffusion of the Internet as an open platform for communication for use by private, business and government sectors, applications of commerce via computers and computer-mediated communications have expanded due to the secured transmission of financial transactions, low search costs and user friendly-ness.

Although estimations of E-Commerce and electronic trade activities differ substantially, the OECD (1999b) has estimated the volume of worldwide sales via the Internet at 50.5 billion dollars between 1995-1997.³⁸ The EU’s share in electronic-based trade was only 160 million dollars in this period. The OECD predicts a phenomenal growth between 2003-2005 of 50 times

³⁷ Recently, the importance of meta tags as locators of products and services in a “virtual marketplace” has been emphasized by the implementation of intelligent-agent technologies in price comparison and in electronic auctioning (OECD, 2000a).

³⁸ “Business-to-business” and “business-to-consumer” share equal volume of sales.

more than the equivalent period of 1995-1997, of which the share of business-to-business sales will be 70-80 percent.

With the rapid evolution of E-Commerce over the Internet during mid 1990s, three major social and economic trends have stimulated policy makers' concerns. First, the shift in electronic commerce from a minor, mistrusted distribution channel towards a mainstream method of direct marketing and sales, in a vast variety of products and services. Second, the evolution of E-Commerce as a global market mechanism, as derived from the nature of Internet communications, has facilitated the formation of consumer networks worldwide. Third, the access to cross-border communication networks transparently connecting various software and hardware at a low cost has enabled the establishment of new and innovative *online entrepreneurs*, merchandizing both new and more "traditional" types of goods in a global scale.³⁹

While E-Commerce over the Internet, free from legislative boundaries, is perceived by many firms as a green field in which new technologies, products and business models flourish, for others a lack of regulation in cyberspace is a tangible threat. As legal frameworks over the Internet are only in their initial phases, both at national and global levels, many firms are concerned that their intellectual property, the profit generator of the firm, will be duplicated, disseminated and used with no legal practices or remedies to deter violators. Policy makers attempt to strike a balance between provision of adequate IPR protection and preservation of the pace of innovation. However, risks that inappropriate regulation, lacking efficiencies to cope with a complex technological reality and may soon become outdated and deter new entrants from new markets and inventions, still exist.

A Framework for Global Electronic Commerce (White House, op. cit.) was initiated by the Clinton Administration to study the needs of governance over E-Commerce activities on the Internet. Since its publication, the report is regarded as a pivotal source for evaluation of E-Commerce regulation (as well as a keystone in debates) in the US and, with an increasing importance, worldwide. The study focusses on the diffusion of electronic commerce among Internet users and firms in the form of online marketing of multimedia products, *virtual* trade in information goods and the execution of commercial transactions between organizations, firms and individual customers in increasing numbers over the net. Within the general framework of the report, regulation of intellectual property rights in E-Commerce mostly involves issues of the information transmitted in cyberspace, control over standards of electronic commerce systems and communications and proposed regulatory requirements for licensing electronic commerce technologies.⁴⁰

Different from traditional institutional approaches toward market failure, the report takes a generally non-regulatory stance towards the electronic marketplace, **despite** mentioning such episodes of market failure in the body of the report.⁴¹ The principles of the Framework state that:

"For electronic commerce to flourish, the private sector must continue to lead... Business models must evolve rapidly to keep pace with the break-neck speed of change in the technology; government attempts to regulate are likely to be outmoded by the time they are finally enacted, especially to the extent such regulations are technology-specific. Accordingly, governments should refrain

³⁹ Common examples for "traditional" goods are books, CDs and electronics. However, many Internet-based firms have defined online supply of e-books and MP3 music files as their strategic goals.

⁴⁰ Other parts of the report contain policy recommendations for taxation over the Internet, privacy issues and regulation of Internet service provision (ISP) rates.

⁴¹ One would think of unauthorised duplication of digital contents and high-scales of software piracy via the Internet, as derived from the essence of reproducing and distributing information goods at zero marginal production costs.

from imposing new and unnecessary regulations, bureaucratic procedures, or taxes and tariffs on commercial activities that take place via the Internet” (Framework, Principles, 1 & 2).

The report, driven by the potential for establishment of a *laissez-faire* economy in cyberspace, suggests the implementation of a uniform regime based solely on international agreements and treaties as the most preferred alternative for IPR protection over the Internet, especially in the context of E-Commerce, rather than a statutory framework at the national level.⁴²

While the balance between monopoly over standards and economic incentives to innovate is widely discussed, issues of trademark dilution are hardly brought into the scope of the Framework. Although “recognizing that misuse of a domain name could significantly infringe, dilute and weaken valuable trademark rights”, policy recommendations for resolution of trademark dispute in domain names are vague, stating that “the [research] group will consider what contribution government might make, **if any**, to the development of a global, competitive, market-based system to register Internet domain names, and how best to foster **bottom-up governance** of the Internet” (Framework, IPR Protection, Trademark and Domain Names). This standpoint in favour of *self-governance* of the Internet and a weaker legislative position has raised strong criticism and objection. However, while no alternative was introduced to a scenario in which rent-seeking firms may shift from *free-market* behaviour toward a *predatory* (or a “*jungle*”) type of behaviour, the US Administration has promoted regulation in the international arena through WIPO (Froomkin, 1999).⁴³

WIPO and the WTO (through the GATT/TRIPs agreement)⁴⁴ are indeed the responsible authorities for the formulation of international IPR treaties, and further for the steering and consistency of IPR legislation of their member states. In 1997 WIPO initiated a process of examination, headed by representatives of its members and by consultation, aimed to define a uniform doctrine for policy on trademark registration and guidelines for jurisdiction by national courts. The final report of the Internet Domain Name Process was published in April 1999 (WIPO, 1999).

In the background to the final report, WIPO reviews the various categories in which trademarks may be violated and the threats to *social welfare* partially caused by *web-squatting* and *cyber-piracy* and partially cause by the employment of technical and legal resources to defend trademarks against abuse. WIPO’s report supports the regulation of the Internet domain system by a uniform legislative framework, globally implemented by the ICANN — the Internet Corporation for Assigned Names and Numbers, which allocates web-addresses and registers domain names in the US and, by affiliates, worldwide. The recommendations of WIPO’s expert group are based on the traditional model of intellectual property registration — applications for domain name registration that go through a process of examination and approval, which can be revised after a domain name was obtained (e.g. when trademark infringement is proven). Although most of the obstacles in the path to implementation of the suggested regulation seem to be administrative and technical, legal issues of privacy (i.e. the normative right for user’s anonymity) and personal property (e.g. registering family-name domains) have not completely been resolved. However, information law in a historical overview is often found to be outdated when enacted, not only lagging beyond the developing technology but also inefficient as a result of inadequate definition and rules. Moreover, in many cases regulation and jurisdiction have

⁴² On the advantages and the drawbacks of international IPR regimes, see Cowan and Harison (op. cit.), section 3.3.

⁴³ US Department of Commerce (1998) has called in its *White Paper* for a co-ordinated action toward an international policy aimed to regulate trademarks in the Internet.

⁴⁴ WIPO – World Intellectual Property Organization; WTO – World Trade Organization; GATT – General Agreement on Tariffs and Trade; TRIPs – Trade-Related Aspects of Intellectual Property Rights.

gradually developed since the introduction of the first E-Commerce and Internet technologies. Consequently, Courts, attempting to resolve ad-hoc appeals and lacking policy guidelines to address adequately the essence of new technologies, have drawn awkward analogies to previous cases and established doctrines by which other lawsuits are judged. Nevertheless, had those legal guidelines been formed, one may expect that the verdicts, though loosely created to cope with rapidly-evolving technologies, would be catered by rent seekers and incumbent firms to acquire dominance in emerging markets and to deter new entrants by legal means, regardless hazardous side-effects on innovation, in the long run (Cowan and Harison, op. cit.).

The Internet is indeed an emerging technology and is characterized as such by both economic dynamics of related markets (e.g. reduction of search costs as a result of formation of online communities and discussion groups and web-contents), high levels of uncertainty and lack of regulation. Hence, the Internet attracts new rent-seekers attempting to benefit **by all means**, as previously happened in other new, novel markets that experience rapid growth (e.g. the New York stock exchange in its early days). A self regulation of E-Commerce may not contribute to the positive evolution of the industry in the long run, whereas regulation that considers the risks of monopolies created by private parties, the globalization aspects and the need to preserve the pace of innovation in ICT may better appropriate societal and industrial interests. The challenge confronting policy-makers and legislators is therefore rather complicated and fragile. It consists of extension of the scope of regulation by international authorities (as WIPO and WTO) to cyberspace, and formation of new institutions and centralized policies, simple enough to be applied technically, so that a continuous development of the Internet as a global and border-less marketplace should be guaranteed.

