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Aura Soininen

The Software and Business-Method Patent Ecosystem

Academic, Political, Legal and Business Developments in the U.S. and Europe

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Ever since software and hardware were unbundled, and the commercial value of software was realized, there has been increasing focus on software patents as a means for appropriating returns on R&D investments and leveraging. Business-method patents have also been attracting research interest from the time when the Internet's commercial potential was recognized. Nonetheless, there are lapses, gaps, and numerous contradictions in these studies. In fact, the debate concerning the recently rejected EU software-patent directive proposal was a good illustration of the lack of knowledge and consequent miscommunication. There is a need for interdisciplinary research on software and business-method patents in the context of the entire patent ecosystem.

The objective of this paper is to provide the necessary common ground by examining four interconnected and partially overlapping trends—academic, political, legal and business developments—and pointing out problems and misunderstandings related to software and business-method patents. This paper also contributes to the related discussion by providing empirical data on ICT companies' patent strategies and thus combining theoretical views and practice. On this basis it aims to give a well-reasoned glimpse into the future: as markets for technology advance, it is probable that firms become even more interested in patents and their strategic potential. In the long run, however, the industry matures. As various technologies become commoditized, technological development slows down, and firms move towards service-oriented business models, the availability and relevance of ICT-patents is likely to decrease and that of pure business-method patents to increase. On a policy level, we appear to be heading towards more limited patent protection.

THE SOFTWARE AND BUSINESS-METHOD PATENT ECOSYSTEM

ACADEMIC, POLITICAL, LEGAL AND BUSINESS DEVELOPMENTS IN THE U.S. AND EUROPE

Aura Soininen*

Abstract

Ever since software and hardware were unbundled, and the commercial value of software was realized, there has been increasing focus on software patents as a means for appropriating returns on R&D investments and leveraging. Business-method patents have also been attracting research interest from the time when the Internet's commercial potential was recognized. Nonetheless, there are lapses, gaps, and numerous contradictions in these studies. In fact, the debate concerning the recently rejected EU software-patent directive proposal was a good illustration of the lack of knowledge and consequent miscommunication. There is a need for interdisciplinary research on software and business-method patents in the context of the entire patent ecosystem.

The objective of this paper is to provide the necessary common ground by examining four interconnected and partially overlapping trends— academic, political, legal and business developments— and pointing out problems and misunderstandings related to software and business-method patents. This paper also contributes to the related discussion by providing empirical data on ICT companies 'patent strategies and thus combining theoretical views and practice. On this basis it aims to give a well-reasoned glimpse into the future: as markets for technology advance, it is probable that firms become even more interested in patents and their strategic potential. In the long run, however, the industry matures. As various technologies become commoditized, technological development slows down, and firms move towards service-oriented business models, the availability and relevance of ICT-patents is likely to decrease and that of pure business-method patents to increase. On a policy level, we appear to be heading towards more limited patent protection.

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I. INTRODUCTION

A. BACKGROUND: ACADEMIC, POLITICAL, LEGAL AND BUSINESS TRENDS IN A NUTSHELL

Two decades ago patents were neither a popular research topic nor a media attention-getter. Certainly companies had patents, but, with the exception of pharmaceutical firms[2], they basically saw them as legal instruments and exploited them cautiously in business. Patents were regarded as defensive tools and used mainly for protecting key products and manufacturing processes from imitation. Today, however, these legal rights to exclude others are seen more and more as bargaining chips. Since patents provide the leverage needed they are essential for doing business, especially in areas such as various parts of the information and communications technology (ICT) sector that are characterized by technological complexity.[3] Patents have also been a subject of controversy lately, and have therefore aroused the interest of companies, scholars and the media. They have been in the headlines of magazines such as Forbes[4], the Economist[5], and the New York Times[6]. Nevertheless, and contrary to general assumptions, patents have not always been underutilized as business tools. In the 19th and early 20th centuries, before the era of far-reaching antitrust scrutiny, dominant market players exploited them vigorously with a view to keeping new entrants at arm's length and maintaining their dominant position.[7] In many cases patent wars between the most influential competitors escalated into cartelization in the form of cross-licensing and the formation of patent pools[8]. A strategic view of patents is nothing new.

In addition to changes in the ways in which companies utilize patents in their businesses, there have been some major developments in the patent regime. The availability, scope and

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[2] Pharmaceutical companies have traditionally relied on patent protection and used them offensively in order to gain market advantage (Kevin Rivette & David Kline, *Unlocking the Hidden Value of Patents, Rembrandts in the Attic*, at 38 (Harvard Business School Press 2000)).

[3] Rivette & Kline, at 37-45 (2000); Henry W. Chesbrough, *Open Innovation, The New Imperative for Creating and Profiting from Technology*, at 158-159 (Harvard Business School Press 2003).

[4] *See e.g.* Dorothy Pomerantz, *Get Katz. Telecom patent king Ronald Katz has extracted $750 million from companies in licensing fees. They want him stopped* (Forbes Magazine, 28 March 2005); Gary L. Reback, *Patently Absurd* (Forbes.com, 24 June 2002); Rob Wherry, *Patent Peril, If you thought inventing was hard, just wait till you try to protect the invention in markets across the globe* (Forbes Global, 24 June 2002); Michael S. Malone, *The Smother of Invention. The world's most important patent office is 200 years old and showing its age* (Forbes Global, 24 June 2002); Quentin Hardy, *In the Path of an Avalanche. An examiner at the U.S. patent office explains how he manages the never-ending flow of applications* (Forbes Global, 24 June 2002); Eric W. Pfeiffer, *Managing Your Knowledge. Companies are coining intellectual property* (Forbes Global, 24 June 2002); David Raymond, *How to Find True Value in Companies. Look for patent relevance to pay off* (Forbes Global, 24 June 2002).

[5] *See e.g. Monopolies of the Mind* (Economist.com, 11 November 2004); *The Broken Patent System* (Economist.com, 11 November 2004); *Europe's Patent Mess* (Economist.com, 20 May 2004); *Patent Wars* (Economist.com, 6 April 2000).

[6] *See e.g.* Steve Lohr, *Sharing the Wealth at I.B.M.* (The New York Times, 11 April 2005); Teresa Riordan, *Patents; A patent owner claims to be owed royalties on much of the Internet's media content* (The New York Times, 16 August 2004); Hal R. Varian, *Patent Protection Gone Awry* (The New York Times, 21 October 2004).

[7] Rivette & Kline, at 37 (2000).

[8] *See e.g.* Peter Drahos & John Braithwaite, *Information Feudalism. Who Owns the Knowledge Economy?* at 53-54 (Earthscan 2002). On the evolution of the consumer electronics and computer industries, *see e.g.* Alfred D. Chandler Jr, *Inventing the Electronic Century. The Epic Story of the Consumer Electronics and Computer Industries* (The Free Press 2001).

strength of patent protection have varied over time[9] and throughout industries' life cycles. The early days of information and communications technology, the focal point of this research, did not abound with patents, and while they were typically employed in electronics, semiconductors and computer hardware[10], unlike today, patent protection was not available for software inventions.

Currently, patent propensity in the ICT sector compared with the total number of patents is relatively high. Indeed, of all OECD patent applications, around one third are ICT-related, and the proportion appears to be constantly on the increase.[11] Of course, this increased propensity is not only the result of changes in the patentability regime, and the expansion of the role of patents in business, but it also stems from the growing importance of information and communications technology. ICT has become one of the largest and most influential industries in the world. It spans manufacturing and service industries involved in information acquisition, processing and transfer, as well as communications, and touches on the electronics and electrical industries, telecommunication services, information technology and, depending on the definition, also on content businesses.[12] Naturally, all these fields have developed at their individual paces and they all have diverging characteristics. ICT is a multifaceted business sector.

What are the reasons behind the broadening of the scope of patentable subject matter? Has there been a need for better protection? As far the information-technology side of the ICT sector is concerned, despite the assumption that patents are essential for encouraging innovation, their absence has not prevented the software business from developing, growing and blooming as an autonomous industry. Once technological developments had made it possible to write general-purpose rather than machine-specific software, and particularly after software and hardware had been unbundled, independent software suppliers began to appear[13]. However, other forms of intellectual property rights (IPRs) were applied to software rather early in its life cycle: computer software could be considered a trade secret, and it was officially regarded as a subject of copyright protection in the early 1980s, both in the U.S. and in Europe. Even before, the U.S. copyright office had issued registration certificates to software source code, and also to object code under its "rule of doubt"[14]. Nonetheless, the need for more efficient protection was recognized in the mid-80s when microcomputers became popular, mass-markets for software developed, and the scope of

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9 *See e.g.* Adam B. Jaffe & Josh Lerner, *Innovation and Its Discontents, How Our Broken Patent System is Endangering Innovation and Progress, and What to Do about It*, at 90-91 (Princeton University Press 2004).

10 Mark A. Lemley, Peter S. Menell, Robert P. Merges & Pamela Samuelson, *Software and Internet Law*, at 259 (Aspen Law & Business 2000).

11 *See e.g. OECD Science, Technology and Industry Scoreboard 2003, Towards a Knowledge-Based Economy* (2003) <http://www1.oecd.org/publications/e-book/92-2003-04-1-7294/A.4.3.htm> (last visited 5/25/05); OECD, *ICT patents as a percentage of national total (EPO) in selected countries, According to the residence of the inventors, by priority year 1991, 2000* <http://www.oecd.org/dataoecd/20/8/34083325.xls> (last visited 5/25/05) .

12 TEKES, *The Future is in Knowledge and Competence, Technology Strategy -a review of choices,* at 12 (June 2002) <http://www.tekes.fi/julkaisut/Tekes_Teknstrat_eng.pdf> (last visited 5/25/05). *See also* OECD, *Measuring the Information Economy 2002, Annex 1. The OECD Definition of the ICT Sector*, at 81 <http://www.oecd.org/dataoecd/34/37/2771153.pdf> (last visited 5/25/05).

13 Chandler, at 121 (2001); Stuart J. H. Graham & David C. Mowery, *Intellectual Property Protection in the U.S. Software Industry*, at 221 (in Wesley M. Cohen and Steven Merrill (eds.) *Patents in the Knowledge-Based Economy*, National Academy Press, Washington, D.C. 2003, 219-258).

14 Lemley, Menell, Merges & Samuelson, at 97 (2000).

copyright protection reached its limits[15]. Consequently, due to technological, commercial and copyright law developments, and also because of ineffectual limits of patentable subject matter, software-implemented inventions have gradually come into the sphere of patentable subject matter in the U.S. and Europe. Lately, patents for business methods, such as novel and non-obvious methods for pricing, distributing and/or marketing on the Internet, have been accepted in the U.S[16]. Not all software developers and companies have unanimously welcomed these developments[17].

At the time software and business methods gradually entered the patent sphere biotechnological inventions were also making their entrance, and the political atmosphere favored a broad patent scope. Concerns about industrial stagnation and the lack of technological innovation had resulted in the U.S. Congress and the courts strengthening patent rights during the 1980s and 1990s.[18] For instance, before the specialized patent court, the Court of Appeals for the Federal Circuit (CAFC), was established in 1982, around one in three patent holders won their cases. After that, around two in three won.[19] The U.S. antitrust analysis framework was also updated at that time. This change was driven in part by academic rethinking, which was based on the Chicago School of Economics, and related to antitrust law and its approach to patents.[20] In the meantime, Europe had taken a step towards more harmonized patent regulation, and the European Patent Office (EPO) was stabilizing its role alongside national patent offices[21].

Academic, political and legal evolution concerning copyrights, patents and antitrust analysis have played a role in modifying the ways companies exploit patents today[22], but these are certainly not the only factors. The competitive environment has become more knowledge-based, and as technological complexity and convergence have increased, companies' innovation processes have become more decentralized. Firms lean heavily on cooperation and networks.[23] In this context, large ICT companies in particular acquire and use patents in

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[15] *See e.g.* Denis T. Rice, *Building a Strategic Internet IP Portfolio in a "Down" Economy* (Practising Law Institute, Patents, Copyrights, Trademarks, and Literary Property Course Handbook Series, PLI Order Number G0-018F, 7th Annual Internet Law Institute, July 2003). The sweeping interpretation of copyright protection adopted in Apple Computer, Inc. v. Franklin Computer Corp was narrowed and weakened considerably in a series of copyright infringement cases— particularly the *Borland* decision— brought by Lotus Development. (Graham & Mowery, at 225 (2003)).

[16] As explained later in this paper these inventions can be patented also in Europe if the invention resides in the technical implementation, not in the business method itself.

[17] Lawrence Lessig, *The Future of Ideas, The Fate of the Commons in a Connected World*, at 208 (Random House 2001).

[18] Federal Trade Commission (FTC), *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy*, at Chapter 1, 18 (2003), <http://www.ftc.gov/os/2003/10/innovationrpt.pdf> (last visited 5/25/05); Jaffe & Lerner, at 97 (2004).

[19] The Economist, *Patent Wars, Better Get Yourself Armed, Everyone Else Is* (Economist.com, 6 April 2000).

[20] FTC, at Chapter 1, 18 (2003).

[21] Hon. Sir Robin Jacob, *The Onward March of Intellectual Property Rights and Remedies*, at 416 (in Rochelle Dreyfuss, Diane L Zimmerman & Harry Fist (ed.), *Expanding the Boundaries of Intellectual Property Innovation Policy for the Knowledge Society*, Oxford University Press 2001, 415-419).

[22] For instance Graham and Mowery have suggested that Borland decision which weakened the software copyright protection may have, along with decisions affirming the strength of software patents, contributed to the increased reliance by some U.S. software firms on patents in the 1990s. (Graham & Mowery, at 225-226 (2003)).

[23] OECD, *Patents and Innovation: Trends and Policy Challenges*, at 7, 16 (2004), <http://www.oecd.org/dataoecd/48/12/24508541.pdf> (last visited 5/25/05). *See also* Henry Chesbrough,

order to get access to technologies developed by others[24]. At the same time, it has become necessary to secure one's freedom to operate and to employ a defensive patent strategy especially in markets flooded with patents and in an environment in which infringement is common[25]. Moreover, many U.S.-based ICT and other firms have begun to enforce their patent rights aggressively, and companies are exploring strategies to profit from licensing and selling patents[26]. Conversely, European ICT companies are only beginning to realize how patents can be used strategically to support their businesses[27].

Nonetheless, preventing the findings of companies' research and development (R&D) activities from leaking to competitors is one significant function of patents[28]. In fact, this use has become prominent in the knowledge-based economy, and the right to exclude others naturally also forms the basis of all their other functions. Another factor that has contributed to their attractiveness as a protection measure is the declining usability of other intellectual property rights. In many cases these other forms have turned out to be inefficient, or their use no longer complies with the market needs.[29] Nowadays, in the software industry, for instance, customers often demand access to the source code because they want to be able to update and fix the program even if the software vendor goes bankrupt. Therefore, providing the customer only with the object code version is not necessarily a viable strategy, particularly if the software is tailor-made[30]. As an alternative to the strictly proprietary model according to which a firm keeps the source code a secret, a company may choose to employ a more open strategy and simply allow its customers to

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The Logic of Open Innovation: Managing Intellectual Property (California Management Review, Volume 45, number 3, 2003, 33-58).

[24] For instance IBM has expressed its strategy as follows: "The IBM patent portfolio gains us freedom to do what we need to do through cross-licensing— it gives us access to the inventions of others that are key to rapid innovation. Access is far more valuable to IBM than the fees it receives from its 9000 active patents." This description dates back to 1990. Nowadays IBM is very active in generating patent licensing revenues. (James Bessen, *Patent Thickets: Strategic Patenting of Complex Technologies,* at 2 (ROI Working Paper 2003) <http://www.researchoninnovation.org/thicket.pdf> (last visited 6/21/05)).

[25] *See e.g.* Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, at 12-13 (RAND Journal of Economics, Vol 32, No 1, Spring 2001, 101-128); Bessen, at 1 (2003); Interview data U.S. (2004).