4. Intellectual Property Rights in Intelligent-Agent Technologies: Facilitators, Impediments and Conflicts

Intelligent agents are the *state-of-the-art* in computational sciences and informatics, applied in information systems to perform multi-task operations on a large scale (such as data gathering and information processing from a numerous number of information sources, databases and webpages). Software agent technologies are implemented in a large number of fields, including biotechnology, economic simulation and data-mining, as well as in hostile applications (*viruses*), machine learning and cryptography algorithms (see Fig. 4.1).

Intelligent agents actually do not carry any intelligence in themselves. They are identical software programs that “behave” as digital robots⁴⁵ according to defined sets of rules which enable them to accomplish their tasks in parallel (more advanced features include interoperability and interaction among different agents that carry out a similar mission), without dependence on a continuous stream of instructions received from their “home-base” mainframes. As agents inter-operate on many machines at the same time with no need for guidance from a central server, software applications achieve new scales of efficiencies when intelligent agents are implemented in computational tasks of decentralized systems, such as the Internet.⁴⁶

⁴⁵ A more common terminology uses the terms “shop-bots” or “spiders” to illustrate navigation activities throughout the World-Wide Web.

⁴⁶ Overviews merely on technical grounds are found, for example, in: Klusch (1999); Hayzelden and Bigham (1999).

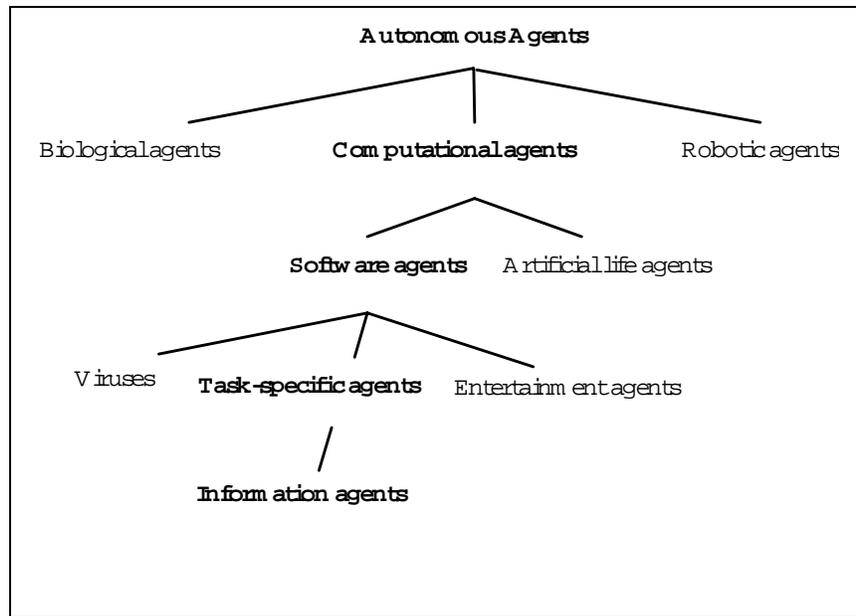


Figure 4.1: Taxonomy of intelligent agents and their uses.

Source: Franklin and Gassner (1999).

Intelligent agents operate semi-autonomously over the Internet, performing complex and wide-scale search and retrieval activities, mainly as electronic assistants in shopping decision-making and product information search. When user submits a query for information about commercial goods in price comparison websites, the agent programs link (if authorized to do so) to selected websites of E-Commerce retailers, search for details about the products (and in some cases for a recommended substitute too), availability and prices in the company's sources and then import the information in a user-friendly format, mostly as comparison tables presenting prices and lead times, and enable consumers to link directly to webpages of suppliers.⁴⁷

Other Internet service providers apply intelligent agent technologies in other fields, such as *meta-search engines*, which operate on top of other search engines by integrating the results of users' queries from several sources, and financial advisory services that retrieve, filter and process data on stock quotes and market trends to support investment decisions (OECD, 2000a).

4.1. The Importance of Intelligent Agents in the Electronic Marketplace: A Techno-Economic Analysis

The human cognitive ability to search for information and to evaluate their usefulness is extremely limited in comparison to those of computers. While humans are able to perform several queries in parallel, and are good at drawing parallels and analogies between pieces of information, advanced systems that embody software-agent architecture may be far more effective in terms of calculation power and parallel processing abilities, particularly in the quantities of material they can process. Although intelligent agent technologies have not yet fully exploited their potential in E-Commerce operations, the initial influence of their implementation on electronic marketplace can be assessed. Whereas the Internet as a communication medium

⁴⁷ Some of the popular websites for shopping information are: <http://www.mysimon.com>, <http://www.dealtime.com> (various commodities); <http://www.travelocity.com> (tourist services).

contributes to social welfare in terms of substantial reductions in transaction costs between individuals and firms and between firms and firms, intelligent agents further these economic benefits by reducing search costs. Information about services and commodities is transmitted from enormous numbers of firms to the user's desktop instantly and if agent systems have genuinely been programmed to embed basic "intelligence" by including heuristic rules how these information items should be ranked and viewed, the results will contain only information with a high relevance to the user.

Therefore, intelligent agents may foster free competition and perhaps approach the level of a theoretical *free market*, by presenting a wide range of alternatives for purchase and effectively addressing consumers' preferences. Moreover, when supply chains are designed to fulfill global demand and consumers freely order from any distributor, the ability of a firm to create even local monopoly power is significantly reduced. Therefore, it is not only that information about products and suppliers becomes transparent to end-users, but also that worldwide availability of goods increases (and prices fall) due to the possibility of capturing economies of scale and scope in the transportation industry.

A second outcome of a broad implementation of intelligent agents may be a decline in product differentiation in some goods. The more "intelligent" technologies⁴⁸ diffuse to commercial websites, the more accurate is the information that producers have about consumers' tastes and habits.⁴⁹ Therefore, as preferences of buyers are easily predicted on the *supply-side*, producers driven by motives of profit maximization would prefer to allocate their product development and marketing efforts to the mainstream market, rather than to its marginal segments. This scenario recalls for concerns about a slowdown in the pace of innovation in a non-diverse market and the influence of business strategies on the social environment (Goss, 1995). The contrary effect, however, may prevail when other goods and services are considered. This argument suggests that future technologies of intelligent agents will be able to evaluate apart from basic characteristics of products (price and description) other properties, such as warranty, method of payment and after-sales service and to consider alternatives on more sophisticated grounds, hence to increase differentiation among services and goods (OECD, 2000a). Further, as this argument goes, the Internet is an ideal hemisphere for the evolution of "*niche oriented*" firms. Potential customers, assisted by decision support systems, are able to achieve commercial information which is highly correlated with their interests and needs (e.g. by visiting websites and registering for services online). Additionally, the availability to accumulate information on market behavior of individuals enables identification of peculiar segments in the population, and even presentation of specific advertising on the user's screen. Steinmueller (2001) describes the formation of markets based on "*virtual communities*", in which commercial audiences join discussion forums and addressed by advertisements that appropriate their themes. This advertising method is characterized by low communication costs and high probability to project member's interests and responses.

It is extremely difficult to foresee whether electronic markets will be highly concentrated or diverse in the long run, but the evolutionary path of intelligent agent technologies will probably be of a major influence. However, as agent applications continue to evolve, the peculiar merits of the technology raise legal issues, amongst them are the possibility to limit agent's "movement" in private hosts and the restriction on their accessibility to intellectual assets. We

⁴⁸ "Intelligent" in the sense that ameliorated capabilities of web access, content retrieval and processing are implemented in progressive algorithms and software applications.

⁴⁹ The most cited example in this context is the *Ford model-T*, which was produced and sold in a single version and became a success story in the US in the beginning of the century. It is worth mentioning Henry Ford's famous saying about his consumers' alternatives: "*They can have any colour they want, as long as it is black*".

hereby review a controversial US case, which is currently in the eye of the legal storm stating a major statutory decision in E-Commerce law.

4.2. Do Intelligent Agents Infringe Property Rights? The Case of *eBay vs. Bidder's Edge*

The algorithms underlying intelligent agents are a relatively new technology (when put on a historical time scale or even placed along the evolution of computer science) and their technological potential has not fully been grasped. It is quite natural, therefore, that jurisdiction over intelligent agents, and in particular their impacts on intellectual property rights, hardly exists. However, in the case of *eBay vs. Bidder's Edge* (Northern District California, May 2000) a recent US precedent, Court has created initial guidelines.

eBay is the largest provider of auction services via the Net. The company developed an automated trading system which allows suppliers (individuals and firms) to offer their goods in more than 2,500 different categories, including commodities, collectibles and real-estate assets. Users are able to search for an item and to place their bids online. During the period of its operation, eBay's consumer base counts for seven million registered users and over 400,000 items are added to its auctions every day (more than 3 million items are available for purchase at any given time).