[26] Russell L. Parr, *IP Leverage, Facilitating Corporate Value Creation*, at 283 (in Bruce M. Berman (ed.) *From Ideas in Assets, Investing Wisely in Intellectual Property*, Wiley & Sons, Inc. 2002, 271-291): Jaffe & Lerner, at 59 (2004).

[27] Derived from the Interview data Finland (2003). *See also* DLA, *European Intellectual Property Survey* (2004), <http://www.dlapiper.com/files/tbl_s47Details/FileUpload265/98/EuropeanIPSurvey.PDF> (last visited 8/32/05); Knut Blind, Jakob Edler, Ralph Nack & Joseph Straus, *Mikro- und makroökonomische Implikationen der Patentierbarkeit von Softwareinnovationen: Geistige Eigentumsrechte in der Iinformatinstechnologie im Spannungsfeld von Wettbewerb und Innovation* (Forschungsprojekt im Auftrag des Bundesministeriums für Wirtschaft und Technologie, Forcshungsauftrag 36/00, 2001), <http://www.computerundrecht.de/docs/computerprogrammen.pdf> (last visited 6/21/05); Nicholas S. Vonortas, *Technology Licensing,* at 33 (Final report, 10 October 2003), <http://www2.gwu.edu/~cistp/PAGES/licensing.pdf> (last visited 9/8/05).

[28] *See e.g.* Wesley M. Cohen, Richard R. Nelson & John P. Walsh, *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not),* at 17 (NBER Working Paper Series, Working Paper 7552, 2000).

[29] Production of today's cutting-edge technical know-how differs from that generated during industrial revolution due to the chronic inability of those who invest in its commercial exploitation to keep it secret. (Jerome H. Reichman, *On Green Tulips and Legal Kudzu: Repacking Rights in Subpatentable Innovation*, at 26 (in Rochelle Dreyfuss, Diane L Zimmerman & Harry Fist (ed.), *Expanding the Boundaries of Intellectual Property Innovation Policy for the Knowledge Society* (Oxford University Press 2001)); OECD, at 15 (2004). *See also* supra notes 15 and 22.

[30] One option is to use escrow agreements that allow the licensee to obtain access to the software source code under certain circumstances, such as bankruptcy or failure to make required modifications.

access the source code, learn from it and potentially fix and modify it. Of course, non-disclosure agreements may be used to restrict the flow of information.[31] Nevertheless, the recent success of open-source software[32] has verified that there may be benefits even with a more open approach[33].

As explained previously, patents are now obtainable in new technological areas and the protection is stronger than it was twenty years ago. The business environment has changed and so has their role in it. What, then, are the consequences from society's perspective? Is the U.S. and European patent system working the way it is supposed to? It is a political challenge to maintain a supportive policy framework and to balance the interests of society and the rights-holder at all times. If the system is not working optimally, adjustments are needed.

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[31] The ultimate "openness" depends on the buyers bargaining power. A proprietary software company does not usually want to share the source code, and if it does it typically places tight constraints regarding its use. (Steven Weber, *The Success of Open Source,* at 191-192 (Harvard University Press 2004)).

[32] The Open Source Initiative defines open source as follows: "Introduction: Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

1. Free Redistribution: The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

2. Source Code: The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

3. Derived Works: The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

4. Integrity of The Author's Source Code: The license may restrict source-code from being distributed in modified form *only* if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

5. No Discrimination Against Persons or Groups: The license must not discriminate against any person or group of persons.

6. No Discrimination Against Fields of Endeavor: The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

7. Distribution of License: The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

8. License Must Not Be Specific to a Product: The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

9. License Must Not Restrict Other Software: The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

*10. License Must Be Technology-Neutral: No provision of the license may be predicated on any individual technology or style of interface." (Open Source Initiative <http://www.opensource.org/docs/definition_plain.php> (last visited 6/14/05).

[33] *See e.g.* Weber, at 197-207 (2004).

There has been an ongoing, and often heated, academic and public debate on whether the patent system enhances innovation, and whether it even should be applicable to the new generations of technologies, particularly information technology and life-sciences[34]. The problem is that it is almost impossible to say anything definite about the economic efficiency of the system. Patent economics is complex and has multiple dimensions. It has been recently recognized, for instance, that besides enhancing innovation through inducing more R&D investments and promoting technology diffusion, patents that are legal, limited monopolies may increase competition[35]. Hence, it is not given that the more a patent-holder gets, the less competition and the less benefit there is to consumers. In addition, the effects of patent protection are different in different fields[36], and in many cases the theoretical problems are not as severe in practice[37].

Although it is difficult to assess whether and when patent protection is beneficial for society, some flaws, such as the granting of software and business-method patents that do not fulfill novelty or non-obviousness requirements, have become apparent. Indeed, multiple amendments to the U.S. patent system have been suggested.[38] Even the companies utilizing the patent system the most at the moment understand that the expansive patent game eats away resources they could otherwise spend on R&D[39]. It is likely that the U.S. patent system is about to experience some turbulence. This requires, of course, that public discussion, various research papers, books and specifically recently published recommendations not only reach the eyes of political decision makers and the courts but also become enacted. In the meantime, Europe is still arguing whether and in what form software and business-method patents should be granted. Individual software developers and open-source software supporters in particular have raised their voices in their fight against software patents[40]. In fact, the European parliament eventually rejected the proposed directive on computer-implemented inventions[41]. The time was not mature for its adoption. At the same time, the European Patent Office (EPO) grants patents to software-related inventions without much

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[34] Commission on Intellectual Property Rights (CIPR), *Integrating Intellectual Property Rights and Development Policy*, at 111 (September 2002) <http://www.iprcommission.org/graphic/documents/final_report.htm> (last visited 9/5/05).

[35] *See e.g.* OECD, at 9 (2004); FTC (2003).

[36] *See e.g.* CIPR, at 112 (2002); Jaffe & Lerner, at 198 (2004); OECD, at 9 (2004); Dan L. Burk & Mark A. Lemley, *Designing Optimal Software Patents,* at 89 (Stanford Law School, Public Law & Legal Theory Working Paper series, Research Paper No. 108 and University of Minnesota law School, Legal Studies Research Paper series, Research Paper No. 05-11, March 2005).

[37] The means to mitigate patent-related problems involve licensing, inventing around, moving research offshore, or simply infringing (CIPR, at 127 (2002)).

[38] *See e.g.* FTC (2003); National Academy of Sciences, *A Patent System for the 21st Century* (April 2004) <http://www.nap.edu/books/0309089107/html/> (last visited 5/25/05); Jaffe & Lerner (2004).

[39] *See e.g.* Federal Trade Commission (FTC), *Patent Reform Workshop, Industry/institutional issues panel* (Ideas into Action, Implementing Reform of the Patent System Conference, UC Berkeley 15-16 April 2004). Transcript available at: <http://www.law.berkeley.edu/institutes/bclt/patentreform/transcripts/BCLT_Patent_Industry.pdf> (last visited 9/2/05).

[40] *See e.g.* Jeremie Zimmermann, *Europe Struggles over Software Patents* (IEEE Spectrum, September 2004, 61-63).

[41] Michel Rocard, *No Directive on Software Patents* (European Parliament, *Report on the Council common position for adopting a directive of the European Parliament and of the Council on the patentability of computer-implemented inventions (11979/1/2004 – C6 0058/2005 - 2002/0047(COD)*, 6 July 2005) <http://www2.europarl.eu.int/omk/sipade2?PUBREF=-//EP//TEXT+PRESS+DN-20050706-1+0+DOC+XML+V0//EN&L=EN&LEVEL=2&NAV=X&LSTDOC=N#SECTION1> (last visited 9/3/05).

objection based on computer programs' character as a non-patentable subject matter: according to one estimate more than 20,000 software patents had already been granted by 2002[42].

The identified shifts have shaped the status of software and business-method patents, and will continue to affect them in the future. In fact, it appears that the developments in the patent arena have followed a sine wave, fluctuating from strong to weak and from weak to strong protection, and from the strategic to the non-strategic and back to strategic view of patents. Are we confronting another chasm? Is the era of strong and easily obtainable patent protection over? Are patents becoming less paramount to ICT firms?

This paper examines the various trends in the software and business-method patent ecosystem[43] with a view to determining whether we are heading towards a weaker patent regime and their diminishing role in business. A further purpose is to provide a holistic view in order to promote knowledge of the software and business method patent framework.

The software and business-method patent ecosystem is illustrated in Figure 1. Technological developments and academic, political and legal systems that overlap are depicted here as forming part of the company's business/competitive environment.

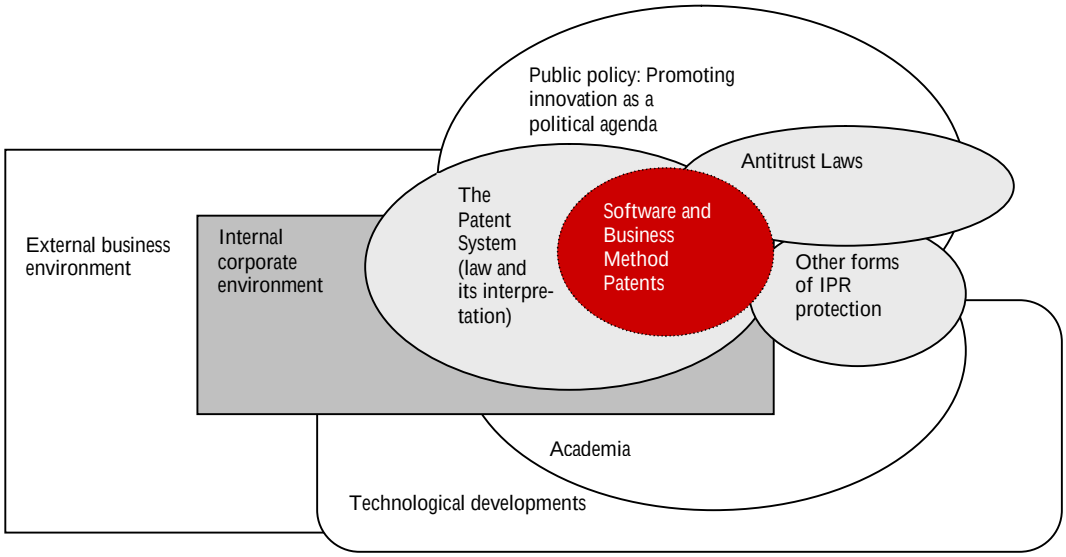

FIGURE 1. THE SOFTWARE AND BUSINESS METHOD PATENT ECOSYSTEM

[42] Kim G. Hansen, *Software Patents in Europe,* at 176 (in Peter Wahlgren (ed), *IT Law*, Scandinavian Studies in Law, Vol 47, Stockholm Institute for Scandinavian Law, 2004).

[43] The term ecosystem originates from biology and refers to self-sustaining, dynamic systems whose members benefit from each other's participation via symbiotic relationships. Ecosystem can be an area of many sizes, and it contains organisms (e.g., plants, animals, bacteria) interacting with one another and their non-living environment. In business context, an ecosystem can be viewed as a system in which the relationships established across different industries become mutually beneficial, self-sustaining and somewhat closed. *See e.g.* Learnthat.com, <http://www.learnthat.com/define/view.asp?id=302> (last visited 9/1/05); Biology-online.org, <http://www.biology-online.org/dictionary/ecosystem> (last visited 9/1/05). In this paper the term is used flexibly and it refers, as the title indicates, to the interconnections between academic, political, legal and business developments having to do with software and business method patents. Technological developments are also included but as they are not highlighted they are largely viewed as part of the business environment.

B. THE RESEARCH OBJECTIVE

Although the fast-evolving area of software and business-method patents has been a relevant research theme for over a decade, there is a lot to be done before we are able to declare the case closed. For example, the big picture comprising both the ideology and the implementation of the patent system, and software and business-method patents in this context, is clearly deficient. It is my observation that legal scholars and practitioners often take the law and the legal practice as it is, and thus concentrate on interpreting a specific wording of the patent law, or a certain court case without paying much attention to the economic reasoning behind the rules. It seems also to be common, particularly for economists, to oversimplify the connection between innovation and patents. Economists typically look at the macro level and attempt to determine whether innovation is promoted in a certain field, but ignore the associated practicalities and the system's underlying complexity. Furthermore, the (software) engineers' perspective appears often as idealistic and highlights the importance of being able to innovate freely, while ICT companies promote the interpretation that contributes to their prevailing business interests. The unfortunate result is that this type of academic discussion may have little or no real-world value. It could be misleading at worst, while the practical perspective often lacks the societal aspect. A combination of academic interest, practitioners' point of view and business reality is needed.[44]

With a view to filling the research gap and offering a glimpse into the future, I aim in this paper to provide a comprehensive picture of software and business-method patents. My approach is interdisciplinary, and the developments are considered from various perspectives. Four interrelated and partially overlapping trends are combined, three of which are societal, and the fourth is business-oriented. These are: 1) trends in academic/public discussion 2) trends in political views, 3) trends in the law and its interpretation, and 4) trends in the business climate. I examine the driving forces and point out problems and common misunderstandings, but make no attempt to make policy recommendations. The purpose is to provide basic information and to help academics, legislators, judges, and companies to see the forest for the trees. My objective is to offer a reasonable starting point for future research and decision-making in an area that has a notable impact on industrial development even beyond the U.S. and Europe. Despite the potential spillover effect, this study is largely limited to the above-mentioned areas.

C. RESEARCH METHODOLOGY

The originality of this research resides in the combination of various perspectives. It contributes to the discussion on software and business-method patents in particular by bringing the theoretical and practical aspects together. In addition, it identifies and clarifies some problem areas, introduces new perceptions such as the "no patents strategy", and presents a vision of the future.

The paper is based on research conducted by others. Multiple research papers and reports published in the U.S., such as the Federal Trade Commission's study "To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy" (2003) and

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[44] *See also* Frank H. Easterbrook, *Who Decides the Extent of Rights in Intellectual Property?*, at 405-413 (in Rochelle Dreyfuss, Diane L Zimmerman & Harry Fist (ed.), *Expanding the Boundaries of Intellectual Property Innovation Policy for the Knowledge Society*, Oxford University Press 2001, 405-413).

Wesley M. Cohen and Steven Merrill's (eds.) "Patents in the Knowledge-Based Economy" (2003), have explored patent and antitrust developments. Software and business-method patents have been studied from legal, technological and economic perspectives, and companies' patent strategies have been a popular topic. To mention a few sources, legal developments consisting of a stream of court cases are described in books such as Merges and Duffy, "Patent Law and Policy: Cases and Materials" (2002) and Merges, Menell, and Lemley, "Intellectual Property in the New Technological Age" (2003). Cohen and Lemley reviewed the scope of software patents in their article "Patent Scope and Innovation in the Software Industry" (2001), and patent system's efficiency has been addressed by Jaffe, Gallini, Ziedonis, Shapiro, Hall, Kortum, Lerner, Levin, Merges, Lessig, Bessen, J Cohen, and W. Cohen, among others. Business literature includes books such as Rivette and Kline's "Rembrants in the Attic" (2000), Davis and Harrison's "Edison in the Boardroom" (2001), and Berman (ed.) "From Ideas to Assets" (2002). Furthermore, software engineers' views on software and business-method patents are aired in Internet discussions and magazines published by the IEEE, for example. On the whole, there is comparatively more patent-oriented research in the U.S. than previously. In addition, research is becoming more interdisciplinary, and there is a strong trend towards empirical studies that rely upon statistical and econometric analysis of collected data on the acquisition and enforcement of patents.[45]

In Europe, the legalistic and patent engineers' view of software as a patentable subject matter has been well represented. For example, Beresford's book "Patenting Software Under The European Patent Convention" (2000) provides a good starting point for finding out the status of software patents in Europe. Less attention has been devoted to the other patentability criteria, patent scope, the economic efficacy of the European patent system, and European ICT companies' patent strategies. In fact, more interdisciplinary and empirically oriented research on the European patent system and how it functions would be most beneficial. Nevertheless, some business-oriented studies have been conducted in Europe, such as Granstrand's "The Economics and Management of Intellectual Property" (1999) and Rahnasto's "Intellectual Property Rights, External Effects and Anti-Trust Law" (2003).