Bidder's Edge is a small provider of auctions online founded in 1997 and a one of eBay's minor rivals. However, Bidder's Edge's strategy has differed from most of the business models in auction websites by implementation of intelligent agent technologies in their services, and operates as a *meta-search* engine for available bids. The Bidder's Edge information system receives users' queries with descriptions of items on which they wish to bid. The system sends software agents to search for similar records in other online auction websites, including *eBay* and presents the information in a user-friendly comparison chart. Large portions of Bidder's Edge's activity were based on eBay's data: two-thirds of the records presented in *Bidder's Edge* website had been acquired from eBay's databases, and searches performed by its intelligent agents had constituted approximately 1.1%-1.5% of total queries performed in eBay's website. *eBay* applied an online user agreement in its homepage that prohibits "any robot, spider, other automatic device, or manual process to monitor or copy our web pages or the content contained herein without our prior expressed written permission" and in addition restricted access by various security systems. Parallel to protecting its website, eBay negotiated with Bidder's Edge over licensing permissible searches in its records, on the basis of intelligent agent applications, and initiated feasibility tests. However, when the parties did not agree upon terms of use, Bidder's Edge continued retrieving information from eBay, and eBay, failing to limit its unauthorized queries by technical means, submitted a lawsuit.

eBay has accused Bidder's Edge in infringements of the following legal criteria and applied to Court for a relief and remedies by enjoining Bidder's Edge from intervening into its website:

- (1) *Trespass to chattels* caused by the violation of access agreement to eBay's servers.⁵⁰ eBay claimed a loss of capacity in its computer systems ("*system harm*") as a result of Bidder's Edge automated agents, and a consequential harm to its reputation as an online service provider ("*reputational harm*").

⁵⁰ The "trespass to chattels" doctrine was accepted as a test for "intentional interference with the possession of personal property has proximately cause injury" in unauthorized use of long-distance telephone lines (*Thrifty-Tel vs. Beznik*, California Court of Appeals, 1996).

- (2) *False advertising, unfair competition* and infringement of eBay's intellectual property through a *trademark dilution* according to the Trademark Act ("Lanham Act", 1946) as a result of an unauthorized presentation of eBay's commercial signs in Bidder's Edge homepage.
- (3) Violation of the *Computer Fraud and Abuse Act* by an intended and harmful access to eBay's information systems.⁵¹
- (4) *Misappropriation* of eBay's permissive use of its records: massive queries in its website and rendering records of offered items are prohibited.
- (5) Interference with *prospective economic advantages* and *unjust enrichment* by unauthorized use of eBay's reputation and data records.

On the basis of eBay's arguments, Court accepted the plaintiff's opinions and ruled for damages as a result of Bidder's Edge acts. However, the judgment can be regarded as a keystone in the US *Internet Law*, defining new measures for violation by access to databases and web-based contents.⁵²

Shortly after Judge Whyte gave his ruling *in re eBay*, a group of professors of high technology law ("*cyberspace law*") has petitioned to Court against the decision, submitting a *friend-of-the-court* brief (Burk et. al., 2000).⁵³ The group has become concerned by the application of old and outdated legislative analogies to a new technological reality and by the consequences that this doctrine may have on free flow of information, in particular on the virtual markets, in the long run.

The case of *eBay* is controversial in the sense that the judgment recalled the old theory of "trespass to chattels", originally formed to address unauthorized break in to a physical asset (such as burglary), and applied it to a case in which software agents intervene into an Internet-based service. Courts are aiming to settle juridical cases in the short term and sometimes seek solutions by drawing analogies between traditional legislative doctrines and cases to modern technologies, such as the Internet. However, those legal parallels are not necessarily relevant given the characteristics of recent technologies and may hazardously bind the use of technology in the long run. The case of *MAI vs. Peak* (1991) is often mentioned in this context to emphasize consequences of myopic jurisdiction. In this case Court has defined the storage of original works in the computer's RAM⁵⁴ sufficient to infringe copyrights. Later, the precedent was applied to determine that a temporary download of web contents while browsing websites is regarded as violation of IPR according to Court's decision *in re MAI* (see also Cowan and Harison, op. cit.).

The imbalance between public interests and private incentives may impede advances in electronic commerce and obstruct free flow of information over the Net. Had an equivalent test to the precedent been applied in the jurisdiction of search engines (which are commonly based on intelligent agents), essential functions in *web-surfing* would be severely restricted. Further,

⁵¹ Section 1030 in the Act clearly states that: "*Whoever... intentionally accesses a computer without authorization or exceeds authorized access, and thereby obtains information contained in a financial record of a financial institution... [shall be punished] for an offense*".

⁵² Had this case been ruled in an EU Court, judgment would have probably been affected by the EU Database Directive in determining whether Bidder's Edge had infringed eBay's *sui-generis* rights by a non-permissible access to its databases.

⁵³ Among the group of twenty-eight professors, the scholars leading this initiative were Mark Lemley, Pamela Samuelson, Michael Froomkin and Denis Karjala.

⁵⁴ RAM – Random Access Memory, the computer's workspace in which program execution and data processing takes place. The program's instructions are copied into memory from disk or tape and then extracted from memory into the control unit circuit to be analyzed and performed (www.techweb.com).

restrictions on access to auction data and inability to compare prices online would raise search costs of consumers and remove social benefits from both private users and firms.

5. IPRs and Information Goods: Keystones in the Digital Economy

*Artistic and literary works*⁵⁵ are protected by international agreements that aim to harmonize legal definitions and terms of protection in order to provide a uniform scheme of intellectual property protection, when works “migrate” across national borders and legislative regimes. The international framework for copyright protection from which WIPO’s members enact their national statutes was determined mainly by the Berne Convention that was signed in 1886 by more than 120 Member States. Copyright protection is granted for author’s rights, reproduction and moral rights for artistic and literary works and their derivatives for the creator’s lifetime with an additive period of fifty years to seventy years *post mortem auctoris* in most countries.⁵⁶ However, states have a degree of freedom to deviate from the framework, as described by the terms of the Convention (WIPO, 1998).⁵⁷

Peculiar issues of related fields were addressed by a complementary agreement to the Berne Convention. The International Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations (“Rome Convention”) was designed to accommodate, by the formation of “neighbouring rights”, the peculiarities of vocal works and recordings (phonograms) and their broadcastings (WIPO, 1994).

The shift from the physical medium in which knowledge is organized (e.g. books, magazines and records) towards *digitized goods* does not change the scope of protection granted by copyright law.⁵⁸ Nevertheless, as literary and artistic works have become available online, their unauthorized dissemination among a wide scale of users has facilitated new types of infringements of intellectual properties. Those infringements are reviewed in the following section.

⁵⁵ The Berne Convention defines “*literary and artistic works*” as: “every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression, such as books, pamphlets and other writings; lectures, addresses, sermons and other works of the same nature; dramatic or dramatico-musical works; choreographic works and entertainments in dumb show; musical compositions with or without words; cinematographic works to which are assimilated works expressed by a process analogous to cinematography; works of drawing, painting, architecture, sculpture, engraving and lithography; photographic works to which are assimilated works expressed by a process analogous to photography; works of applied art; illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science” (Berne Convention, Article 2 § 1).

⁵⁶ A uniform term of protection of lifetime plus seventy years was enforced in the EU’s Member States with the approval of the *Directive of Harmonizing the Term of Protection of Copyright and Certain Related Rights* (93/98/EEC) in October 1993. The duration in the US is shorter - author’s lifetime and an additive period of fifty years, and was enacted in the US Copyright Act (1976).

⁵⁷ Countries may extend their scope of protection to include for example manuscripts of national rules as copyrightable.

⁵⁸ The term *digital goods* emphasizes the essence in which data, information and multimedia artefacts are being transformed, stored and retrieved in an intangible mode (e.g. in databases, CD-ROMs and in computer-mediated communication).

5.1. “When Old Dogs Learn New Tricks”:⁵⁹ Recording Firms and the Distribution of Music via the Internet

Background

It has been a long time since music firms (and in particular the “*Majors*”⁶⁰ of the industry) were threatened by the appearance of a technological change.⁶¹ The rapid development of technologies for voice compression and signal stream transmission during the last decade and the emergence of the Internet as a medium for communication and digital transmission have generated a virtual source, from which millions of users are able to obtain leisure goods, such as music albums in a digital format, at a minor cost.

Recently, the “production” of music has received increasing attention from economists and social scientists. The music market is characterized by high levels of concentration: most of the market, including low-quality and inexpensive records, intermediate and high fidelity products, is dominated by a small number of multinational firms (*Majors*) which periodically offer retailers series of records (“catalogues”), varied by musical virtue and style, and differentiated in their perceived qualities and their prices (Harchaoui and Hamdad, 2000).