Information from the prevailing academic and business literature is complemented by empirical research data from 27 ICT companies. I conducted interviews in 11, and my and my co-instructor Olli Pitkänen's students[46] in eight, Finnish ICT firms. These patent strategy studies were completed in 2003 and they were exploratory in nature. I also interviewed representatives (General council, VP of licensing, or VP of IP) of eight ICT companies in the Bay Area, CA, U.S. These interviews were conducted in cooperation with Pia Hurmelinna in 2004[47]. The companies were asked to fill out a short questionnaire regarding their innovation model before the interview, and their patent strategies and licensing

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[45] John R. Thomas, *The Status of Intellectual Property Research in the U.S.*, at 6 - 10 (IIP, Institute of Intellectual Property, March 2003) <http://www.iip.or.jp/summary/pdf/thomas2.PDF> (last visited 5/25/05).

[46] Helsinki University of Technology, IT Law Course, Spring 2003. The interviews were conducted as student assignments (group assignment, a group consisting of 4-5 students). The students were instructed to independently select ICT companies that had no patents. Interview questions were provided, but students were encouraged to deepen the interview when appropriate. The purpose was to provide the students with a practical perspective to the subject-matter studied, and also to explore whether companies have implemented a "no patents" strategy in practice.

[47] We were both present at six interviews from which one was conducted via teleconferencing. I interviewed two of the companies alone. Seven companies allowed the discussion to be recorded, and we were both present at the one that did not permit it.

practices were then discussed in more detail. Most questions asked of the representatives were open-ended: quantitative results were not a desired goal.

The Finnish companies I interviewed personally differed in size as well as in the particular ICT field in which they were competing. In general, they offered software products and related services, equipment, and/or communications and logistic services to a wide range of clients. The number of patents and pending patent applications varied. The characteristics of the selected companies are illustrated in Tables 1 to 4 in Appendix 1. The objective was to interview representatives of a variety of ICT firms. The in-depth interview incorporated questions regarding patenting, utilization of patents in business, patent infringement and IPR management.

The basic data on the firms in which the students did the interviewing is given in Tables 5 and 6 in Appendix 2. These companies had no patents and they were mainly small information technology (IT) organizations operating primarily in Finland, but also in Sweden, Norway, Great Britain, Germany, Italy and the Benelux countries.

Five of the U.S. firms interviewed were different-sized, global ICT companies providing software and hardware products as well as services to a variety of clients in order to make communication and networking easier. Two of them supplied digital entertainment products, and one delivered secure-access and managed-network solutions to its clients. Unlike the other seven companies, this one had no patents and did not operate globally—its main area of operations being North America. All the other firms had large or medium-sized patent portfolios their size varying between 200 and 2000 patents. The average number of personnel varied from a little over 200 to over 36 000. In the following the U.S. research material is referred as interview data U.S (2004), and the data collected from Finnish companies as interview data Finland (2003)[48].

D. DEFINITIONS

The business context of this paper is the ICT sector. The justification for this is that, although it might be expected that software-related patents are most important to firms operating in the software industry, most are issued to manufacturing firms operating especially at the electronics and machinery industries. Relatively few are assigned to software-publishing and software-service organizations.[49] Companies such as Microsoft, Hewlett-Packard, Sony, Fujitsu, Matsushita Electric Ind., Samsung, Siemens, Sun and Nokia have been reported as the top software patentees.[50] Moreover, companies operating in the ICT sector apply for a lot of business-method patents many of which are computer-

[48] The interview data Finland (2003) has been partially published under the title *"Yhteenveto Suomen ICT-sektorin yritysten patenttistrategioita koskevista haastatteluista"* (in Aura Soininen (ed), Jukka Kemppinen, Perttu Virtanen, Risto Sarvas, Herkko Hietanen & Tommo Reti, *Digital Economy Core Project (DE CORE): Structures of Mobile Digital Economy* (Final Report, Helsinki Institute for Information Technology HIIT, 18 January 2005)). This publication does not include material collected by students. The interview data (U.S.) has so far been analyzed in two conference publications: Pia Hurmelinna & Aura Soininen, *Appropriability and Licensing in Closed versus Open Innovation Models* (EURAM, Munich, 4-7 May 2005) and Aura Soininen & Pia Hurmelinna, *Patent Strategies and Licensing Practices in Closed versus Open Innovation Models* (R&D Management, Pisa, 6-8 July 2005).

[49] James Bessen & Robert E. Hunt, *An Empirical Look at Software Patents*, at 15 (Federal Reserve Bank of Philadelphia Working Papers, Working Paper No.03-17/R, March 2004), <http://www.researchoninnovation.org/swpat.pdf> (last visited 6/21/05).

[50] Although the reliability of the source can be questioned, data regarding software patentees in Europe can be found *e.g.* from FFII's website. *Top EPO Software Patent Applicants 1978-2003* <http://swpat.ffii.org/patents/stats/index.en.html#jarappl> (last visited 5/25/05).

implemented: according to the U.S. Patent and Trademark Office (USPTO), Pitney-Bowes, Fujitsu, IBM, NCR, Hitachi, Citibank, EDS, Microsoft, Neopost and Matsushita Electric Industrial were the top 10 assignees in patent class 705 (Data processing: financial, business practice, management, or cost/price determination) in 1995-1999[51].

It is obvious that ICT companies are not restricted to software and business-method patents. In fact, due to definition problems, it is difficult to know exactly which of their patents could be regarded as belonging to these categories, which could be defined in many ways. Software patents could be thought of as patents related to inventions containing a software element, those implemented with software, but solving an external problem, or those in which the problem solved actually resides in the software. Similarly, business-method patents could be understood as patents relating to inventions residing in the technical application of a business-method or in the business-method itself. Indeed, I do not typically make any distinction between the different categories, and have not sought to determine exactly how software and business-method patents are utilized in the business, but have taken the view that, despite the characteristics resulting from problems such as inefficient prior art search and consequent lack of novelty and non-obviousness[52], these patents are utilized in the same way as ICT companies 'other patents. It should also be kept in mind that, irrespective of the definition, it is not merely the ICT industry to which software and business-method patents are of interest. Software is pervasive: it is currently used in products and processes in all technological fields. Business-method patents are clearly not industry-specific either.

Another concern over definitions relates to the terms software, computer programs, and algorithms, which are used interchangeably and thus inaccurately in this paper. In fact, software is a wider concept than computer programs and algorithms[53], and patent claims are not typically directed to software as a whole but relate to specific function generating computer programs and applied algorithms described in combination with the computer or computer networks executing the program. Nonetheless, since the term is in common use, I have chosen to apply it. I use also other terms such as computer-implemented, software-implemented and software inventions inconsistently.

E. THE STRUCTURE OF THE PAPER

The paper is structured as follows: Chapter II, "Four Intertwined Patent-related Developments at Large", describes four identified trends and explains how they are connected. It also introduces recent changes in the business environment and the patent regime, and considers the interface between patent law and antitrust/competition regulation. The focus is therefore on the areas marked in white and light gray in Figure 1. Chapter III, "Developments in Software and Business-method Patents in Europe and the U.S.",

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[51] USPTO, *White Paper, Automated Financial or Management Data Processing Methods (Business Methods)* (2000) <http://www.uspto.gov/web/menu/busmethp/index.html> (last visited 5/25/05).

[52] *See e.g.* Jaffe & Lerner, at 145 (2004).

[53] For example, software is defined as follows in the IEEE Standard Glossary of Software Engineering Terminology (1990): "Computer programs, procedures, and possibly associated documentation and data pertaining to the operation of the computer system." Computer programs are defined as: "A combination of computer instructions and data definitions that enable computer hardware to perform computational or control functions", and algorithms as: "(1) A finite set of well-defined rules for the solution of a problem in a finite number of steps; for example, a complete specification of a sequence of arithmetic operations for evaluating sine x to a given precision. (2) Any sequence of operations for performing a specific task".

concentrates on the legal, political and academic evolution related particularly to software and business-method patents, *i.e.* the area marked in red in Figure 1. Chapter IV, "Patent Strategies Reflecting Business Trends in the Information and Communications Technology Sector", focuses on ICT companies' patent strategies that fall into the dark gray area in Figure 1. Potential problems caused by patents in the ICT sector are also addressed, and the discussion is thus drawn together with that in Chapters II and III. Chapter V concludes the paper by distinguishing the identified trends, key misunderstandings and problem areas.

II. FOUR INTERTWINED PATENT-RELATED DEVELOPMENTS AT LARGE

The software and business-method patent ecosystem discussed in this paper encompasses technological, commercial as well as academic, political and legal frameworks, all of which interconnect and have evolved over time. Indeed, as will be further explained in this chapter, noteworthy shifts that have already taken place in the business arena include the transition from an industrial to an information economy, the era of intellectual property and the notion of intellectual property rights (IPRs)[54]. Furthermore, although maximum dominance has traditionally been a high preference for companies, and IPRs such as patents provide the means for achieving that position, the value of patents is not restricted to preventing all others from utilizing an invention: they also facilitate technology transactions and help a company to position itself favorably in the markets through licensing[55]. In fact, technology management of the future has been claimed to center on leveraging technology that is owned to gain access to technology that is needed[56].

As far as licensing practices are concerned, a distinction will be drawn between closed and more open licensing models, the difference residing mainly in the essence of control[57]. Firms have typically been reluctant to give up their hegemony particularly in relation to their core technologies[58], but due to network effects and the importance of interoperability, they have been opening up their licensing practices and have even occasionally allowed a large, unlimited number of companies to access some of their technologies at no or low cost[59]. It has also become more important to be able to complement companies' internal R&D with external technologies[60]. Although, the ideology of open-source licensing goes even further than most commercial licenses, it has also penetrated the business world[61]. In fact, if openness in licensing starts to prevail in the sense that subsequent inventors are able to access all kinds of third-party technologies easily and at low cost, develop them further and license the entire package to others, it is about to reduce the value of patents to the extent that the right to exclude others loses some of its relevance. Furthermore, along the ideological continuum from "not invented here" to "nothing invented here", patents' importance to a firm is likely to increase at first as leveraging becomes more important, but decrease as the business model of a firm reaches the latter end[62]. Exclusivity is a hollow right

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[54] *See e.g.* Margaret M. Blair, Gary M. Hoffman & Salvatore P. Tamburo, *Clarifying Intellectual Property for the New Economy*, at 84 (in Bruce M. Berman (ed.) *From Ideas in Assets, Investing Wisely in Intellectual Property* (Wiley & Sons, Inc., 2002, 83-108).

[55] Robert C. Megantz, *Technology Management, Developing and Implementing Effective Licensing Programs,* at 80 (John Wiley & Sons, Inc 2002); Vonortas, at 32 (2003).

[56] Parr, at 275 (2002).

[57] Chesbrough, at 155 (2003).

[58] Interview data U.S. (2004); Vortonas, at 33 (2003).

[59] Licensing on liberal terms, widely and on minimal royalties takes typically place when a firm is attempting to establish a standard (David J. Teece, *Managing Intellectual Capital. Organizational, Strategic and Policy Dimensions,* at 143 (Oxford University Press 2000)). Penetration pricing is also one of the reasons why firms give away their technologies for free or for low cost. One of the most famous examples of modern times is the fight over Internet browsers, Microsoft Internet Explorer versus Netscape (Carl Shapiro & Hal R. Varian, *Information Rules. A Strategic Guide to the Network Economy*, at 292-294 (Harvard Business School Press 1999)).

[60] Chesbrough, at 182-184 (2003).

[61] *See e.g.* Weber, at 197-207 (2004).

[62] *See also* Soininen & Hurmelinna (2005).

that has value only in connection with competition[63]. Third-party patents may nonetheless continue to cause problems even to companies operating in the latter end. At the same time, the more commoditized the technology and service-oriented the firms become, the more interested they may become in protecting their services and other types of business methods by patents.

Moreover, it will be established in this chapter that in academic circles, and to some extent in political and legal realms, it is no longer assumed that strong patent protection is necessary for the promotion of innovation in all fields of technology: it has been established that the negative and positive effects vary between industries[64]. A critical view of patent protection has become widespread particularly in the context of biotechnology, software and business methods, but it is also taking hold more generally. By way of a conclusion, it is suggested that the strength of patent protection will be reassessed and will most likely be downgraded.

A. THE CONNECTION BETWEEN ACADEMIC, POLITICAL, LEGAL AND BUSINESS TRENDS

The patent system is a tool for guiding technological development and promoting innovation. Patents provide their holders with exclusive rights to novel and non-obvious inventions. The limits of these rights are determined by national patent laws and international treaties. These limits should be in line with the goals of the patent system, and with its utility and effects in practice. A dysfunctional system may harm society by causing unnecessary restraints on trade[65].

Patent laws, in their current form, date back to the era of industrialism[66], but have been modified since. It is aspiratory to maintain a supportive policy framework and infrastructure that allows creative thinkers to innovate, and entrepreneurs to create jobs, start new companies and ultimately generate perpetual wealth. For example, due to the internationalizing business environment, harmonizing national patent laws and setting the same protection standards globally have been seen as a major improvement, and as inevitable[67]. Treaties such as The Paris Convention (1883), The Patent Cooperation Treaty (PCT, 1970), The European Patent Convention (EPC, 1973) and the WTO-governed Trade-related Aspects of Intellectual Property Rights Agreement (TRIPS, 1995) have had their role in this respect. Moreover, The Patent Law Treaty (PLT, 2000) has entered into force on 28 April 2005[68]. Nevertheless, national legislations have maintained some divergent characteristics, and although similar terms and phrases might be used, their interpretation may vary. Despite their deficiencies, new international agreements are constantly called for[69].

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63 Hans Ullrich, *Intellectual Property, Access to Information, and Antitrust: Harmony, Disharmony, and International Harmonization*, at 373 (in Rochelle Dreyfuss, Diane L Zimmerman & Harry Fist (ed.), *Expanding the Boundaries of Intellectual Property Innovation Policy for the Knowledge Society*, Oxford University Press 2001, 365-402).

64 *See e.g.* CIPR, at 112 (2002); Jaffe & Lerner, at 198 (2004); OECD, at 9 (2004); Burk & Lemley, at 89 (2005).

65 FTC, at Executive Summary, 3 (2003).

66 *See e.g.* Pirkko-Liisa Haarmann, *Immateriaalioikeuden oppikirja*, at 99-100 (Kauppakaari 2001); Ove Granstrand, *The Economics and Management of Intellectual Property, Towards Intellectual Capitalism*, at 27-38 (Edward Elgar 1999); Morgens Koktvedgaard & Marianne Levin, *Lärobok i immaterialrätt*, at 26 (Norstedts Juridik AB 2000).

67 *See e.g.* Drahos & Braithwaite, at 10-11 (2002).

68 WIPO, *Patent Law Treaty (PLT)* <http://www.wipo.int/patent/law/en/plt.htm> (last visited 9/2/05).

69 *See e.g.* WIPO, *Substantive Patent Law Harmonization*, <http://www.wipo.int/patent/law/en/harmonization.htm> (last visited 9/2/05).

Changes to the rationale and language of current legislation are made through political decision-making. The urgency of issuing new legislation in certain areas and the form that legislation takes depend on matters highlighted in academic discussion and other forums, and on the constraints set by previous legislation and international agreements. The lobbying efforts of interest groups are included and given emphasis in the materials that legislators and those who participate in the preparation processes consider. In practice, decisions are not necessarily based on independent economic research in which the interests of the general public are taken into account. For example, Boldrin and Levine (2003) mention the recent Sonny Bono copyright extension law, in which the U.S. Congress unanimously extended copyright protection by 20 years although there was no economic argument whatsoever in favor of such an extension.[70] This Act has been claimed to be the practical effect of the urge of keeping proprietary such notable old works as Mickey Mouse and the songs of George and Ira Gershwin[71].