Analysis of British album sale charts points out that key determinants in commercial success of music titles are public exposure, promotional campaigns, initial popularity and reputation of artists (Strobl and Tucker, 2000). All factors, however, require massive investments in marketing, which small and medium recording firms can hardly provide. Therefore, small firms commonly represent a single musical title or a sole artist and hold only marginal shares of the market. Most of those *Indie* (independent) companies do not survive the initial stages of the business cycle and rarely offer second albums of their artists. Other *Indie* companies may represent artists in early stages of their careers. Later, when talented musicians are revealed by one of the *Majors*, most probably that they would leave their *indie* company in favour of superior terms of market development and higher compensation (IMF, 1993; Monopolies and Mergers Commission, 1994).⁶²

The creator of a piece of music is granted a copyright to it, and in practice this copyright is typically transferred to a firm which produces and markets the music as a product. The major music-producing firms, assisted by a network of industrialists and public committees, attempt to deter illegal duplication of their titles by monitoring piracy in global markets (Silva and Ramello, 2000). Application of copyright law, in addition to monitoring activities have traditionally seemed to provide enough protection of intellectual property. However, the locus of the Internet as a global distribution channel for information goods, in which music fans are able to search and to exchange data files online, and the development of audio-encoding technologies, which transfer sound to digital media, have driven private copying to shift its position from a sunspot

⁵⁹ With an apology to Paul Auster’s *Timbuktu*.

⁶⁰ According to the UK Monopolies and Mergers Commission, the five major firms that dominate the lion’s share of the music industry are EMI, Polygram, Sony, Warner and BMG (Towse, 1997).

⁶¹ An important episode was the introduction of audiotapes by Philips in 1964. However, their wide adoption has occurred only towards the end of the 1970s after the developments of noise reduction system by Dolby (1969) and the Walkman by Sony (1979).

⁶² “The economics of *superstars*” suggests that market the elasticity of talent and reward is extremely high. Therefore, most of the income, as well as reputation and sales, are held by a small group of *virtuosi* with minor and somewhat sporadic advantage in artistic endeavours, whereas most of the performers remain only in marginal shares in terms of incentives and publicity (Rosen, 1981).

on the unauthorized reproduction, towards a widespread phenomenon which threatens to remove large shares of revenues from music recording firms.

The digital revolution

Among audio-vocal innovations exploited online was the MP3 voice compression standard. The *MP3 (Moving Pictures Audio Layer 3)* was developed in Germany in 1991 by the Fraunhofer Institute. MP3 enables the compression of sound by a factor of twelve (i.e. standard CDs may contain approximately 850 minutes in MP3 files, while other audio formats enable maximal recording time of 74 minutes) providing quality of the digitally-stored sound similar to the original recording. Users are able to listen to MP3 files on their PCs or on portable players. Because of this high compression ratio, Internet-based distribution has become feasible at “normal” connection speeds. In response, special portals were established to search for a song, by mentioning its name or its performer, and to transfer the file from web servers or from other user’s disk to the desktop in a reasonable time (www.techweb.com).⁶³

The new standard has offered substantial advantages in its abilities to compress and to transform vocal contents, in comparison to the prevailing technologies, and has rapidly become the norm in Internet applications. MP3 has revolutionized the distribution of music by disseminating digitized songs via the virtual cords at no cost⁶⁴ and with no reduction in fidelity. Hence, major recording firms have become concerned by the possibility that the new standard will remove their traditional sources of consumers and profits. To emphasize the potential effects of the new technology, the EU’s trade in *cultural goods* was estimated by 371.2 billion dollars in 1997 (4.4% of Europe’s GDP), compared with 177.5 billion dollars in the US (2.2% of its GDP) (UNESCO, 2000). The annual trade losses of US producers resulted from an *unauthorized reproduction* of sound recordings worldwide is estimated by 1.68 billion dollars, with a dominant share of copyright infringement in optical media and digital goods (IIPA, 2000).⁶⁵ Recently, retrieval of MP3 files in *peer-to-peer* applications and in hi-fi systems has exponentially diffused among large shares of the population with an access to the Internet. Those networks of users, exchanging music files across borders and legal regimes, have made the enforcement of copyrights almost impossible by technical means, and have facilitated a debate over copyright legislation in *cyberspace*. The new compression method has furthered the distribution and purchase of music goods: complete collections, catalogues and musical titles can be rendered, shared and transmitted with no quality distortions.⁶⁶ Hence, the traditional distinction between high fidelity records sold at high prices and poorly recorded copies illegally reproduced may be regarded as obsolete.

The wide diffusion of MP3 and the introduction of software platforms for music trade (e.g. Napster and GNUtella) recall the debate over photocopying early in the 1980s. Although one may carefully draw parallels between analogue copying of papers and duplication of digital music files, more can be learnt from the differences between the techniques.

⁶³ Download duration depends on the size of files, communication capacities of servers and connections and the free bandwidth of the network at any given time. When fast Internet connections are applied, a complete CD that converted to a digital format can be transferred within five to fifteen minutes through the Net.

⁶⁴ Uploading and downloading music files can be performed at zero marginal cost and do not require additional investments in hardware and software.

⁶⁵ UNESCO (2000) presents somewhat diverse estimations of piracy rates in the global recorded music markets: 12% piracy in the European markets (or 44.5 billion dollars) and 3% in the US (5.3 billion dollars).

⁶⁶ The compression process is based on inclusion of frequencies that are audible to the human ear (20Hz to 20KHz) as stored information. The algorithm excludes other segments of the tonal spectrum from the digital files.

The introduction of the photocopy machine in 1959 and its expansive use in public libraries since the mid 1970s, had faced journal publishers with similar concerns to those of today's record companies. Liebowitz (1985) examines the market behavior of journal publishers, libraries and individuals and the links among them. His analysis reveals that publishers were not harmed by the introduction of Xerox technologies. Quite curiously, the results were opposite to the pessimistic expectations of journal owners: as the use of copy-machines in public libraries has expanded, the population of subscribers to scientific journals has broadened over time. These benefits of "indirectly appropriating revenues" from individual copiers can be explained, to a large extent, by the formation of *demand network externalities* in information goods such as professional magazines and artistic works (Takeyama, 1997).

Demand network externalities appear when the consumption of additional units leads to an increasing demand, under *market clearance* terms (i.e. the quantity of goods offered by a firm is completely purchased and consumed). For example, when audience loyalty to an artist is driven by perceived reputation and quality, the more an artist's songs are played, the higher are the sales and exposure to wider parts of the population. As Silva and Ramello (op. cit.) point out, small recording firms may use this in their business strategies for introducing artists into the market, by offering their records in a special price. By employing unauthorized reproduction and distribution of albums for their needs, music firms are also able to target even wider audiences at lower costs, in order to introduce unknown artists that they represent. However, where major firms or famous performers are concerned, their traditional business models are put at risk, and they appeal to the Courts for relief, as recent US cases may illustrate.

5.2. Mobilizing Digital Sounds: The Cases of *Recording Industry Association of America (RIAA) vs. Diamond Multimedia Systems*, and *A&M Records vs. Napster*

The music market has changed dramatically since the introduction of MP3 compression technology. The main threats are aimed towards large and "traditional" music firms, which in turn attempt to control distribution of copyrighted materials by both technological and legal means. Music recording for private use in the US, the largest music market worldwide, has been regulated by the *Audio Home Recording Act (AHRA)* since 1992. Two legal cases in which the *Sony Corporation* was involved have led the pattern to the legislation of the Act by the US Congress.

The first case, *Sony Corp. vs. Universal City Studios, Inc.* (Supreme Court, 1984) confronted Court with an interpretation of Copyright Law for unauthorized recording of broadcasting programmes for home use by Sony's *Betamax* videotape recorder (VTR). Since video-recording was applied by home users mostly for recording TV programmes **in this period**, the US Supreme Court ruled that copyright violations did not occur, recognizing that videotapes were employed for watching television shows with a "*time shift*" in their broadcast schedule, hence constituting a "fair use". Moreover, as *Universal* had failed to prove Sony's involvement in exploitation of copyrighted works, the firm was not held liable for any wrongful acts of its users. Although this judgment has become a statutory keystone for copyright infringement via digital devices, Supreme Court intentions had ignored the possible essence of the new technology as a widespread apparatus for legal and unauthorized distribution of cinematographic films in an accessible format.

The second case on copyright infringement by digital recording devices was initiated in the US in 1991, when music producers feared that the *Universal* precedent would revive itself in the context of music goods as a result the introduction of Sony's *DAT (Digital Audio Tape)*. The technology enables generation of perfect copies, without reduction in audio-vocal qualities, and,

moreover, additional copies generated from previous copies preserve the fidelity of the original recordings along this chain. Thus, “serial duplication” of copies may emerge by applying digital tape devices in distribution of music. From a legal standpoint, a wide range of duplication activities of musical endeavors, unauthorized by producers but allowed by Court, permits this process under terms of “private use” and “fair use”, as the verdict in *re Universal* had determined. Indeed, the *AHRA*, which was approved on those grounds, aims to prevent large scales of unauthorized copying for home use and to define the terms of permissible fair use by private music fans. The Act requires producers of digital audio devices to include in their designs technical means to prevent serial duplication and to allocate part of their revenues for distribution among right holders. However, the *AHRA* is also perceived as compromise between electronics firms, consumer organizations and the music industry (US Copyright Office, 2000).

As Court has explicitly stated, in cases of copyright violation “the ‘starting point’ for interpreting a statute is the language of the statute itself”.⁶⁷ The general terms of the Act prohibit unauthorized reproduction and dissemination of musical works protected by copyrights for mere economic benefits. The Act also defines **exemptions** for permissive digitization and duplication of audio files via software interfaces and digital devices for non-commercial and private use. Therefore, in several scenarios copyright infringement would not occur if the following terms were satisfied:

“No action may be brought under this title alleging infringement of copyright based on the manufacture, importation, or distribution of a digital audio recording device, a digital audio recording medium, an analog recording device, or an analog recording medium, or based on the **noncommercial use** by a consumer of such a device or medium for making digital musical recordings or analog musical recordings” (*AHRA* § 1008; emphasis added).

To emphasize, transformation of **authorized copies** of music recording to a digital form by an individual for his own purposes **with no further distribution** of the audio-vocal file is recognized by the Act as a permissible activity that does not violate copyrights. However, when the number of users and consequently the variety of music files made available online have increased, record companies have predicted future scenarios in which a virtual realm for a massive, efficient and free exchange of MP3 files, though illegal, will eliminate album sales.

In the case of *Recording Industry Association of America vs. Diamond*, a public organization representing the major firms of that account for 90% of the US music industry has submitted a lawsuit against Diamond, a producer of MP3 portable players (distributed under the brand name *Rio*) for infringing the Audio Home Recording Act and copyrights of its members. Users of the *Rio* player are able to upload music files from their personal computers or from Internet websites to a portable apparatus which can play up to sixty minutes of music or sixteen hours of speech, like regular Walkmans and Discmans.⁶⁸ However, *Rios* are incapable of exporting stored files to other computers or of distributing them to other players. The case of *Diamond*, and the new possibilities of accessing musical pieces online have attracted high levels of attention from legal and economic scholars, music publishers and wide shares of the public (the coverage of the trial in the international media has probably fostered the adoption of MP3 applications). As Court has mentioned in its ruling: “*the dispute over the Rio's design and function is difficult to comprehend without an understanding of the revolutionary new method of music distribution made possible by*

⁶⁷ *Exxon Mobil Corp. vs. United States Environmental Protection Agency* (9th Circuit, 2000), quoting *Consumer Product Safety Commission vs. GTE Sylvania, Inc.* (1980).

⁶⁸ This was the maximal capacity for digital storage of sound in the period of the trial (Oct. 1998). The latest models of portable players (such as Remote Solutions' *Jukebox*) can store up to 330 hours of MP3 files, before additional memory extensions are installed.

*digital recording and the Internet; thus, we will explain in some detail the **brave new world** of Internet music distribution” (9th Circuit, 1999; emphases added).*

The California District Court was the first juridical authority to accept Diamond’s arguments that neither had its product infringed the Audio Home Recording Act nor had it violated copyrights. The inability of the Rio to disseminate music in an unauthorized way and its capability to store music do not cause damages to music firms and both are legitimate by the *Fair Use* doctrine. The opinion of California District Court was supported by the decision of the 9th Circuit, when *RIAA* has later appealed to over-rule the verdict.

The 9th Circuit of Appeals has rejected *RIAA*’s arguments that the Rio should be considered as both a recording and transmission device on the grounds of its inability to download stored files to other media. Moreover, Court has recognized a loophole in the Act by which computers, though having become popular equipment for storage and distribution of music files, cannot be defined as digital recordings devices. In the case of *MAI vs. Peak* (1991) storage of copyrighted material in the computer’s workspace memory (*RAM*), even for very short periods, was defined as a “fixation” in a tangible medium, sufficient to violate copyrights.⁶⁹ The *Diamond* ruling has substantially narrowed the standard of protection for music works in a digital format, allowing to store music files in the computer’s hardware, which was previously determined as copyright infringement according to the *MAI* doctrine.

The case of *A&M Records vs. Napster* (Northern District Court of California, 2000) elaborates similar issues of unauthorized distribution of music via the Internet from different legal and technical aspects. *Napster* is the main provider of a *peer-to-peer* software platform, a computer program that enables users to search and to download MP3 files, by sharing music files stored on their computer’s hard drive with other members of the network. The program was developed in 1999 by a college student, Shawn Fanning, and has rapidly become the norm for downloading music files via the Net. According to Jupiter Research Group, 58% of the private “music traders” have chosen *Napster* as their favorite application for music exchange (*Napster*’s market share was even higher before *A&M* submitted its lawsuit).⁷⁰

The use of *Napster*’s software was possible under the following terms: “*Napster will terminate the accounts of users who are repeat infringers of the copyrights, or other intellectual property rights, of others. In addition, Napster reserves the right to terminate the account of a user upon any single infringement of the rights of others in conjunction with use of the Napster service*”. Although the company had applied this policy in October 1999, which is in compliance with Copyright Law, its efforts to enforce it during year 2000 were only minor.⁷¹ However, *Napster*’s arguments were based, apart from the AHRA allowances for music copying for non-commercial use, also on the Digital Copyright Millennium Act (DCMA, 1998) by which providers of data transmission services via the Internet are immunized against copyright infringement that their users perform.⁷² California District Court accepted the plaintiff opinion that *Napster* had not deterred its users from infringing copyrights and enjoined the firm from providing its online services of music exchange (May 2000). This ruling was supported later by the opinion of the Northern District

⁶⁹ This case, a statutory keystone in computer -law and Internet jurisdiction, has defined the US guidelines for jurisdiction in copyright infringements via the Internet, until the legislation of the Digital Copyright Millennium Act (*DCMA*) in 1998.

⁷⁰ Data is available in: <http://www.jup.com>.

⁷¹ Though *Napster* adopted the policy in October 1999, it admitted that its users were notified about the new terms only in February 2000.

⁷² Section 512(a) in the Digital Copyright Millennium Act protects by a “safe harbour” the activities of Internet service providers, including “transmitting, routing and providing connections for sharing of the files its users choose” (unless providers were notified by copyright holders about continuous violations of users and have not used their authority to stop them).

Court which required in a civil procedure that *Napster* would post a five-million dollar bond, in case that wrongful acts and damages to other parties were proven (August 2000).

The last accord, and probably not the final note in the case of *Napster*, was heard on February 2001. The Court of Appeals for the 9th Circuit accepted the arguments of music firms against *Napster* and concluded that the use, downloading and distributing MP3 files, is considered not only as contributing to copyright infringement, but also as a direct violation of copyrights. Moreover, the Court refused to accept *Napster*'s defense for a fair use, under terms of "space shift" (i.e. its users are allowed to download songs that they already own on CDs) as the ruling of *Diamond* defined, since MP3 files are available not only to the owners of a CD but also to millions of music fans that have not purchased it.⁷³ Court has concluded that *Napster*'s acts were violating copyrights and has mentioned that remedies should be sued separately on appeal.⁷⁴

The recent opinion of the US Court *in re Napster* has preserved the status of music files, though digitized and accessible by millions of users at no cost, as intellectual assets in their traditional definition (i.e. copy-protected artistic and literary works). Although *Napster* was seeking relief in the *fair use* law or by accusing its users in violating copyrights (and thus *Napster* claimed that it is not liable for their acts), Court has recognized that reproduction and distribution of MP3 files infringes copyrights and threatens the survival of music producers by removing large shares of their revenues.⁷⁵

The cases of *Diamond* and *Napster* demonstrate a lack of policy guidelines that regulate IPR in evolving technologies, as one may also observe in other knowledge-based industries. IPR regimes are continuously challenged and adapted by juridical decisions and by *sui-generis* rules. As a result, when firms introduce new technologies to the market, other companies that rely on traditional business models and IPR protection for their goods appeal to Courts for relief.

In many episodes, judgments draw outdated analogies, or attempt to rely on statutes that aimed to protect right holders from future perils when accepted as *sui generis* laws but have not been modified for long periods (on the time-scale of modern technologies). Hence, when Courts are confronted with new episodes, neither their legislative framework nor precedents that have prudentially resolved previous *technical scenes* can form guidelines for rulings that represent adequately a recent technological reality.

5.3. The Proposed Directive on Harmonisation of Certain Aspects of Copyright and Related Rights in the Information Society

The proposal for a European Directive on Harmonization of Copyrights and Related Rights in the Information Society⁷⁶ was initiated in 1997, after the adoption of the "*Copyright Treaty*" and the "*Performances and Phonograms Treaty*" by the EU in WIPO's Diplomatic Conference of 1996. The EC was concerned by the emergence of unauthorized dissemination of

⁷³ Moreover, CD owners can transfer their albums to digital files by applying MP3 encoding software. Hence, *Napster*'s program is only one of the alternatives to acquire digital music files.