Minor legal changes come to pass via the interpretation of laws in courts and other forums. How much weight these interpretive modifications carry and how political these adjustments are depend on the legal culture: common-law and civil-law systems differ in this respect. Nevertheless, in both regimes, prevailing academic literature is one source that can be taken into account when decisions are made in individual cases. In doing so judges are, however, compelled to follow and apply the statutes. Unlike academics they do not have the privilege of thinking what the statutes ought to provide.[72]

Legislation and its interpretation set limits on company behavior, but the business environment in terms of how competitors behave and what the culture is like in that particular country or market has a huge impact on how companies exploit available rights. Hence, the business climate, and the ways in which companies exploit patents are somewhat different in Europe compared to the U.S., and there are also variations across industries and company sizes[73]. It should also be remembered that the firm's function is to survive competition and generate as much profit as possible for its shareholders, not to balance the interests of business and society. Basically, everybody would like to be in a monopoly position, and this naturally has an impact on companies' lobbying agendas. Of course, the interests of business and the general public may not be that different in the end. There are always some, usually small and medium-sized, companies that are in opposition to strong entry barriers, but unfortunately these firms are not always the most active lobbyists. Balancing is typically left to academics and interest groups. Figure 2 sums up these factors, illustrating the connections between four patent-related trends.

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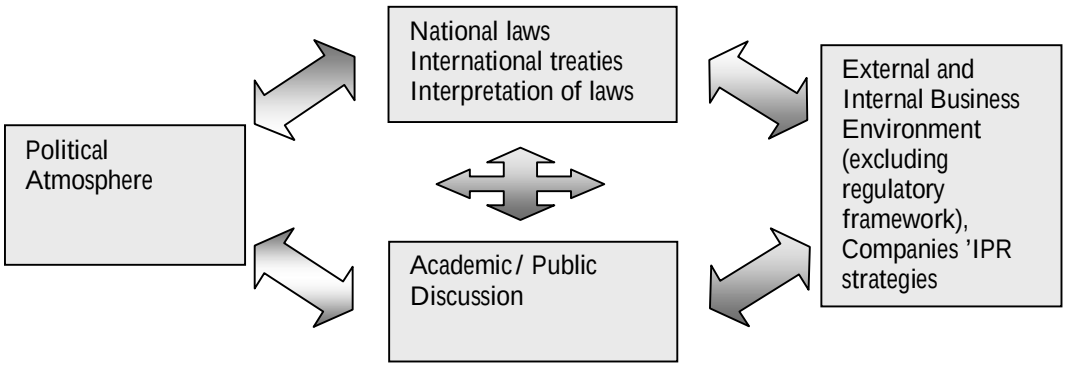
[70] Michele Boldrin & David K. Levine, *Rent-seeking and Innovation*, at 2 (Working paper, 13 July 2003) <http://levine.sscnet.ucla.edu/papers/cr35.pdf> (last visited 6/21/2005).

[71] Robert P. Merges, Peter S. Menell, Mark A. Lemley, *Intellectual Property in the New Technological Age,* at 396 (Aspen Publishers 2003).

[72] Hon. Jon O. Newman, *Academia and the Bench: Toward a More Productive Dialogue*, at 422 (in Rochelle Dreyfuss, Diane L Zimmerman & Harry Fist (ed.), *Expanding the Boundaries of Intellectual Property Innovation Policy for the Knowledge Society*, Oxford University Press 2001, 421-430).

[73] There are differences in licensing practices, for instance. Chemical and pharmaceutical companies license typically on an exclusive basis, while electronics companies have the highest share of non-exclusive and cross-licenses. Also, with an exception to large corporations, unlike their U.S. counterparts, European companies are largely unaware of the value of intellectual property asset management. (Vortonas, at 20, 33 (2003)).



Academic/public discussion combined with changes in the business environment signaled by companies 'lobbying affect what politicians consider important, the type of laws drafted and how existing laws are interpreted. In the context of political decision-making, existing laws and international treaties may have a restricting function; it is not usually necessary to change the system entirely. Moreover, legislation adopted in other countries acts as a guideline in many cases.

Academic/public responses to decisions are made via political legislative process and in the courts. There are also reactions to the way companies and society function. Companies ' IPR and patent strategies should also allow for response to potential and actual changes in the social, legal and business framework. The process is continuous and multifaceted.

FIGURE 2. FOUR INTERTWINED PATENT TRENDS

Some recent changes in the external and internal business climate, which have created a need for better-suited legislation in the field of patent rights and antitrust (U.S) and competition regulation (Europe) are presented in the following. The focus moves from the increased importance of intellectual property rights in the knowledge-based economy to the current trend towards more openness in licensing as well as more service-oriented business models. A discussion of the main changes in academic, political and legal thinking follows, and although the approach is more general than in the other chapters in this paper, the emphasis is on the ICT sector.

B. CHANGES IN THE BUSINESS CLIMATE

(i) The Rise of ICT: from an Industrial to an Information Economy

The information and communications technology sector, as we know it today, consists of manufacturing and service industries involved in information acquisition, processing and transfer, and communications. In fact, ICT is a combination of various industries, including the electronics and electrical industries, telecommunication services, and information technology.[74] All these fields have naturally developed at their individual paces and every one of them has its own special features. For instance, the software industry is fairly young, and its progress owes a great deal not only to companies 'research laboratories but also to the U.S. government, military in particular, universities, and groups of users, all of which have contributed to its development since the 1950s[75]. Indeed, the ideology of publishing source code, sharing, adding on components created by others and improving others 'contributions has characterized software engineering over the years. Although business interests, including capturing the source of competitive advantage and protecting software by trade secrets,

[74] TEKES, at 12 (2002). *See also* OECD, *Measuring the Information Economy 2002, Annex 1. The OECD Definition of the ICT Sector*, at 81.

[75] *See e.g.* Paul E. Ceruzzi, *A History of Modern Computing* (The MIT Press 1998); Chandler, at 121 (2001).

copyright and/or patents, entered into the sphere of software development in the late 1960s as software firms started to appear[76], the ideology still holds.[77] It is to be hoped that software engineers developing software just for fun, pride and peer-recognition will continue doing so as they contribute significantly to the technological development.

Whether or not it is a result of the freedom to innovate and compete in certain areas, the ICT sector has developed into one of the most influential industries in the world today. Software is pervasive. It is embedded[78] in products and manufacturing, guiding and information systems in all fields of technology and business, and as a separate commodity it comprises a diverse business sector. There are many types of software that can be distinguished from the supporting hardware: infrastructural software such as operating systems, applications software, which builds on its capabilities, and component software, which is software that can be incorporated into applications and infrastructure software. It does not constitute a complete application in itself, but it is a ready-to-use element that provides certain functionality. The idea in software development is to build new capabilities on previous layers without modifying them, and to build systems by re-using existing components.[79] Indeed, it is the re-usable components providing certain functionalities that many software companies consider worth patenting[80].

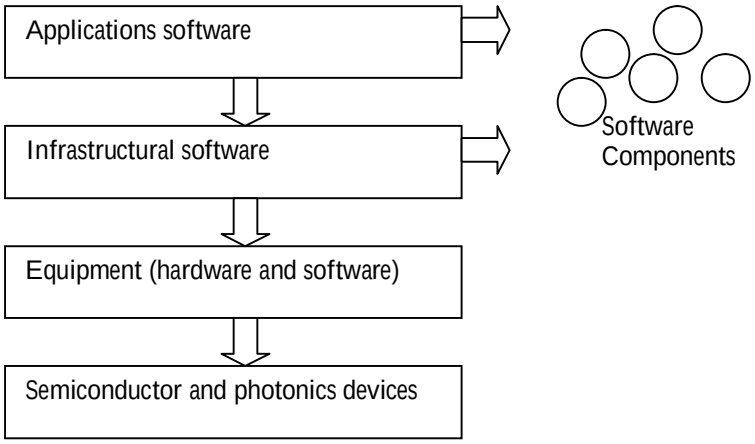


FIGURE 3. LAYERS OF COMPLEMENTARY SUPPORTING SOFTWARE[81]

The hardware and software providers, as well as service providers, content providers and end-users (organizations and individuals), form part of the complex software ecosystem[82],

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[76] Ceruzzi (1998).

[77] *See e.g.* Pekka Himanen, *The Hacker Ethic and the Spirit of the Information Age* (Random House 2001).

[78] Embedded system can be defined as "a specialized computer system that is part of a larger system or machine. Typically, an embedded system is housed on a single microprocessor board with the programs stored in ROM. Virtually all appliances that have a digital interface -- watches, microwaves, VCRs, cars -- utilize embedded systems. Some embedded systems include an operating system, but many are so specialized that the entire logic can be implemented as a single program." (Webopedia <http://www.webopedia.com/TERM/E/embedded_system.html> (last visited 6/7/05))

[79] David G. Messerschmitt & Clemens Szyperski, *Software Ecosystem, Understanding an Indispensable Technology and Industry*, at 24 (The MIT Press 2003).

[80] Interview data Finland (2003).

[81] Messerschmitt & Szyperski at 24 (2003).

[82] Messerschmitt & Szyperski (2003).

and thus also of the software and business-method patent framework comprising a constantly increasing number of applied-for and granted patents. However, the effects of information technology extend even further. In fact, in conjunction with the development of communications technology, information technology has affected all of society. It has changed the way information is acquired and transferred, improving productivity at home and in the workplace. It has also created new ways of reaching a larger customer base than was previously accessible. In particular, the expansion and vast utilization of the Internet have facilitated the flow of information[83]. The development of the ICT sector has led the way towards a new, information economy.

(ii) Intangible Assets Become Vital

The information economy is more knowledge-based than the old industrial economy that was, to a large extent, driven by economies of scale[84]. The importance of intangible assets such as knowledge, competence and intellectual property (IP) weighed against tangible assets such as factories and manufacturing capabilities has increased.[85] As a consequence, strategies for preventing others from stealing and imitating these companies 'key assets have become more important. Contracts and intellectual property rights (IRRs), including patents, copyrights, models, trademarks and trade secrets, combined with various technical means such as access control, can be utilized in this connection. In fact, IPRs establish competitive markets for information and knowledge goods[86].

Because the importance of intellectual property in relation to companies 'other resources has increased, the IP markets have also become more vibrant. As understood in this paper, intellectual property incorporates inventions, discoveries, know-how, processes, methods, copyrightable works, original data, and other creative or artistic products that can somehow be legally protected. It also includes the physical embodiment of intellectual effort, such as models, machines, devices, designs, apparatus, circuits, computer programs and records of research.[87] However, the practical dilemma with most intangibles is that they do not fit well into tangible world concepts and business structures. This has created uncertainty in business, one reason being that the mechanisms for IP valuation are still undeveloped and companies have not had a credible way of determining the value of these intangibles to themselves, to buyers and to investors. Unlike tangible property, intellectual property has value only in context and has not only one but multiple value chains. Patents for instance can have value derived from excluding competitors, licensing, and access to use external technologies at the same time.[88] This stems from their nature as knowledge goods: if someone learns about an invention, he or she is able to apply that knowledge, and this use does not diminish the ability of others to utilize the same invention. Its use is non-rival just as the use of information goods such as software and entertainment products stored in digital form.[89] In particular, the software industry, in which returns on R&D investments and

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[83] OECD, at 15 (2004).

[84] Shapiro & Varian, at 173 (1999).

[85] Teece, at 3 (2000).

[86] Ullrich, at 375 (2001).

[87] Southern Illinois University Carbondale, Office of Research Development and Administration (ORDA), *Glossary of Research terms* <http://www.siu.edu/orda/general/glossary.html> (last visited 5/25/05).

[88] Patrick H. Sullivan (ICMG), *The Valuation Paradox* (IP Society, *Advanced Topics in IP Valuation Seminar*, Palo Alto, 13 July 2004).

[89] Suzanne Scotchmer, *Innovation and Incentives*, at 31 (MIT Press 2004); FTC, at Chapter 1, 5 (2003).

in many cases the entire market structure are influenced by the ownership of intellectual property rather than tangible property,[90] is therefore seeking its place among "traditional" industries. Another special characteristic of software is that its replication, storage, and distribution are very inexpensive compared to its creation costs[91].

IPRs enhance IP tradability by giving it a form, a defined right that can be transferred. Indeed, patents have emerged as a very important intellectual asset management tool utilized in the pursuit of profit enhancement through IP sales[92]. Trading function has recently been highlighted even more strongly due to the changes in the internationalizing innovation environment. The production of tangible goods is increasingly moved to the developing countries while their IPR components are produced in the developed world[93]. Moreover, many companies no longer rely only on their own resources and capabilities in producing new innovations, and have moved towards a more open approach. Nowadays, a firm has to be able to take advantage of useful ideas that are produced outside in order to be successful.[94] In-house R&D is not enough to bring competitive advantage in today's dynamic business environment. Collaboration between various companies has become increasingly essential as a result of the technological complexity of products and processes, rapid technological change, more intense competition, and higher costs and risks associated with innovation. In addition, companies have become more specialized, and therefore, given the typically systemic nature of innovations in the ICT industry, are often forced to acquire complementary technologies from other firms. The interoperability of products and processes is also of essence. In fact, developments in innovation processes have enhanced technology and patent licensing.[95] However, as collaboration between potential or actual competitors increases, in the form of standardization for example, antitrust and competition law problems may emerge.

(iii) The Digital Marketplace Challenges Operational Models

The Internet became the dominant design of networking in the late 1990s changing the competitive environment within the ICT sector[96]. For instance, a shift from product to process innovation, *i.e.* improvement, differentiation and applications of the technology, has taken place in certain fields: Internet protocol is used today as a basis for most applications in telecommunications[97], and operators in particular are facing challenges due to the evolution from circuit-switched service delivery infrastructure to packet-switched all-IP[98] infrastructure that is low-cost and available for everyone. This has diminished operators 'role and forced them to search for new earnings capabilities from mobile and content services

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[90] Graham & Mowery, at 219 (2003).

[91] Messerschmitt & Szyperski, at 20 (2003).

[92] Vortonas, at 32 (2003).

[93] GRAIN, *One Global Patent System? WIPO's Substantive Patent Law Treaty* (October 2003) <http://www.grain.org/briefings_files/wipo-splt-2003-en.pdf> (last visited 9/3/05).

[94] Chesbrough, at 155 (2003).

[95] OECD, at 15-16 (2004).

[96] Olli Martikainen, *All-IP Trends in Telecommunications*, at 1 (International Workshop NGNT, 2002) <http://saturn.acad.bg/bis/pdfs/01_doklad.pdf> (last visited 5/25/05).

[97] Martikainen, at 2-3 (2002).

[98] IP refers here to Internet protocol, not to intellectual property.

built on the open infrastructure.[99] The Internet has affected also the ways in which software is designed, architected, delivered and consumed service-orientation being the prevailing trend at many levels. For instance software distribution is converting, as the web-based "software as a service" -model is getting more attractive. Alongside perpetual licenses software can increasingly be subscribed.[100]

The expansion of the Internet has posed further challenges to ICT and other companies in their business strategies including the ways in which they exploit patents in this new environment. Just like the software industry in its early days, the Internet used to be a patent-free zone. By now, patents have become an essential part of e-commerce. Service sectors, such as banking, retailing, insurance, and telecom services are nowadays more active in applying for patent protection.[101]

Presumptions aired some years ago about the digital economy and the Internet as a marketplace suggest some reasons why patents have assumed importance in this environment. For example, Porter (2001) claimed that the Internet diminishes many traditional sources of competitive advantage: it makes it possible for buyers to have easy access to information about products and suppliers, which bolsters their bargaining power and intensifies price competition. In addition, the need for sales forces and for access to established distribution channels is not as critical on the Internet as it is in the conventional world, thus the Internet reduces barriers to entry. Then again, rivalry is intensified because the Internet is a wide, international marketplace and it brings more companies into competition.[102] In fact, based on price data collected on CDs and books sold through the Internet versus conventional retail outlets, Brynjolfsson and Smith (2003) found that Internet prices are 9% to 16% lower than prices in conventional outlets. However, adjustments in the prices of Internet retailers are more incremental than those of comparable conventional retailers.[103]

According to Porter (2001), new sources of competitive advantage, such as strong network effects[104] benefiting the first firm to capture the largest market share, and potentially high switching costs, did not prove valuable despite all predictions. This is not to say that network effects are not of relevance, but it is easier to switch from one supplier to another

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[99] Ericsson AB, *Evolution towards All-IP: the Service Layer* (White Paper 2005) <http://www.ericsson.com/products/white_papers_pdf/evolution.pdf> (last visited 5/25/05).

[100] Gavin Clarke, *IBM Pushes Software as a Service 'on Partners* (The Register, 27 May 2005) <http://www.theregister.co.uk/2005/05/27/ibm_saas_pw/> (last visited 6/7/05); Eric Knorr, Leon Erlanger & James R. Borck, *A Field Guide to Software as a Service* (InfoWorld, 18 April 2005) <http://www.infoworld.com/article/05/04/18/16FEsasdirect_1.html> (last visited 6/7/05).

[101] Stephen C. Glazier, *e-Patent Strategies: e-Commerce, the Internet, Telecom Services, and Business Methods (with Case Studies and Forecasts),* at 24 (LBI Law & Business Institute, Inc, 3rd edition, 2000).

[102] Michael E. Porter, *Strategy and the Internet,* at 66 (Harvard Business Review, March 2001, 63-68).

[103] Erik Brynjolfsson & Michael D. Smith, *Frictionless Commerce? A Comparison of Internet and Conventional Retailers,* at 563 (Management Science, Vol. 46, No. 4, April 2000, 563-585).

[104] Network effects arise when the value one user places on a product or service depends on how many other people are using it. Then again, if network effects are present and a system has attracted a lot of users, it is difficult for a user to switch to another system. It could be said that switching costs are high and that customers have been locked into a system. (Shapiro & Varian (1999)). Generally speaking, network effects, and thus also standards that allow others to add interoperable products and services to a system, are essential in the ICT sector. Standardization is discussed more comprehensively in the section on patent strategy.

on the Internet, and its openness makes it difficult for one company to enjoy their benefits.[105]

As certain traditional ways of achieving competitive advantage have not been applicable on the Internet, it has been necessary for companies to adjust their business strategies. To supplement new ways of gaining and maintaining competitive advantage, companies have become more interested in other applicable ways that make them stand out from their competitors. Combined with the ease of replicating business models in cyberspace, this explains the urge for patenting not just inventions relating to the underlying infrastructure and applications that allow the Internet to function, software, networks, designs, chips, routers, switches, user-interface and so on[106], or features of software products and software-implemented services, but also new ways of doing business on a more abstract level[107]. Same level of secrecy available in the conventional market place is not on hand on the Internet[108]. There have also been defensive reasons for filing more Internet-related patents as bricks-and-mortar companies have been going through their portfolios to see whether some of their patents are broad enough to cover Internet applications, thus allowing them to capture a share of the increase in e-commerce[109].

(iv) Open Licensing Models Attract ICT Firms 'Interest

Although patents have become paramount for protection, trade, co-operation and leverage purposes, firms may need to further amend their patent (and copyright) strategies in order to maintain their competitive advantage. Although many are keen on controlling the rights related to their products, processes and services, a proprietary model in which access to such innovations is restricted is not always viable or practical. The benefits of product compatibility and interoperability, and therefore also of open standards, are considerable, but companies should also be aware of the special characteristics and opportunities the Internet offers. The Internet is a highly interactive environment of sequential innovation: allowing a large number of subsequent creators and inventors to make improvements to an original work or technology instead of limiting access to it may add to its value.[110] Indeed, von Hippel has demonstrated in his recently published book "Democratizing Innovation" (2005) that due to continuing advances in computer and communication capabilities an increasing number of inventions is born among users of products and services including both individual consumers and companies. According to von Hippel neither companies nor legislators should ignore the potential of such, typically freely-revealed inventions and the societal welfare they produce[111]. Nowadays, user-networks and (virtual) communities

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[105] Porter, at 68 (2001).

[106] Rice (2003).

[107] Stephen C. Durant & Thomas C. Chuang, *E-Commerce Patents and Shifting Balances in Patent Law,* at 109 (IEEE Communications Magazine, July 2000, 106-110).

[108] OECD, at 15 (2004).

[109] Robert R. Kimball (RealNetworks Inc.), *General Counsel Roundtable – How Do E-Commerce Best Practices Evolve?* (Stanford Ecommerce Best Practices Conference, 25 June 2004).

[110] James Bessen, & Eric Maskin, *Intellectual Property on the Internet: What's Wrong with Conventional Wisdom* (Working Paper 2004) <www.researchoninnovation.org/iippap2.pdf> (last visited 6/21/05); *See also* Shy & Thisse (1999).

[111] Eric von Hippel, *Democratizing Innovation*, at 1-2 (The MIT Press 2005)

provide useful structures and tools for developing, distributing and testing innovations much faster and more effectively than manufacturers[112].

Innovation communities and individual users have played a central role in the area of software development from the start: before IBM's unbundling decision in the 1970s and the birth of the software industry, software, aside from that written by the computer companies themselves, was produced by the buyers of computers or by individuals for hire[113]. At the present day, the success of open-source software, the development of which no longer takes place only on the grassroots level but has penetrated the commercial world, has well-demonstrated that a proprietary model where software cannot be copied, modified, or distributed, source code is not available, and reverse engineering is forbidden, is not the only viable solution[114]. Indeed, this model has already affected commercial software licensing as various licensees disfavour the licensor keeping the source code secret, and for instance different types of shared and public source licenses have emerged[115]. A range of open-source licensing models, although based primarily on copyright protection but increasingly including patent clauses, support "freedom" of software by allowing licensees to run it for any purpose, to study how it works and to adapt it, to redistribute copies and to improve it and distribute the improved version both commercially and non-commercially.[116] Therefore, although the IP protection may be similar, the licensing terms in a variety of open-source licenses differ from those used in typical commercial software licenses. Because anyone can become an open source distributor and compete on price, business models based on open source software circle often around services, such as support and installation, and selling warranties. Of course dual licensing meaning that software is licensed under both open source and commercial license is an option.[117] Openness in licensing, the resulting access to various external technologies and particularly their commoditization tends to go hand in hand with service-oriented business models in which the technology itself is no longer the primary source of differentiation.

In addition to allowing free distribution and modification of software or other technologies, for that matter, there are strategic reasons why companies should not always react if their products are being used without authorization. When the network effects are potentially strong, the larger number of users, whether they are authorized or not, increases the utility of the particular product or service[118]. In any case, software inventions tend to have quick,

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[112] von Hippel, at 11 (2005).

[113] Chandler, at 121 (2001).

[114] *See e.g.* Lessig (2001).

[115] For instance Microsoft has created a shared-source program, which allows its customers to read and examine parts of the source code but does not allow the use of the code or its derivatives for commercial purposes. This way engineers are able to use the information to do practical things and design interfaces to Microsoft's products and to create programs that read and write Microsoft's data format, but they are not given the right to design competing products that would infringe Microsoft's copyrights or patents. Public source licenses go further allowing licensees to make copies, create derivative works, and distribute them as well as examine and interface. Royalties are, however, typically required if licensees wish to utilize the software for commercial purposes. (Lawrence Rosen, *Open Source Licensing, Software Freedom and Intellectual Property Law,* at 226-264 (Prentice Hall PTR 2004)).

[116] Rosen, at 2 (2004).

[117] Rosen, at 231-232 (2004). *See also* Weber, at 195-196 (2004).

[118] Shy & Thisse, at 186 (1999). *See also* Davis Lee, *Profiting from Innovations in Digital Information Goods* (in Dundar F. Kocaoglu & Timothy R. Anderson, *The Role of Intellectual Property Rights. Technology Management in the New Technology Era*, 2001, 471-480).

cheap and fairly straightforward post invention development cycle[119]. Furthermore, returns on investments in already established software products are oftentimes realized early on in the product/version lifecycle, making infringement at a later stage less detrimental. In sum, an even more open approach to innovation and technology diffusion than most companies are currently used to may turn out to be the winning strategy.

In general, most business developments are dictated by the markets and have little to do with the legal framework. However, the legal framework does encourage companies to adopt a certain model. Thus, by adapting patent and antitrust/competition regimes governments may be able to guide society's development in a desired direction. Given the widespread impact of ICT, it is essential that policy decisions do not deter further development of the industry. The ICT sector currently invests heavily in R&D and is highly innovative. In fact, ICT manufacturing industries accounted for more than a quarter of total R&D expenditure in manufacturing in most OECD countries in the year 2000.[120] It is to be expected, though, that technological development not only shifts within the industry but also slows down as the industry matures. Indeed, over the 1990s, average annual growth rates for R&D were already higher in services than in manufacturing[121]. The next phase following a service and content -based information economy has been claimed to be its industrialization meaning the automatization of software development and information production, for example[122]. In the meantime technological breakthroughs based on the enhanced product and system interoperability (wireless networks) are driving the industry evolution[123]. The following section addresses the question of the assumed efficacy of the patent system at different times.

C. CHANGES IN ACADEMIC, POLITICAL AND LEGAL THINKING

The patent regime should be able to adapt to developments in the technological and commercial sectors and to provide incentives to finance the development and commercialization of new products and processes at all times. Efficient protection is one element that is needed in order to do this[124] as patents have traditionally been considered as one of the main incentives for R&D[125]. Adapting what is eligible to be patented, patentability requirements, and patent term and breadth are prerequisites for balancing patent strength so that the optimal protection level can be achieved. Being able to issue preliminary and permanent injunctions, the amount of damages potentially issued, and exemptions to patent-holders' rights also contribute to their strength.[126] Antitrust laws (U.S) and competition

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119 Burk & Lemley, at 90 (2005).

120 *OECD Science, Technology and Industry Scoreboard 2003, Towards a Knowledge-Based Economy,* at A.4.3 (2003).

121 *Ibid.*

122 Olli Martikainen, *Innovaatioiden kolmas aalto* (TeliaSonera Finland Research Foundation, Award event, 4 April 2005).

123 Olli Martikainen, *Innovaatioiden kolmas aalto lisää yhteentoimivuutta* (Tiedosta-lehti 2/2005). <http://www.tieke.fi/tiedosta-lehti/?ARTICLE_NUM=14275> (last visited 9/7/05).

124 *See e.g.* European Commission, *Innovation Policy in Europe 2001*, at 22 (European Trend Chart on Innovation, Innovation Papers No. 17) <http://trendchart.cordis.lu/annualreports/innovation%20policy%20europe%202001%20en.pdf> (last visited 9/19/05); Richard C. Levin, Alvin K. Klevorick, Richard R. Nelson & Sidney G. Winter, *Appropriating the Returns from Industrial Research and Development,* at 783 (Cowles Foundation Paper 714, 1987, 783-820).

125 OECD, *Patents and Innovation in the International Context*, at 6 (OCDE/GD(97)210, Paris 1997).

126 OECD, at 10 (2004).

regulation (Europe) may also limit the possibilities of rights holders to benefit from their patent rights although the ultimate goals of both regulations are not contradictory: patents that have value mainly in the context of competition can be used as entry barriers, and as such their purpose is partially at odds with that of antitrust/competition laws. The U.S. antitrust regulation is based on the idea of ensuring that competition is free from cartels and the acquisition or maintenance of monopoly power by unacceptable means[127]. Similarly, European, both national and EU, competition regulations aim at encouraging competition and well-functioning market economy[128].

The following describes the trends in relation to the availability and strength of patents and their effects on innovation. These trends flow from the anti-patent to the pro-patent era, and then move again towards a more skeptical view of the benefits of patent protection both generally and particularly in the contexts of software and business methods. It should be noted, that the term "strong patent protection" refers here to the combination of statutory requirements, patent office and court practices and thus to the overall intensity of the legal protection. It does not refer so much to the legal strength of a patent in an individual case. In court, for instance, a narrow patent is typically stronger than a broad patent, and those patents that have gone through a thorough prior art search or have been previously tested are stronger than those which have not. The term does not equal commercially valuable patents, either as this depends on the value of the protected subject matter and patent holder's resources. As the saying goes a weak patent[129] in strong hands is more powerful than a strong patent in weak hands. Furthermore, it does not refer to a strong, high quality patent system.

(i) The Pro-Patent Era: the Stronger the Better in All Fields of Technology and Business

In the 19th and the early 20th century the U.S. patent holders were able to engage in almost any activity regarding their patent rights without facing problems with the antitrust regime. These activities included patent pooling for the purpose of collectively restricting output and controlling prices, for instance. Indeed, in 1902 the Supreme Court laid out the general rule that there should be an absolute freedom to use or sale patent rights under the U.S. patent laws the object of which was monopoly. However, the pro-patent era was followed by an anti-patent era during which series of court decisions eroded the permissive attitude towards restrictive practices.[130]

The change from the anti-patent era back towards the pro-patent era took place in the U.S. in the mid-80s due to concerns about industrial stagnation and the lack of technological innovation[131]. It was assumed that stronger patents would encourage more innovation in all fields of technology (and apparently even business): a patent grants the inventor the right to exclude others from utilizing the invention for a certain period of time, thus allowing him or

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127 Robert Pitofsky, *Challenges of the New Economy: Issues at the Intersection of Antitrust and Intellectual Property* (American Antitrust Institute Conference: An Agenda for Antitrust in the 21st Century, National Press Club, Washington, D.C. 15 June 2000).

128 Mikko Alkio & Christian Wik, *Kilpailuoikeus*, at 7 (Talentum 2004).

129 Weak patent refers here to a patent that is likely to be unenforceable in court.

130 Jaffe & Lerner, at 96-97 (2004).

131 FTC, at Chapter 1, 18 (2003). *See also* Robert Hunt, *Patent Reform: A Mixed Blessing For the U.S. Economy?,* at 16 (Federal Reserve Bank of Philadelphia, Business Review, November/December 1999, 15-22).

her to recoup the initial R&D investments and to gain a reasonable return.[132] This may happen if the inventor commercializes the invention personally, or transfers the patent rights to someone who is in a better position to introduce the invention onto the market[133]. On this basis, it could be argued that the stronger the patent, the better the possibilities of recovering investments, and the more stimulus there is to invest in R&D.

What happened at the hands-on level in the U.S. was that the Court of Appeal for the Federal Circuit (CAFC) was established in 1982, which unified and strengthened patent rights also at the District Court levels.[134] The CAFC resorted to a great extent to the doctrine of equivalents and expanded the average patent scope. Furthermore, it was, and still is, willing to sustain large damage awards and to grant preliminary injunctive relief to patentees.[135] It has become also easier to fulfill the non-obviousness requirement due to the weight given to secondary considerations such as commercial success[136], and common-law exceptions to patent-holders 'rights have been interpreted narrowly. In the recent Madey v. Duke University case (2002), the Federal Circuit came to the conclusion that research projects advance institutions' legitimate business objectives, including educating and enlightening the students and the faculty participating in these projects. Consequently, experimental use doctrine, which is limited to actions performed "for amusement, to satisfy idle curiosity, or for strict philosophical inquiry", could not be used in defense of patent infringement.[137]

Although the attitude in Europe never was quite as anti-patentee as in the U.S, Europe has experienced a shift towards pro-patent atmosphere too. According to Justice Jacob (2001) IPRs seemed like a good thing in his early days as a barrister, and the more and stronger they were the better.[138] For the most part, strengthening has, however, taken place via harmonization of national laws and the establishment of centralized examination systems[139]. The Council Regulation (EEC) on the creation of a supplementary protection certificate for medical products (1768/92) could be mentioned as one clear example. TRIPS, which is the most significant agreement on IPRs in the 20th century, has also played a role in this respect, although its effects have been most visible in the developing countries. Furthermore, attention has recently been devoted to patent holders' insufficient possibilities to enforce their rights within Europe. Indeed, the European Union has introduced an enforcement-directive (2004/48/EC) aimed at harmonizing the IPR sanction system within the common market[140]. Moreover, it has put the question of community patents on the table again. The purpose is to make it cheaper and easier to protect new inventions in all EU member states, and to avoid the expense, inconvenience and confusion that can occur when judgments in several different national courts are required. According to the proposal, the European

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132 Nancy T. Gallini, *The Economics of Patents: Lessons from Recent U.S. Patent Reform*, at 131 (Journal of Economic Perspectives, Vol 16, number 2, Spring 2002, 131-154).