⁷⁴ *A&M Records et. al. vs. Napster*, Court of Appeals for the 9th Circuit, February 2001, No. CV-99-05183-MHP.

⁷⁵ Court rejected arguments that *Napster* had contributed to development of new markets and tastes among music fans and hence promoted sales of musical titles.

⁷⁶ *Proposal for EU Directive*, COM (250) 1999 (European Commission, 1999).

information goods, via illegal duplication and over the Internet, and, parallel to other forms of legislation during the 1990s,⁷⁷ has established a proposal for a new Directive on IPR.

The proposal expands author's rights, reproduction and moral rights according to the Berne Convention, by granting an exclusive right "*to authorize or prohibit any communication to the public of originals and copies of their works, by wire or wireless means, including the making available to the public of their works in such a way that members of the public may access them from a place and at a time individually chosen by them*" to creators of works, phonograms, broadcasts and films (Proposal, Article 3 § 1). Its scope of protection, however, excludes computer programs and databases, rental and lending of copyrighted works, IPR of broadcasted programmes by satellite and cable retransmission and the term of protection of copyright and certain related rights, all are regulated by other EC Directives.

The proposed Directive is based, to a large extent, on the experience of US legislators: one may find similarities between the proposal and legal provisions defined in US acts (such as the Audio Home Recording Act and the Digital Copyright Millennium Act) and in international agreements (e.g. the Rome Convention). Nevertheless, the proposal defines a coherent IPR regime that to regulate wire-based and wireless transmissions and use of copyrighted works, with Fair Use exemptions for private reproduction and scientific use (Proposal, Article 4 § 2 & Article 5 § 2).⁷⁸

The proposal recognizes that information technologies are dynamically and rapidly evolving. Hence, prediction of market trends over elongated periods and the establishment of long-term policies *ex ante* is extremely difficult and may lead an institutional "lock-in" to inefficient regulatory guidelines, hazardous to the pace of innovation in the long-run. Therefore, the proposal defines evaluation terms of the new Directive: in the second year after the enactment of the new Directive and every three years afterwards the European Commission will monitor its application in the member states in order "*to facilitate the exchange of information between the Member States and the Commission on the situation of and developments in regulatory activities in the field of copyright and related rights and sui generis rights, as well as on the **relevant developments in the field of technology** [and] **to examine any developments in the sector** for which consultation appears useful*", inter alia (Proposal, Article 11 § 4a; emphases added).

To conclude, the proposed Directive represents an attempt by European policy makers to establish a rigid doctrine, yet open to periodical assessment, that aims to formulate a uniform framework for a regulation of copyrighted works and contents available online rather than accepting a myopic course of action in which juridical solutions, right-holders' lawsuits and ad-hoc rulings shape statutory guidelines addresses more adequately the needs of evolving technologies, as frequently happened in the US. For example, the proposal defines exemptions that allow reproduction of copyrighted works for short periods, hence resolves legal problems of temporary storage of copyrighted contents in the computer's hard-drive and memory during *web-surfing* (Proposal, Article 5 § 1).⁷⁹ Moreover, regulators have formerly aimed to address specific needs of emerging sectors in the European economy, or to emphasize their competitive position in global markets in the short run, by formation of more strengthened IPRs. This policy, which created, to a large extent, an "inflation" in enactment of new Directives and *sui generis* regimes, difficult to comply with technological changes and market trends in the long run, was

⁷⁷ During the 1990s, the European Parliament enacted the EU Council Directive on the Legal Protection of Computer Programs (91/250/EEC), the EU Directives for the Legal Protection of Databases (96/6/EC and 96/9/EC), amongst other regimes.

⁷⁸ The Directive preserves the important principle of "first buyer", by which copyright protection allows reproduction of works originally purchased by public libraries and institutes ("*first buyers*"), by the public ("*second buyers*") under the restrictions of Fair Use; compare with a critical review of the EC Database Directive in Cowan and Harison (op. cit.), section 3.5.

⁷⁹ See also our reviews in section 3.4 and section 3.5.

criticized as an obstacle for both innovation and scientific research (see for example: Reichman and Uhler (1999); David (2000)). However, the proposed Directive emphasizes a different approach, by which legislative guidelines do not regulate particular technologies and industries, but cautiously expands present IPR outlines to major and unregulated applications of the technologies, on a basis of past experience and in conformity with international treaties.

6. Conclusions

Intellectual property rights, namely patents, copyrights and trademarks, are traditional legal structures that aim to disclose advances in technical know-how to the public domain and to provide inventors incentives to innovate. When knowledge-based industries are considered, technical know-how disclosed to the public domain is not only an input for innovation of new products and technologies but also consists a major part of final goods.

Since the 1980s, the appropriateness of traditional IPR regimes to protect knowledge-based industries has been put under continuous examination by policy makers, industrialists and academic scholars. Present IPR regimes are perceived by some as *over-protective* and hence impeding innovation, whereas other faculties argue that the inability of IPRs to safeguard digital endeavours from large scales of unauthorized reproduction implies an *under-protective* legal design, similarly impeding innovation.

The rapid emergence of alternative models of intellectual property rights in which the use of legal intellectual property regimes is (almost) prohibited have sharpened the debate over the necessity of legislative systems of IPR for Infocom technologies. The Open Source model indeed demonstrates a *creativity paradox*, in which software developers prefer to distribute their programs “at no cost” and to rely on the peculiarities of software economics rather than on patents and copyrights as producers of proprietary code do. The success of Open Source applications and their competitive technical qualities have called into question the need to protect by legal means the evolving information technologies by adaptation and extension of existent IPR systems.

Internet technologies, and E-Commerce in particular, are in the eye of the storm of the public debate and confront policy makers and Courts with a serious lack of legislative guidelines. Internet-based technologies for electronic commerce provide technological platforms for an “electronic marketplace” and increase the welfare of both retailers and consumers through reduced search costs, new distribution channels and flexible communication standards. Moreover, E-Commerce has been identified as a key technology to nourish economic growth *vis-à-vis* the diffusion of Internet communications. However, as E-Commerce systems are infant technologies, firms that register patents over core inventions acquire “monopoly over technology” and may preempt new entrants and rivals from the market and consequently hinder advances of new technologies and *virtual markets*. Lessons from the development of communication technologies prior to the Internet emphasize the importance of non-private standards (e.g. communication protocols and APIs)⁸⁰ to the technological trajectories of information technologies, particularly in their early stages. Hence, policy makers should foster the formation of public committees to develop and regulate “open standards”.

A lack of legislative guidelines and legal definitions for recently-developed technologies is especially significant when parties apply for Court’s relief when intellectual property is presumably infringed. Juridical cases are often settled in the short term, as Courts seek solutions

⁸⁰ API - Application Program Interface. A language and message format used by an application program to communicate with the operating system or some other system or control other software applications, such as database systems (techweb.com).

by drawing analogies between archaic legal doctrines or outdated precedents and cases and modern technologies, such as intelligent agents and digital music files, composing a doctrinal basis on which future jurisdiction is established. However, those legal parallels can badly misrepresent the characteristics of recent technologies and may confine the use and the development of technology in the long run. Consequently, advances in electronic commerce and Internet technologies may be hindered and free flow of information over the Internet may substantially be hampered.

Finally, regulators seek legal formulae that would resolve wide range of issues and yet be flexible enough to be adapted to include evolving technologies. One method is the enactment of *sui-generis* laws to regulate peculiar technological fields, which are difficult to be comprehended in the traditional IPR models. Another method, which has been adopted by WIPO, advocates a pro-active approach in which technological forecasts are involved. Policy guidelines aim to identify future trends in modern technologies, such as the Internet, and attempt to formulate cross-border and coherent frameworks of IPR enforced by international treaties