133 Granstrand, at 83 (1999).

134 Hall & Ham Ziedonis, at 101 (2001).

135 Samuel Kortum & Josh Lerner, *What is Behind the recent Surge in Patenting?,* at 6 (Research Policy 28, 1999, 1-22); Robert P. Merges & John F. Duffy, *Patent Law and Policy: Cases and Materials*, at 11 (LexisNexis, 3rd edition, 2002).

136 Jaffe & Lerner, at 119-123 (2004); Hunt, at 20 (1999).

137 Madey v. Duke University 64 USPQ2d 1737 (Fed. Cir. 2002).

138 Jacob, at 416 (2001).

139 OECD, at 17-18 (2004).

140 More about the enforcement directive, *see e.g.* Marcus Norrgård, *Immaterialrättens sanktionssystem och Enforcement-directivet* (NIR, Number 5, Edition 73, 2004, 444-468).

Patent Office would have the authority to grant community patents, and it would be possible to enforce these patents in a single Community Patent Court.[141] Despite the efforts, consensus on the Community Patent Act, the claim translation and its binding effect in particular, has yet to be reached.[142] Another litigation centric agreement that has been under discussion in Europe is the European Patent Litigation Agreement (EPLA). The agreement suggests that a European Patent Court should be established. This Court would have jurisdiction to deal with infringement and revocation actions regarding "European"[143] patents.[144]

In connection with the general pro-patent shift, the scope of patentable subject matter has become wider within the last 20 years. This has taken place in both the U.S. and Europe, and it has been a consequence rather than a prerequisite, of both bio-industrial[145] and information technology revolutions.

In the field of biotechnology, once the breakthroughs in molecular biology had taken place, multinational companies started to seek new commercialization opportunities, and wanted the patent system to deliver them the kind of returns it had in chemical technology[146]. Ultimately, the U.S. Supreme Court confirmed in its Diamond v. Chakrabarty (1980) ruling that living things do not fall to the category of non-patentable subject-matter, *i.e.* laws of nature, physical phenomena and abstract ideas, and so they can be patented[147]. Furthermore, the Harvard OncoMouse patent (1988) extended the patentable life-forms from bacteria to higher level organisms, and in the 1980s gene fragments, markers and a range of intermediate techniques and other inputs relevant to drug discovery and commercialization became patentable[148]. In Europe the patentability of biotechnological inventions such as plants, animals, micro-organisms, genes and tools and processes for their production has involved three hurdles all of which the European Patent Office has interpreted narrowly: 1) mere discoveries (EPC Art. 52), 2) inventions whose publishing or exploitation is contrary to "ordre public" or morality (EPC, Art. 53), and 3) plant or animal varieties or essentially biological, but not microbiological, processes for their production (EPC Art. 53) are excluded from patentability[149]. Also the EU has taken action in this highly controversial, but at the same time one of the most promising business sectors. After ten years of discussions,

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141 Commission of the European Communities (EC), *Proposal for a Council Regulation on Community Patents* (COM(2000) 412 final, 2000/017 (CNS), Brussels, 1 August 2000).

142 *See e.g.* European Commission Press Releases, *Industrial Property: Commission Proposes Establishing Community Patent Court,* IP/04/137, (Brussels, 2 February 2004). <http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/04/137&format=HTML&aged=0&language=EN&guiLanguage=en> (last visited 6/21/05); Winfried Tilmann, *Community Patent and European Patent Litigation Agreement* (EIPR, Vol 27, Issue 2, February 2005, 65-67).

143 Patents granted by the EPO.

144 European Patent Office (EPO), *Legislative Initiatives in European Patent Law, EPLA –European Patent Litigation Agreement,* <http://patlaw-reform.european-patent-office.org/epla/> (last visited 9/3/05).

145 Drahos & Braithwaite, at 155 (2002).

146 Drahos & Braithwaite, at 155 (2002).

147 CIPR, at 111 (2002).

148 John P. Walsh, Ashish Arora & Wesley M. Cohen, *Effects of Research Tool Patents and Licensing on Biomedical Innovation* at 290 (in Wesley M. Cohen and Steven Merrill (eds.) *Patents in the Knowledge-Based Economy* (National Academy Press, Washington, D.C. 2003, 285-340).

149 Guy Tritton, Richard Davis, Michael Edenborough, James Graham, Simon Malynicz & Ashley Roughton, *Intellectual Property in Europe,* at 109 (Sweet & Maxwell, 2nd edition, 2002).

it introduced the Directive on the legal protection of biotechnological inventions (98/44/EC) in 1998.[150] The directive was largely based on the EPO practice[151].

Even though EPO practice has diluted the scope of the previously mentioned exclusions little by little[152], Europe has maintained a stricter policy than that adopted in the U.S. While it is possible to patent all kinds of transgenetic animals in the U.S., for instance, it is required in Europe that the technical feasibility of the invention is not confined to a particular animal variety[153]. The line between patentable and non-patentable subject-matter is difficult to draw, though, and this area is dynamic and both economically and ethically problematic. Patenting "life" has caused considerable anxiety among the general public, environmental and animal organizations. Also scholars are concerned over these patents' effects on further innovation.[154]

In regard to the other new types of patentable inventions, especially in the U.S., the possibility of granting both software and pure business-method patents has led to difficulties in assessing their patentability. The non-obviousness standard in particular has created practical problems resulting in a huge number of patents that are likely to be judged invalid if challenged.[155] Widespread critique from academia, practitioners and firms has resulted[156]. The general claim is that patent protection, especially in its current form, deters rather than accelerates innovation in fields such as the software industry.[157] Actually, it has become easier to be awarded with a patent also more generally as the patent examiners 'workload has unreasonably increased as more and more patent applications are filed. Indeed, although Congress changed the structure of fees and financing of the patent office turning it into a revenue-based agency in the early 1990s, the revenues earned are not spend for the benefit of the patent office. Congress pulls out a large share from the patent office revenue and diverts it to the general fund of the government. Over the eight year period from 1994 to 2002 this amount totaled one billion dollars.[158]

Although, also the European Patent Office and other national patent offices have been granting patents on software-related inventions for over a decade, the question whether software and business methods should be patentable at all is still a somewhat controversial subject in Europe, where the EU software patent directive proposal was under discussion

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150 Commission of the European Communities (EC), *Report from the Commission to the European Parliament and the Council, Development and Implications of Patent Law in the Field of Biotechnology and Genetic Engineering,* at 4 (COM(2002) 545 final, Brussels, 7 October 2002).

151 Tritton, Davis, Edenborough, Graham, Malynicz & Roughton, at 109 (2002).

152 CIPR, at 115 (2002).

153 European Patent Office (EPO), *Guidelines for Examination*, at Part C, Chapter IV, 2a.2 (June 2005).

154 CIPR, at. 112, 115 (2002); Tritton, Davis, Edenborough, Graham, Malynicz & Roughton, at 108 (2002). For further information on biotechnology patent developments *see e.g.* Drahos & Braithwaite, at 155-162 (2002).

155 Gregory Aharonian, *Does the Patent Office Respect the Software Community?* (IEEE Software July/August 1999, 87-89).

156 *See e.g.* Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform* (Berkeley Technology Law Journal, Volume 14, 1999); Lawrence Lessig, *The Problem With Patents* (The Standard, 23 April 1999). A list of articles criticizing software and business-method patents is to be found, for example, at www.bustpatents.com.

157 *See e.g.* Bessen & Hunt (2004); Cohen & Lemley (2001); Bronwyn H. Hall, *Business Method Patents, Innovation, and Policy* (NBER Working Paper Series, No 9717, May 2003), <http://papers.nber.org/papers/w9717.pdf> (last visited 6/21/05); Sylvain Perchaud, *Software Patents and Innovation* (JILT (1) 2003) <http://elj.warwick.ac.uk/jilt/03-1/perchaud.html> (last visited 6/21/05).

158 Jaffe & Lerner, at 2 (2004); Malone, at 25 (2002).

for several years until the parliament rejected it on 6 July 2005[159]. In this context the U.S. experience and the critique of software and business method patents created interesting twists. The anti-patent discussion has not seized, however, and although it may not have much influence, it is likely to continue as long as the *status quo* persists. One of the arguments favoring the current EPO practice and even broader interpretation is the claim that Europe would violate the TRIPS agreement if it placed constraints on the patentability of computer programs or business methods[160]. The argument that all fields of technology should be treated equally when it comes to the availability of patent protection is based on the TRIPS agreement, and in particular on Article 27. Although it is relatively easy to argue that if the business method forms the core of an invention it does not fall into any field of technology, the distinction can sometimes be difficult to make. The Substantive Patent Law Treaty (SPLT) that is currently prepared by the WIPO may also add pressure to settling the question over patentable subject-matter in the near future.

(ii) Academic Unease: the Stronger Is Not Always the Better, and the Effects of Protection Vary

Although political and legal trends have been towards internationally strong patent protection in all fields of technology, there are serious doubts about the benefits in academia and among the general public. It may be true that strong protection is required in fields in which research and development costs and risks are high and end results are easy to imitate. However, in areas in which early investments are low, the industry develops rapidly, and product cycles are short, preventing others from manufacturing the same or comparable products or using a process without investing the same amount of money in R&D is not that critical. For example, lead-time, secrecy, copyright protection, advance on the learning curve, technological complexity and/or control of complementary assets may very well be enough in terms of making a profit. In fact, according to the results of Cohen, Nelson and Walsh's (2000) empirical research, patents have fairly minimal significance as protection measures, especially in complex industries such as semiconductors. They were nevertheless found to be more important in industries such as pharmaceuticals, chemicals, medical equipment and to some extent in machinery, auto parts and computers. There is a difference between industries in which one patent covers one product and those in which one product involves multiple patented inventions.[161]

Both product and process types, those covered by only one patent and those that may incorporate multiple patented inventions, exist in the ICT industry, but software typically belongs to the latter category. Then again, although firms invest heavily in software development, and software is easy to copy, the manufacturers also benefit from manufacturing costs that are close to zero. Indeed, the costs of writing and manufacturing computer programs are low in relation to the fixed development costs in many other industries[162]. Moreover, if the Internet is utilized as a distribution channel, the distribution costs are minimal too. Thus, patents may not be necessary for protecting profits that may

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159 Rocard (2005).

160 *See e.g.* Merges & Duffy, at 174 (2002); Daniele Schiuma, *TRIPS and Exclusion of Software "as Such" from Patentability* (IIC Vol 31, No 1/2000).

161 Cohen, Nelson & Walsh, at 9 (2000); *See also*, Levin, Klevorick, Nelson & Winter (1987); Edwin Mansfield, *Intellectual Property Rights, Technological Change, and Economic Growth* (in Charles Walker & Mark A. Bloomfield, *Intellectual Property Rights and Capital Formation in the Next Decade,* New York, University Press of America, 1988, 221-244).

162 Burk & Lemley, at 90 (2005).

accrue from the commercialization or sale of software-related innovations. However, it is not only a question of protection: patents often serve other essential purposes, the weight of which varies between industries.[163]

Regardless of whether patents are essential for protecting the revenues that accrue from commercializing new technologies in a certain field, ICT companies certainly utilize the system, and the strength of patents should be fine-tuned so as to encourage innovation. In order to achieve the best results, all the factors affecting patent strength, including patentability criteria, scope, and duration, should be balanced correctly. The first step is to determine whether the current system works or not. Here attention has traditionally been focused on R&D investments as if more would automatically mean the generation and commercialization of more inventions, in other words the production of innovations. The emphasis has been also on licensing and the role of patent disclosures. Encouraging innovation while at the same time potentially reducing competition are not by all means the only effects patents may or may not have on the economy, however. On an international level, the OECD's report, "Patents and Innovation: Trends and Policy Challenges" (2004), is an example of research that recognizes the complexity surrounding their positive and negative effects. The report points out that the traditional view of patents as a trade-off between the positive effects on innovation and the negative effects on competition and technology diffusion, in the sense that others are not free to utilize patented inventions, is incorrect. Patents can either encourage or deter innovation, technology diffusion and competition depending on certain conditions and particular features of the patent regime.[164]

If we focus on the relation between patents and R&D investments, and the patent-protection model is applied to a single, isolated invention, it is true that stronger patents will most likely bring about more R&D investments. Indeed, the patent system fits best to a model where the developed and potentially commercialized product is the discrete outcome of a linear research process[165]. However, according to the prevailing economic literature, particularly in fields of technology in which innovation is cumulative, occurs rapidly, and technology is complex, strong rights may do more harm than good[166]. Cumulativeness in the innovation context means that new innovations build upon previous ones. Thus, the most important benefit of the innovation may be the boost it gives to later innovators.[167] Software, for example, typically consists of previously coded software, which is then modified and to which new code is added the larger system composing then of various components. It is rare to write programs entirely from scratch.[168] Research tool patenting has raised similar concerns[169]. The challenge in designing the optimal patent policy for industries with high degree of cumulativeness is to make sure that earlier innovators are

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163 Cohen, Nelson & Walsh, at 4, 30 (2000).

164 OECD, at 9-10 (2004).

165 CIPR, at 112 (2002).

166 Adam J. Jaffe, *The U.S. Patent System in Transition: Policy Innovation and the Innovation Process*, at 24-25 (NBER Working Paper No. W7280, August 1999); *See also* Hunt (1999); Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law* (Journal of Economic Perspectives 5(1), 1991, 29-41); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope* (Columbia Law Review 90(4), 1990, 839-916).

167 Scotchmer, at 127 (2004).

168 *See e.g.* Cohen & Lemley, at 41 (2001).

169 Walsh, Arora & Cohen, at 290 (2003).

compensated for their contributors, while ensuring that later innovators also have an incentive to invest[170].

There is empirical evidence suggesting that patents may, in fact, reduce R&D investments in certain fields. For example, Bessen and Hunt (2004) found that software patents have substituted R&D rather than complemented it. They argue that large manufacturing firms, in particular, have started to employ aggressive patent-portfolio strategies, which have resulted in patent thickets. Since multiple patented inventions may be involved in one innovation, companies willing to manufacture a product are often forced to license or cross-license patents from other companies. Consequently more money is directed to strategic patenting.[171] In this environment, as Bessen (2003) pointed out, patents may also function as a way of gaining access to other companies 'R&D pools. This, in turn, may diminish their and other companies 'willingness to invest in R&D.[172] Similarly, Hall and Ham Ziedonis (2001) found that, although the strengthening of patent rights did partly result in enhanced patenting activity in semiconductors, it did not bring about more R&D investments. The increase in patenting was rather a consequence of managerial improvements: companies were harvesting more patents out of their R&D activities and building large patent portfolios in order to reduce hold-up problems caused by external patent holders. Strategic patenting can thus redirect resources away from productive research.[173] Hold-up problem, also called anticommons, means that a third party patent covering a certain feature, a single routine in a computer program, for example, may hold-up the production of the entire program[174]. In the worst case the fact that many companies and/or individuals may have the right to block others from using a resource results in a reluctance to innovate[175].

The goal of the patent system to promote innovation also includes the facilitation of technology diffusion. This can take place in two ways: through invention disclosure, and technology and patent licensing. Both means are integrated into the patent system. Disclosing inventions is the underlying goal, and this comes automatically with the bargain. Patents are public documents, and the claimed invention must be disclosed in a detailed manner. The idea is that anyone can potentially learn from a patented invention, develop it further or utilize it after the patent expires.[176] A further hope is that disclosure will direct technological development to fields not crowded with patents, and thus reduce research duplication[177]. However, doubts have been raised not only about the system's ability to induce more R&D investments, but also about its ability to fulfill the mission of enhancing public knowledge. If it is to work as it is supposed to, it should be able to provide valuable and up-to-date information and encourage people to read the documents. This does not happen if the technology described in them is already outdated when the information is

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170 Scotchmer, at 127 (2004).

171 Bessen & Hunt (2004)

172 Bessen (2003).

173 Hall & Ham Ziedonis, at 122, 125 (2001).

174 FTC, at Chapter 3, 53 (2003).

175 Michael A. Heller, *The Tragedy of Anticommons: Property in the Transition from Marx to Markets* (Harvard Law Review 111, 1998, 621-688).

176 OECD, at 7 (1997); Koktvedgaard & Levin, at 197 (2002); Gallini, at 139 (2002).

177 Haarmann, at 98 (2001); Gallini, at 139 (2002); William M. Landes & Richard A. Posner, *The Economic Structure of Intellectual Property Law*, at 295 (The Belknap Press, Harvard University Press 2003).

published, or when prior knowledge of a patent leads to the risk of treble damages in patent-infringement litigation, as is currently the case in the U.S.[178]

The scope of the patent determines the pioneer inventor's bargaining power in terms of further development[179]. Hence, overly broad patents may unnecessarily hamper further innovation. On the other hand, strong legal rights to exclude others may provide economic incentives to license these rights and thus facilitate technology transfer. This can occur in the form of technology and patent licensing, cross-licensing and patent pools.[180] Hence, although strong patents may reduce R&D investments, they may promote innovativeness by making technology transfer easier. The above claim that software patents diminish companies 'willingness to invest in R&D by facilitating access to other companies 'resource pools may, in fact, benefit society. As mentioned earlier, a company's ability to acquire external IP resources has become vital in today's dynamic, fast-evolving and international business environment. Firms that do not have any internal R&D but rely entirely on external technologies have also appeared. Nevertheless, the extent to which licensing and cross-licensing are actually beneficial and advance the commercialization of new products and processes, and how far they serve defensive purposes in terms of paying innovation tax, which has nothing to do with technology transfer, remains open to question.

As mentioned above patents that are means for competition may sometimes even advance it. They may be pro-competitive because they may direct technological development to new areas that are not crowded with patents[181], and have a positive effect on market entry and firm creation in facilitating the raising of capital.[182] Moreover, licensing is generally regarded as pro-competitive, and it has been suggested that even defensive licensing could be pro-competitive as it removes obstacles to the development and exploitation of the licensee's own technology[183], and thus eases the problem of anticommons typical in areas such as semiconductors, biotechnology, computer software and the Internet[184]. On the other hand, it has been claimed that if powerful incumbents insist on trading like-for-like in licensing arrangements, firms with modest or negligible patent holdings may be barred from entry[185]. Furthermore, if firms become confident that they have the access to a wide pool of technology from many cross-licensing partners, they may not feel as intense pressure to develop new technologies themselves, which may result in less competition[186].

In sum, patent economics has turned out to be extremely complex. In the end, it is often impossible to determine whether patents in general, or in some technological fields such as ICT, are for the better or for the worse from the societal perspective. Although it is possible

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178 Gallini, at 139-140 (2002).

179 *See e.g.* James Bessen & Eric Maskin, *Sequential Innovation, Patents, and Imitation* (2002); OECD, at 10 (2004); Scotchmer, at 127 (2004).

180 Gallini, at 141-142 (2002).

181 Haarmann, at 92 (2001).

182 OECD, at 9 (2004).

183 Commission notice: *Guidelines on the Application of Article 81 of the EC Treaty to Technology Transfer Agreements* (Official Journal C 101 of 27 April 2004), <http://europa.eu.int/eur-lex/pri/en/oj/dat/2004/c_101/c_10120040427en00020042.pdf> (last visited 6/21/05).

184 Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting,* at 28 (March 2001), <http://faculty.haas.berkeley.edu/shapiro/thicket.pdf> (last visited 6/21/05).

185 Washington CORE, *Patent Strategies for Venture Firms: Experiences from the Uniter States,* at 12 (March 2003) <http://www.iip.or.jp/e/index.html> (last visited 6/21/05); Shapiro, at 16 (2001).

186 Jaffe & Lerner, at 61 (2004).

to identify some problems, more research is needed before fundamental changes to the patent system become a necessity. Moreover, there is a need to broaden the scope of research. Although business-method inventions can be patented in the U.S. with or without technological application, as the previously cited discussion demonstrates even U.S. economists seem to be restricted in their assessments to the traditional relationship between patents and *technological* innovation, although they should also be looking beyond, at patents' effects on *business innovations,* such as services, marketing and accounting methods. Although these inventions do not yet constitute a big number, this follows also a need to reassess the methodology many economics use: the investments made in marketing do not necessarily show up in R&D category.

On the whole, we are currently in a situation in which it is no longer assumed that stronger patents will automatically increase innovation. Academics have also taken notice of the increase in social welfare generated by user innovations, which are typically not patented due to practical reasons, such as high costs, but contributed to the commons of knowledge. Because these inventions are of growing importance, policy makers should ensure that legislation and regulations do not favor manufacturers at the expense of user-innovators.[187]

Another rising concern relates to patent protection in the developing countries. As the production of tangible goods is increasingly outsourced to the poor countries, strong patent protection has become essential for the rich[188]. While the WTO-governed TRIPS agreement already established certain standards for intellectual property protection throughout the world, discussions on the further harmonization of substantive patent law (SPLT) are in progress within WIPO. Although the developed countries would benefit if the developing countries representing the majority of WIPO countries aligned their laws with the provisions of the minority, this might obviously not be in their best interest[189]. One of the widely broadcasted issues has been the importation of patented AIDS medicines to South Africa, and the allegation that by allowing it South Africa breached the TRIPS agreement: The South African Medicines Act was argued to discriminate against pharmaceutical patents. Unfortunately, had the patent protection been recognized, the medicine prices would have been way too high for the people living in developing countries to afford. The accusations of TRIPS violation were dropped, but the problems in South Africa aroused a much broader discussion on access to medicines, and the link between R&D costs, patents and drug prices, and the argumentation reached even beyond—to the unequal distribution of control over intellectual property rights between the rich and the poor countries as well as the large and the small companies.[190] As regards to further developments regarding a truly international patent system, it has been hoped that the developing countries will be able to gather their lines and maintain their freedom to design appropriate IP policies[191]. For instance, the Commission on Intellectual Property Rights suggested in its report "Integrating Intellectual Property Rights and Development Policy" (2002) that developing countries should adopt much higher patentability standards and broader limitations of patent holder's rights than those currently provided in many developed countries[192].

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[187] Von Hippel, at 11-12 (2005).

[188] GRAIN (2003).

[189] CIPR, at 132 (2002).

[190] Drahos & Braithwaite, at 5-9 (2002).

[191] CIPR, at 133 (2002).

[192] It is suggested for instance that developing countries should exclude diagnostic, therapeutic and surgical methods for the treatment of humans and animals from patentability altogether. They should also exclude from patentability plants and animals, computer programs and business methods, avoid from patenting new

(iii) Towards More Limited Patent Protection: the Patent System Under Construction

The fact that patents may be used to limit access to essential drugs in developing countries is a highly ethical issue and as such something that developed countries can no longer turn their backs on[193]. Furthermore, the efficiency of the U.S. and European patent systems is under scrutiny also outside academia. By now, concerns about the real effects of patents on R&D expenditure, the diffusion of technology and competition in different technological fields have reached official forums and policymakers in both the U.S. and Europe.

The U.S. Federal Trade Commission (FTC) and the National Academy of Sciences (NAS) have both conducted research about the functioning of the U.S. patent system. The FTC report, "To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy", was published in October 2003, and the NAS published a more general report, "A Patent System for the 21st Century", in April 2004.

Both the FTC and the NAS reports were based on hearings at which business representatives from small and large companies, patent and antitrust organizations, practitioners and economists, as well as antitrust and patent law scholars, presented their views about the efficacy of the patent system. The business representatives were mainly from high-tech industries: pharmaceuticals, biotechnology, computer hardware and software, and the Internet.[194]

It is affirmed in the reports that, although there is not enough evidence to declare that the patent system does not fulfill its underlying goal, especially due to the so-called questionable patents that are typical in new technological fields, the U.S. patent system is not working as it is supposed to: questionable patents increase the hold-up problem and may therefore unduly deter market entry and follow-on innovation. They also increase the cost to businesses in the form of unjustified licensing fees and royalties and potentially high litigation costs. Taken as a whole, dealing with large numbers of patents that do not fulfill the patentability requirements wastes everyone's resources and ultimately harms consumers. Furthermore, advance knowledge about patents that may be granted in the future is needed in order to improve predictability in business. The willingness to read patents should also be encouraged so that the system could work as it is supposed to, and the legal uncertainty in patent disputes should be reduced.[195]

The two reports call for certain modifications to the U.S. patent system. The suggested changes include: 1) introducing a new administrative procedure, which would allow post-grant review and opposition to patents, thus making it easier to dispute the granting of a patent without going to court; 2) implementing a more considered application of the obviousness standard to allow for implicit knowledge to be taken into account in decisions regarding non-obviousness; 3) providing adequate funding for the Patent and Trademark

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uses of known products, plant varieties and genetic material, provide international exhaustion of rights, an effective compulsory licensing system, and broadest possible exceptions to patent rights, apply strict standards of novelty, inventive step and industrial application, and implement a low cost opposition or re-examination procedure. (CIPR, at 122 (2002)).

193 Drahos & Braithwaite, at 8 (2002).

194 FTC, at Executive Summary, 3-4 (2003); NAS, at 8 (2004).

195 FTC (2003); NAS (2004).

Office and changing some of its procedures so that it would be better able to determine whether a patent should be granted or not; 4) publishing all patent applications within 18 months in order to improve predictability in business, and increase incentives to read patents; 5) making it easier to show that a patent is invalid so that there would only be a need for a "preponderance of evidence" rather than "clear and convincing evidence"; and 6) giving up treble damages altogether, or adjusting the standard so that it would require written notice of infringement from the patentee or deliberate copying of the invention.[196]

It has been difficult for legislators to ignore official organization such as the FTC in conjunction with the NAS and academics calling for patent reform. Indeed, multiple bills proposing patent law amendments have been introduced to the Congress during the last five years. The latest proposition, the Patent Reform Act of 2005 (HR2795), is currently pending in Congress. The suggested changes reflect the urge to make the U.S. system more efficient and to bring it closer to patent standards adopted in the rest of the industrialized world. The most fundamental changes include the adoption of a first-to-file system, and the implementation of a post-grant opposition period. Moreover, raising the burden of proof and limiting the grounds of finding willfulness in patent infringement cases, including limits on the rules for calculating damages, removing the presumption of irreparable harm making it more difficult to obtain an injunction against an accused infringer, and shifting the responsibility for handling allegations concerning improper conduct before the USPTO from the Courts to the Patent Office have been suggested.[197]

It is hard to say, whether the proposed amendments will ultimately make it through Congress and become law. In fact, I believe that the factual implementation of the propositions presented in the Patent Reform Act of 2005, other bills introduced over the years, the reports and studies such as Jaffe and Lerner's book "Innovation and Its Discontents" (2004) will most likely require some more thought and research. The most severe criticism of the suggestions seems to be that they were driven by problems in certain fields such as information technology, business methods and biotechnology: if implemented, all patents would turn out to be much weaker. As a result, the balance would also change in fields in which patents work well in their current form. Then again, although economists have come to the conclusion that one size does not fit all[198], alternative field-specific legislation would create new problems, including defining so-called software patents. As has been noticed in Europe, where computer programs "as such" are not patentable, creating limits is not an easy task. Software is pervasive and an essential part of most industrial processes. Moreover, as industries develop further, the business environment changes, as do the importance and effects of patents. Field-specific legislation might therefore quickly become outdated. In fact, even without field-specific legislation it is possible to apply patent law so that it supports the economic functioning of the patent system. Standards such as the "person skilled in the art" used when assessing novelty, non-obviousness and patent scope are flexible and have been designed with a view to balancing and acknowledging the rationale of the patent system[199].

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196 FTC (2003); NAS (2004).

197 *See e.g.* Roland H. Schwillinski & Benjamin Hershkowitz, *Are Major Changes in Store for the U.S. Patent System?* (IPFrontline.com, 4 November 2005), <http://www.ipfrontline.com/depts/article.asp?id=6969&deptid=8> (last visited 11/12/05).

198 *See e.g.* Scotchmer, at 117 (2004).

199 It has been stated for instance in the preparatory works of Nordic patent legislation that the inventive step assessment should correspond to the pace of technological development in a certain field so that innovation would indeed be stimulated. This means that the standard should be higher in a field that develops fast than in a field developing slowly. (*Betenkning angående nordisk patentlovutgivning*, NU 1963:6, at 126-127) Some elements,

Nevertheless, as doubts about the efficacy of the system have been officially recognized, and not just among scholars, the trend towards stronger and stronger patent rights appears to be slowly changing its course. The U.S. Congress has already taken some concrete steps in this direction. It has reformed the patent law regarding prior-user rights of business-method inventions, and under the American Inventors Protection Act most patents become now public after only 18 months from filing. Applicants are granted an exception, however, if they declare that they have no intention of filing the application in a foreign jurisdiction that would require 18-month publication. Moreover, the Federal Circuit has commenced favoring the literal claim interpretation instead of applying the doctrine of equivalents in the context of patent-scope assessment,[200] although in the recent Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co. case, which ended up before the Supreme Court, the Supreme Court did not accept the Federal Circuit's strict interpretation that there would be an absolute bar on invocation of the doctrine of equivalents if a patent had been amended in any manner during its prosecution (file wrapper estoppel). Even so, the Supreme Court did confirm certain limits to the application of the doctrine.[201] Then again, at the USPTO level, new guidelines that raise the utility barrier for gene patents have been issued, for example[202].

Although some amendments to U.S. patent law have already been made and more are under discussion, the reality still is that U.S. courts are patent-minded and there is a very strong presumption that a patent that has been granted by the patent office is valid[203]. The notion of correlation between a product and a patent seem also to be prevailing and affecting the reasoning in courts, although the economics in these cases differ fundamentally from the situation in which one product involves multiple patented inventions that may be used in various products.

In Europe, the atmosphere was never as anti-patentee as it was in the U.S., and the strengthening of the patent system has certainly been about broadening the scope of patentable subject matter, but not so much about widening patent-holders 'rights, raising the damage level or granting more temporary or permanent injunctions although some of that has taken place on national levels. In Finland, for instance, courts appear to be granting more temporary injunctions than previously. Considered as a whole, the change in Europe has rather focused on simplifying application and enforcement procedures. Moreover, many of the adjustments that the Patent Reform Act of 2005 contains and FTC and the NAS recommended for the U.S., including post-grant review and publishing patent applications within 18 months, are already rooted in the European patent system. Compared to the U.S. patent office (USPTO) the European patent office (EPO) has also nearly twice the manpower to examine each patent application[204]. Furthermore, patent-holders 'rights, as well

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such as the time-factor (time needed for coming up with the solution to a certain problem), that can be taken into consideration when assessing inventiveness incorporate this idea in practice. (Lennart Törnroth, *Datorprogram och patentskydd – utvecklingen av svensk rättspraxis i belysning av främst EPO-praxis,* at 97 (NIR, Vol. 68, No. 1, 1999, 86-98)).

200 Durant & Chuang, at 109-110 (2000).

201 *See e.g.* Karly Stoehr, *Patent Pending... Pending... Pending, The Evolution of Equivalents: Festo Corp. v. Shoketsu Kinzoku Kabushiki Co.* (Computer Law Review and Technology Journal, Vol VII, 2003, 321-329).

202 CIPR, at 127 (2002).

203 For instance, Jaffe and Lerner argue that the number of jury verdicts on patent cases has increased, and juries tend to be excessively sympathetic to patent holders, as it is psychologically difficult for them to overrule a decision made by the patent office. (Jaffe & Lerner, at 124 (2004)).