7. References

- Abel S.M. (1999), "Trademark Issues in Cyberspace: The Brave New Frontier", *Michigan Telecommunication and Technology Law Review*, Vol. 5.
- Antonelli C. (1999), "The Dynamics of Technological Systems: The Case of New Information and Communication Technologies", ITS European Regional Conference, Turin.
- Arrow K.J. (1962), "Economic Welfare and the Allocation of Resources for Invention", In: Nelson R.R. (1962) (ed.), *The Rate and Direction of Inventive Activity*, Princeton University Press.
- Arthur W.B. (1987), "Competing Technologies, Increasing Returns and Lock-in by Historical Events", *Economic Journal*, Vol. 99.
- Arundel A. (2000), "Patent – the Viagra of Innovation Policy?", *Internal Report* to the Expert Group in the Project "Innovation Policy in a Knowledge-Based Economy, Maastricht, MERIT.
- Bjorn-Andersen N., Nygaard-Andersen S. (1995), "IndustriLink – The Case of an Order-Entry System in Denmark", in: Krcmar H., Bjorn-Andersen N., O'Callaghan R. (eds.) (1995).
- Bjorn-Andersen N., Krcmar H. (1995), "Looking Back – A Cross-Analysis of 14 EDI Cases", in: Krcmar H., Bjorn-Andersen N., O'Callaghan R. (eds.) (1995).
- Bradner S. (1999), "The Internet Engineering Task Force", in: DiBona et. al. (eds.) (1999).
- Burk D.L. (1995), "Trademarks Along the Infobahn: A First Look at the Emerging Law of Cybermarks", *Richmond Journal of Law and Technology*, Vol. 1.
- Burk D.L. et. al. (2000), "Friend-of-the-Court Brief: eBay vs. Bidder's Edge", filed on June 2000, available in: <http://www.gseis.ucla.edu/iclp/eBay-ml> (approached January 2001).
- Cohen S.A. (1999), "To Innovate or not to Innovate, That is the Question: The Functions, Failures, and Foibles of the Reward Function Theory of Patent Law in Relation to Computer Software Platforms", *Michigan Telecommunications, Technology and Law Review*, Vol. 5, No. 1.
- Cowan R., Harison E. (2000), *Intellectual Property Rights in a Knowledge-Based Economy*, MERIT Study for the Dutch Advisory Council for Science and Technology Policy (AWT), Maastricht.
- David P.A. (1993), "Intellectual Property Institutions and the Panda's Thumb: Patents, Copyrights and Trade Secrets in Economic Theory and History", in: Wallerstein M.B., Moguee M.E., Schoen R.A. (eds.) (1993).
- David P.A., Foray D. (1994), "Dynamics of Competitive Technological Diffusion Through Local Networks Structures: The Case of EDI Document Standards", in: Leydesdorff L., van den Besselaar P. (eds.) (1994).
- David P.A. (2000), "A Tragedy of the Public Knowledge 'Commons'? Global Science, Intellectual Property and the Digital Technology Boomerang", *SIEPR Discussion Paper*, No. 00-02, Stanford Institute for Economic Policy Research, September 2000.
- DiBona C., Ockman S., Stone M. (eds.) (1999), *Open Sources: Voices from the Open Sources Revolution*, Sebastopol, O'Reilly and Associates.
- Dommering E. (1998), "Addresses in Cyberspace Have no Physical Place: Addresses, Telephone Numbers and Domain Names", in: Kabel J.J.C., Mom G.J.H.M. (eds.) (1998).

- Dueker K.S. (1996), "Trademark Law Lost in Cyberspace: Trademark Protection for Internet Addresses", *Harvard Journal of Law and Technology*, Vol. 9.
- EU (1991), *Council Directive on the legal protection of computer programs (91/250/EEC)*, Council of the European Communities, Brussels, May 1991.
- Farrell J., Saloner G. (1988), "Coordination Through Committees and Markets", *RAND Journal of Economics*, Vol. 19, No. 2.
- Franklin S., Gassaer A. (1999), "Is it an Agent, or just a Program?: A Taxonomy for Autonomous Agents", in: Klusch M. (ed.) (1999).
- Froomkin A.M. (1999), "Of Government and Governance", *Berkeley Technology Law Journal*, Vol. 14, No. 2.
- Fu S., Chung J.Y., Dietrich W., Gottemukkala V., Cohen M., Chen S. (1999), "A Practical Approach to Web-Based Internet EDI", *Proceedings of the 19th International Conference on Distributed Computing Systems*, ICDCS'99 Workshop, May 1999.
- Goss, J. (1995), "'We Know Who You Are and We Know Where You Live': The Instrumental Rationality of Geodemographic Systems", *Economic Geography*, Vol. 71, No. 2.
- Granstrand O. (1999), *The Economics and Management of Intellectual Property: Towards Intellectual Capital*, Edward Elgar, Cheltenham.
- Harchaoui T.M., Hamdad M. (2000), "The Prices of Classical Recorded Music: A Hedonic Approach", *International Journal of Industrial Organization*, Vol. 18, No. 3.
- Hayzelden A.L.G., Bigham J. (1999), *Software Agents for Future Communication Systems*, Berlin, Springer.
- IIPA (2000), "The International Intellectual Property Alliance 'Special 301' Report", Washington, IIPA, available in: http://www.iipa.com/homepage_index.html (approached January 2001).
- IMF (1993), "Monopolies and Mergers Commission Submission", *Report*, available in: <http://www.u-net.com/imf/docs/mmcsb.html> (approached January 2001).
- Kabel J.J.C., Mom G.J.H.M. (eds.) (1998), *Intellectual Property and Information Law*, The Hague, Kluwer Law International.
- Klusch M. (1999), *Intelligent Information Agents*, Berlin, Springer-Verlag.
- Krcmar H., Bjorn-Andersen N., O'Callaghan R. (eds.) (1995), *EDI in Europe*, Chichester, John Wiley & Sons.
- Kuester J.R., Nieves P.A. (1998), "Hyperlinks, Frames and Meta-Tags: An Intellectual Property Analysis", *IDEA: Journal of Law and Technology*, Vol. 38.
- Lemley M.A. (1999), "Standardizing Government Standard-Setting Policy for Electronic Commerce", *Berkeley Technology Law Journal*, Vol. 14, No. 2.
- Lerner J., Tirole J. (2000), "The Simple Economics of Open Source", *NBER Working Paper*, No. 7600, March 2000.
- Lessig L. (1999), "The Limits in Open Code: Regulatory Standards and the Future of the Net", *Berkeley Technology Law Journal*, Vol. 14, No. 2.
- Leydesdorff L., van den Besselaar P. (eds.) (1994), *Evolutionary Economics and Chaos Theory: New Directions in Technology Studies*, London, Pinter Publishers.
- Liebowitz S.J. (1985), "Copying and Indirect Appropriability: Photocopying of Journals", *Journal of Political Economy*, Vol. 93, No. 5.

- Monopolies and Mergers Commission (1994), *The Supply of Recorded Music*, HMSO, London.
- O'Callaghan R., Turner J.A. (1995), "Electric Data Interchange – Concepts and Issues", in: Krcmar H., Bjorn-Andersen N., O'Callaghan R. (eds.) (1995).
- OECD (1998), *21st Century Technologies: Promises and Perils of a Dynamic Future*, Paris, OECD Publication Service.
- OECD (1999a), *Communications Outlook 1999*, Paris, OECD Publication Service.
- OECD (1999b), *The Economic and Social Impact of Electronic Commerce: Preliminary Findings and Research Agenda*, Paris, OECD Publication Service.
- OECD (2000a), *Information Technology Outlook 2000*, Paris, OECD Publication Service.
- OECD (2000b), *Science and Technology Outlook 2000*, Paris, OECD Publication Service.
- Quah D. (1997), "Increasingly Weightless Economies", *Bank of England Quarterly Bulletin*, Vol. 37, No. 1, pp. 49-56.
- Raymond E. S. (1999), *The Cathedral and the Bazaar*, Sebastopol, O'Reilly and Associates.
- Ribbers P.M. (1995), "EDI in Regional Healthcare – The Case of RHCNET in The Netherlands", in: Krcmar H., Bjorn-Andersen N., O'Callaghan R. (eds.) (1995).
- Reichman J. H. (1994), "Legal Hybrids Between the Patent and Copyright Paradigms", *Columbia Law Review*, Vol. 94, No. 8.
- Reichman J.H., Uhler P.F. (1999), "Database Protection at the Crossroads: Recent Developments and Their Impact on Science and Technology", *Berkeley Technology Law Journal*, Vol. 14, No. 2.
- Rosen S. (1981), "The Economics of Superstars", *American Economic Review*, Vol. 71, No. 5.
- Samuelson P., Davis R., Kapor M. D., Reichman J. H. (1994), "A Manifesto Concerning the Legal Protection of Computer Programs", *Columbia Law Review*, Vol. 94, No. 8.
- Schumm B. (1996), "Escaping the World of "I Know It When I See It": A New Test for Software Patentability", *Michigan Telecommunication and Technology Law Review*, Vol. 2.
- Segev A., Porra J., Roldan M. (1997), "Internet-Based EDI Strategy", *Decision Support Systems*, Vol. 21.
- Shulman S. (2000), "Software Patents Tangle the Web", *Technology Review*, March-April 2000.
- Silva F., Ramello G.B. (2000), "Sound Recording Market: the Ambiguous Case of Copyright and Piracy", *Industrial and Corporate Change*, Vol. 9, No. 3.
- Sirilli G., Evangelista R. (1998), "Technological Innovation in Services and Manufacturing: Results from Italian Surveys", *Research Policy*, Vol. 27, pp. 881-899.
- Stallman R. (1999), "The GNU Operating System and the Free Software Movement", in: DiBona et. al. (eds.) (1999).
- Steinmueller W.E. (2001), "Virtual Communities and the New Economy", Forthcoming, in: Mansell R. (ed.) (2001), *Inside the Communication Revolution: Evolving Patterns of Social and Technical Interaction*, Oxford University Press, Oxford.
- Stimson D. (1998), *Hearing on Trade Dress Protection in the United States and the Relationship between Trademarks and Internet Domain Names*, US House Committee on the Judiciary – Subcommittee on Courts and Intellectual Property, available in: <http://www.house.gov/judiciary/41152.htm> (approached December 2000).

- Stolpe M. (2000), "Protection Against Software Piracy: A Study of Technology Adoption for the Enforcement of Intellectual Property Rights", *Economics of Innovation and New Technology*, Vol. 9, No. 1.
- Strobl E.A., Tucker C. (2000), "The Dynamics of Chart Success in the U.K. Pre-Recorded Popular Music Industry", *Journal of Cultural Economics*, Vol. 24, No. 2.
- Takeyama L.N. (1997), "The Intertemporal Consequences of Unauthorized Reproduction of Intellectual Property", *Journal of Law and Economics*, Vol. 40, No. 2.
- Tassey G. (2000), "Standardization in Technology-Based Markets", *Research Policy*, Vol. 29, No. 4-5.
- Towse R. (1997), "The Monopolies and Mergers Commission's Investigation of the U.K. Music Market", *Journal of Cultural Economics*, Vol. 21, No. 2.
- UNESCO (1999), *World Communication and Information Report 1999-2000*, Geneva, UNESCO Publishing House.
- UNESCO (2000), *World Culture Report 2000*, Geneva, UNESCO Publishing House.
- US Copyright Office (2000), "A&M Records, Inc., et al. vs. Napster, Inc.: Brief for the United States as an Amicus Curiae", US Court of Appeals for the Ninth Circuit, NO. 00-16401 & 00-16403.
- US Department of Commerce (1998), "White Paper on Management of Internet Names and Addresses", *Report*, No. 980212036-8146-02, Washington D.C., available in: http://www.ntia.doc.gov/ntiahome/domainname/6_5_98dns.htm (approached January 2001).
- US White House (1997), "A Framework for Global Electronic Commerce", *Report*, Washington D.C., available in: <http://www.iitf.nist.gov/elecomm/ecom.htm> (approached December 2000).
- USPTO (1996), *Examination Guidelines for Computer-Related Inventions - Final Version*, Washington D.C., US Patent and Trademark Office.
- Wallerstein M.B., Moguee M.E., Schoen R.A. (eds.) (1993), *Global Dimensions of Intellectual Property Rights in Science and Technology*, Washington D.C., National Academy Press.
- WIPO (1994), *Guide to the Rome Convention and to the Phonograms Convention*, WIPO Publication, Geneva.
- WIPO (1998), *Introduction to Intellectual Property Theory and Practice*, London, Kluwer Law International.
- WIPO (1999), "The Management of Internet Names and Addresses: Intellectual Property Issues", *Final Report*, Geneva, available in: <http://wipo2.wipo.int/process1/report/doc/report.doc> (approached January 2001).
- Young (1999), "Giving It Away: How Red Hat Software Stumbled Across a New Economic Model and Helped Improve an Industry", in: DiBona et. al. (eds.) (1999).

**MERIT-Infonomics Research Memorandum series
- 2001-**

- 2001-001 **The Changing Nature of Pharmaceutical R&D - Opportunities for Asia?**
Jörg C. Mahlich and Thomas Roediger-Schluga
- 2001-002 **The Stringency of Environmental Regulation and the 'Porter Hypothesis'**
Thomas Roediger-Schluga
- 2001-003 **Tragedy of the Public Knowledge 'Commons'? Global Science, Intellectual Property and the Digital Technology Boomerang**
Paul A. David
- 2001-004 **Digital Technologies, Research Collaborations and the Extension of Protection for Intellectual Property in Science: Will Building 'Good Fences' Really Make 'Good Neighbors'?**
Paul A. David
- 2001-005 **Expert Systems: Aspects of and Limitations to the Codifiability of Knowledge**
Robin Cowan
- 2001-006 **Monopolistic Competition and Search Unemployment: A Pissarides-Dixit-Stiglitz model**
Thomas Zieseemer
- 2001-007 **Random walks and non-linear paths in macroeconomic time series: Some evidence and implications**
Franco Bevilacqua and Adriaan van Zon
- 2001-008 **Waves and Cycles: Explorations in the Pure Theory of Price for Fine Art**
Robin Cowan
- 2001-009 **Is the World Flat or Round? Mapping Changes in the Taste for Art**
Peter Swann
- 2001-010 **The Eclectic Paradigm in the Global Economy**
John Cantwell and Rajneesh Narula
- 2001-011 **R&D Collaboration by 'Stand-alone' SMEs: opportunities and limitations in the ICT sector**
Rajneesh Narula
- 2001-012 **R&D Collaboration by SMEs: new opportunities and limitations in the face of globalisation**
Rajneesh Narula
- 2001-013 **Mind the Gap - Building Profitable Community Based Businesses on the Internet**
Bernhard L. Krieger and Philipp S. Müller
- 2001-014 **The Technological Bias in the Establishment of a Technological Regime: the adoption and enforcement of early information processing technologies in US manufacturing, 1870-1930**
Andreas Reinstaller and Werner Hölzl
- 2001-015 **Retrieval of Service Descriptions using Structured Service Models**
Rudolf Müller and Stefan Müller

- 2001-016 **Auctions - the Big Winner Among Trading Mechanisms for the Internet Economy**
Rudolf Müller
- 2001-017 **Design and Evaluation of an Economic Experiment via the Internet**
Vital Anderhub, Rudolf Müller and Carsten Schmidt
- 2001-018 **What happens when agent T gets a computer?**
Lex Borghans and Bas ter Weel
- 2001-019 **Manager to go? Performance dips reconsidered with evidence from Dutch football**
Allard Bruinshoofd and Bas ter Weel
- 2001-020 **Computers, Skills and Wages**
Lex Borghans and Bas ter Weel
- 2001-021 **Knowledge Transfer and the Services Sector in the Context of the New Economy**
Robin Cowan, Luc Soete and Oxana Tchervonnaya
- 2001-022 **Stickiness of Commercial Virtual Communities**
Rita Walczuch, Marcel Verkuijlen, Bas Geus and Ursela Ronnen
- 2001-023 **Automatic ontology mapping for agent communication**
F. Wiesman, N. Roos and P. Vogt
- 2001-024 **Multi Agent Diagnosis: an analysis**
N. Roos, A. ten Teije, A. Bos and C. Witteveen
- 2001-025 **ICT as Technical Change in the Matching and Production Functions of a Pissarides-Dixit-Stiglitz model**
Thomas Zieseemer
- 2001-026 **Economic stagnation in Weimar Germany: A structuralist perspective**
Thorsten H. Block
- 2001-027 **Intellectual property rights in a knowledge-based economy**
Elad Harison
- 2001-028 **Protecting the digital endeavour: prospects for intellectual property rights in the information society**
Elad Harison
- 2001-029 **A Simple Endogenous Growth Model With Asymmetric Employment Opportunities by Skill**
Adriaan van Zon
- 2001-030 **The impact of education and mismatch on wages: The Netherlands, 1986 - 1998**
Joan Muysken and Jennifer Ruholl
- 2001-031 **The Workings of Scientific Communities**
Robin Cowan and Nicolas Jonard
- 2001-032 **An Endogenous Growth Model à la Romer with Embodied Energy-Saving Technological Change**
Adriaan van Zon and İ. Hakan Yetkiner

- 2001-033 **How Innovative are Canadian Firms Compared to Some European Firms? A Comparative Look at Innovation Surveys**
Pierre Mohnen and Pierre Therrien
- 2001-034 **On The Variance of Market Innovation with the Number of Firms**
Robin Cowan
- 2001-035 **Non linear dynamics in US macroeconomic time series**
Franco Bevilacqua
- 2001-036 **Multinational Firms, Regional Integration and Globalising Markets: Implications for Developing Countries**
Rajneesh Narula
- 2001-037 **Contract Prolongation In Innovation Production As A Principal-Agent Problem With Moral Hazard**
Thomas Zieseemer

Papers can be purchased at a cost of EURO 7 or USD 7 per report at the following address:

MERIT - P.O. Box 616 - 6200 MD Maastricht - The Netherlands - Fax : -31-43-388 4905
(* Surcharge of EURO 7 or USD 7 for banking costs will be added for orders from abroad)

Subscription: the yearly rate for the MERIT-INFONOMICS Research Memorandum series is EURO 150 or USD 150 or,
papers can be downloaded from INTERNET:

<http://meritbbs.unimaas.nl>
<http://www.infonomics.nl>

email: secr-merit@merit.unimaas.nl