204 Jaffe & Lerner, at 131 (2004). Nevertheless the rejection rate is approximately the same in both patent offices. For instance 342 441 utility patents were filed and 169 028 issued by the USPTO in year 2003, while the EPO received 116 613 applications and granted 59 992 patents from which 2634 were opposed (USPTO,

as potential compensations for patent infringements, are much more limited in Europe than they are in the U.S. and consequently many of the problems the U.S. patent system is currently facing are not regarded as serious in Europe[205]. Nonetheless, there is certainly a need for research about the efficacy of the European patent system along the lines of that conducted by the FTC and the NAS.

Although the patent criticism has been largely based on the U.S. experiences, skeptics appear to have influenced European policy makers much more than the U.S. policy makers[206]. Amendments to the European Patent Convention, such as eliminating computer programs from the example list of non-patentable subject matter, have been proposed, but so far the response has been negative.[207] Similarly, the European Parliament rejected the first biotechnology patent directive proposal in 1995 although a Common Position had been adopted on it[208], and the software patent directive faced the same fate this year. In general, the European patent system could be characterized as somewhat conservative as it favors the preservation of established rules. As such, the patent system appears to be fairly stable.

(iv) Balancing Patent and Antitrust Regimes: Free Competition versus Exclusive Rights

The strength of patents depends not only on the patent regime but also on how antitrust (U.S.) and competition (Europe) laws are applied. As explained earlier, although the purpose of both regulations is to promote innovation, exclusive rights and free competition can sometimes contradict: from a societal perspective it would be beneficial to support as wide a diffusion of knowledge and technology as possible after R&D costs have been expended. Patents sometimes slow down the diffusion, and hence restrict competition, thus preventing a variety of products from entering a market place. Furthermore, a patent holder may be in a position to demand higher prices than would be possible in a competitive market.

Although balancing competition and patent regimes is an ongoing process, and antitrust and competition laws in both the U.S. and Europe are currently under reform due to the challenges posed by the "new economy"[209], some past and current trends can be identified. These developments show the other side of the coin concerning changes in thinking about the variety of potential effects that patents have.

Patents were, for the most part, considered acceptable monopolies in both Europe and the U.S. between the late 19th and early 20th centuries. Hence, patent holders benefited from

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U.S. Patent Statistics Chart Calendar Years 1963-2003 <http://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm> (last visited 6/20/05); EPO, *The EPO in figures* (2003) <http://annual-report.european-patent-office.org/2003/statistics/_pdf/epa_jb03_76_splitted.pdf> (last visited 6/20/05).

[205] *See e.g.* Robert Hart, Peter Holmes & John Reid, *Study Contract ETC/99/B5-3000/E/106: The Economic Impact of Patentability of Computer Programs* (Report to the European Commission, 19 October 2000), <http://europa.eu.int/comm/internal_market/en/indprop/comp/study.pdf> (last visited 6/21/05).

[206] Vortonas, at 33 (2003).

[207] *Basic Proposal for the Revision of the European Patent Convention* (MR/2/00 e, Munich, 13 October 2000) <http://www.european-patent-office.org/epo/dipl_conf/pdf/em00002.pdf> (last visited 6/21/05); *Act Revising the Convention on the Grant of European Patents* (MR/3/00 Rev.1e, Munich, 29 November 2000) <http://www.european-patent-office.org/epo/dipl_conf/pdf/em00003a.pdf> (last visited 6/21/05).

[208] Tritton, Davis, Edenborough, Graham, Malynicz & Roughton, at 168-169 (2002).

[209] See e.g. Landes & Posner, at 390-402; Pitofsky (2000).

wide immunity and their actions attracted little antitrust scrutiny.[210] Changes took place little by little, and by the 1930s, patents were largely regarded as anticompetitive in the U.S. These legal rights to exclude others were thought of as very limited exceptions to antitrust laws,[211] and the Department of Justice even promulgated a list of "Nine No-Nos" prohibiting a wide range of seemingly harmless strategic uses of patents[212]. As regards to Europe, cartels were a norm rather than an exception particularly in the early 20th century-Germany, and the early competition regulations in different countries focused on the abuse of economic power positions[213]. Further changes took place after the Second Word War when the European Coal and Steel Community, the European Economic Community and the European Atomic Energy Community were established. The European Community, later the European Union (EU) the purpose of which is to create internal markets through reducing obstacles to free circulation of goods, services, people and capital within that single market, was formed by these three communities. Nowadays, the EU regulates competition within that single market, and has influenced national legislation in its member states concerning competition law as well as intellectual property rights.

It has recently been recognized in both the U.S. and Europe that, despite different ideas of how to achieve this goal, the underlining purpose of competition and patent regulation is to enhance innovation and consumer welfare. Nevertheless, a patent holder may sometimes be in a position in which the utilization of his or her rights is considered harmful from the perspective of "free competition". The fact that someone has a patent, a legal monopoly, no longer in itself confers market power. Even if it did in reality enable the patent holder to exercise market power, as such it would not offend antitrust or competition laws.[214]

The patent holder's right to exclude others forms the core of his or her rights and is in many cases a legitimate business justification for a company's anti-competitive conduct. No one in the U.S. is expected to create competition with their exclusive rights, and if patent holders do not exceed their rights, they can take advantage of their position rather freely[215]. Nevertheless, the general principle is that patents do not confer the privilege to violate U.S. antitrust laws. For example, if patent holders have market power, use their patent/patents to monopolize or to attempt to monopolize the relevant market thus harming competition and ultimately consumers, and they do this in an unacceptable way by exceeding their legal rights, such conduct may constitute violation of U.S. antitrust laws (Sherman Act § 2).[216]

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210 FTC, at Chapter 1, 15 (2003); Ilkka Rahnasto, *Intellectual Property Rights, External Effects, and Anti-trust Law, Leveraging IPRs in the Communications Industry*, at 36 (Oxford University Press 2003).

211 FTC, at Chapter 1, 15-16 (2003); Merges & Duffy, at 1349 (2002).

212 Jaffe & Lerner, at 97 (2004).

213 Alkio & Wik, at 19-23 (2004).

214 FTC, at Executive Summary, 2 (2003); U.S. Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* (April 1995) <http://www.usdoj.gov/atr/public/guidelines/ipguide.htm> (last visited 6/21/05); *Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under article 81,* at 10-11 (COM(2001) 786 final, Brussels, 20 December 2001) <http://europa.eu.int/comm/competition/antitrust/technology_transfer/en.pdf> (last visited 6/21/05).

215 *Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under article 81,* at 14 (2001).

216 *See e.g.* David E. Balto & Andrew H. Wolman, *Intellectual Property and Antitrust: General Principles*, at 428-429 (IDEA, Journal of Law and technology, Vol. 43, No 3, 2003, 394-474); U.S. Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* (April 1995).

When do patent holders exceed their rights in the meaning of the Sherman Act § 2? In the CSU vs. Xerox (2000) case the Court gave the patent holder rather wide freedom regarding the exploitation of his rights, stating: "In the absence of any illegal tying, fraud in the Patent and Trademark Office, or sham litigation, the patent holder may enforce the statutory right to exclude others from making, using or selling the claimed invention free from liability under the antitrust laws. We therefore will not inquire into his subjective motivation for exerting his statutory rights, even though his refusal to sell or license his patented invention may have an anti-competitive effect, so long as that anti-competitive effect is not illegally extended beyond the statutory patent grant."[217]

The CSU vs. Xerox ruling has been criticized for possibly giving too wide immunity to the patent holder, and it remains to be seen what the balance will be in the future. For example, depending on the extent of freedom patent holders are granted, the obligation to license could potentially be based on the doctrine of essential facilities, which is one way to prove monopolization. This doctrine has been applied in the context of physical products as well as intellectual property[218].

Patent-licensing arrangements, even between competitors, are usually considered pro-competitive in the U.S. If there are restraints such as geographical restrictions, use restrictions or restrictions on manufacturing or sale, it is a question of whether these restraints between competitors or potential competitors are likely to have anticompetitive effects. If so, the reasonableness and necessity of the limitations are evaluated in the light of achieving pro-competitive benefits that outweigh the anticompetitive effects.[219] Consequently, standardization, forming patent pools and/or cross licensing, which are essential in today's economy but may create antitrust problems, are usually allowed. Patent pooling, for example, may very well diminish the problem of negotiating licenses with all patent holders separately.[220] Only naked price-fixing, output restraints, and market division among horizontal competitors, as well as certain group boycotts and resale price maintenance, are thought to violate the Sherman Act § 1 *per se*.[221] In sum, the U.S. approach respects the patent holder's right to fully exploit his or her exclusive rights and to impose restrictions on licensing agreements[222].

The situation in Europe is more restrictive, although it is hoped that the recently issued Commission Regulation (EC) No 772/2004 on the application of Article 81(3) (group exemptions) will make the situation more flexible. Basically, it does not matter whether forbidden restraints of trade are based on patent rights or not. However, the special features of patents as government granted rights are taken into consideration when assessing the anti-competitive nature of different arrangements. As a general rule patent holders are given a limited right to take advantage of their patents, including licensing and collecting royalties,

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[217] CSU L.L.C., et al. v. Xerox Corp., Fed. Cir., No. 99-1323.

[218] Robert Pitofsky, Donna Patterson & Jonathan Hooks, *The Essential Facilities Doctrine under U.S. Antitrust Laws* at 452 (Antitrust Law Journal, Vol 70, No 2, 2002, 443-462).

[219] *See e.g.* U.S. Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* (1995).

[220] *See e.g.* Daniel Lin, *Research versus Development: Patent Pooling, Innovation and Standardization in Software Industry* (John Marshall Review of Intellectual Property Law, Vol. 1, 2002, 274-309) <http://www.jmls.edu/ripl/vol1/issue2/lin.pdf> (last visited 6/21/05).

[221] U.S. Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* (1995).

[222] *Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under article 81*, at 14 (2001).

but EC competition law, Articles 81[223] and 82[224] of the Treaty of Rome, may regulate the type of licensing terms that can and cannot be used. Competitors may not, for example, use a patent licensing agreement to share out markets between themselves or to exclude competing technologies.[225] Moreover, examples of conduct that may constitute abuse of a dominant position include refusing to license except on restrictive terms, or charging excessive prices for products protected by patents.[226] Quite to the contrary, courts in the U.S. have not so far treated extensive licensing fees as a restraint of trade[227]. As regards to refusal to deal cases, The European Court of Justice has set out the principles for issuing a compulsory license on the basis of violation of Art 82 in cases such as Volvo v. Veng (1988), Magill (1995), and IMS Health (2004)[228].

Antitrust and competition laws can be applied in specified circumstances and therefore they may occasionally impose limits on the ways in which patents are utilized in business. Yet, although antitrust/competition regulation is often called upon when patents are thought to distort competition, the trend is towards more flexible application. The Sherman Act, the Treaty of Rome, and national competition laws are not the only laws applicable to bad business practices or hold-up problems, however. The doctrine of patent misuse may be applicable in individual cases in the U.S., and the FTC can bring actions based on the FTC regulation. For example, Article 5 of the FTC Act addresses unfair or deceptive practices. Similarly, many countries in Europe have regulations covering unfair business practices, and most European countries have incorporated the possibility of compulsory licensing in their patent laws.

D. SUMMARY

Mainstream academic ideas have flown from skepticism to promoting strong patent protection in all fields of technology. The trends have affected political decision-making in connection with technological and commercial developments and associated business interests, such as the vitality of strong IPR protection in the knowledge-based economy. The anti-patent era has been followed by the pro-patent era. Recently, however, scholars and the general public have become doubtful about patent efficacy particularly in relation to biotechnology, software and business methods. Also ethical aspects related to their utilization particularly in the pharmaceuticals, have been fiercely discussed. Furthermore, in the U.S., Congress, the USPTO[229], and organizations such as the FTC and the NAS have taken concerns about novelty and non-obviousness in software and business-method

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223 Prohibits agreements, decisions and concerted practices by businesses that prevent, restrict or distort competition unless they meet certain exemption criteria.

224 Prohibits the abuse of a dominant market position.

225 *Commission Evaluation Report on the Transfer of Technology Block Exemption Regulation No 240/96 Technology Transfer Agreements under Article 81*, at 12-14 (2001); Commission notice: *Guidelines on the Application of Article 81 of the EC Treaty to Technology Transfer Agreements* (Official Journal C 101 of 27 April 2004), http://europa.eu.int/eur-lex/pri/en/oj/dat/2004/c_101/c_10120040427en00020042.pdf (last visited 6/21/05).

226 The Rt. Hon. Sir Robin Jacob, Daniel Alexander & Lindsay Lane, *A Guidebook to Intellectual Property, Patents, Trade Marks, Copyright and Designs* (5th edition, Sweet & Maxwell 2004). *See also* Rahnasto, at 154-155 (2003).

227 According to Rahnasto there is only one case in the U.S. in which an "exorbitant, oppressive royalty, involving the bulk of industry" has been questioned. However, in this American Photocopy Equip Co v. Rovico, Inc case (on remand) the district court found no violation on the basis of the royalty rate and the appeals court affirmed this. (Rahnasto, at 154 (2003)).

228 IMS Health Case is discussed further in Chapter IV.B.

229 *See* Chapter III.B(ii) for more details.

inventions seriously. The discussion is also lively in Europe, and has affected political decision-making. Consequently, we appear to be in the transition phase towards more limited patent protection. Since the pendulum of changes has been more noticeable in the U.S. also the downward phase is likely to be more pronounced there than in Europe, however.

Yet, the weakening trend cannot be perceived in the antitrust and competition law arena where patent holders are provided with rather broad freedom to utilize their exclusive rights. Moreover, in the business world most companies favor a proprietary model according to which capturing as much in the way of rights as possible and thus maintaining control over the company's key innovations is considered essential. However, the highlighted role of network effects, complexity and the systemic nature of innovations, and the importance of compatibility and interoperability in products and services, among other things, have forced ICT companies to open up their licensing models emphasizing the role of patents as negotiation tools. On the other hand, also other, even more open models, such as the open-source, have started to penetrate the commercial markets, and many ICT firms today base their business models on services. Naturally, patents may play a role for these companies, but the more people are able to access, modify and sub-license the technology the less importance is attached to the right to exclude others from using it. However, even if patents are not as important to companies employing very open licensing models as they are to those employing proprietary models, third-party rights are still likely to cause complications, and service-orientation will probably increase interest in software-implemented as well as pure business-method patents.

When the specific focus is on economic research and the role of patents in promoting innovation in the ICT sector, although the industry is very R&D-intensive and software in particular is easy to copy, patents relevancy in inducing more R&D investments is open to question. Innovation is cumulative in many parts of the ICT sector, and technology could be characterized as developing rather rapidly, and as being complex. As a consequence, patents rarely provide their holders with monopoly power. The result is a rather complex web of overlapping patents, which creates potential hold-up problems. Furthermore, software manufacturing and distribution costs may be low, and because returns on investment are often received early on in the life cycle of established products (versions), patents are not necessarily paramount for generating competitive advantage. On the other hand, the same code base may very well be inherited from one product generation to the other[230].

Although it has been established that patent protection does not necessarily increase investments in R&D, this is not enough to conclude that certain patents do not promote innovation: they may facilitate technology transfer through licensing and therefore add to its commercialization potential. Research in this area is challenging, however. According to Arora et al. (2001), it is difficult to assess the efficiency and social-welfare effects on technology markets in which growth may depend on the allocation and strength of patent rights without data on the incidence and terms of patent licensing and associated fees and royalties.[231] Moreover, investments in R&D do not often times include the development costs of pure business-methods, and their effects on business innovation ought to be researched more in the future.

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[230] Interview data U.S. (2004).

[231] Ashish Arora, Andrea Fosfuri, and Alfonso Gambardella, *Markets for Technology and their Implications for Corporate Strategy* (Industrial and Corporate Change, Volume 10, Issue 2, 1 June 2001, 419-451).

Patents 'role in producing valuable, up-to-date information for society and thus facilitating technological progress is also questionable, particularly in the case of software and Internet patents. The role of patents in expediting competition is also a subject for further study.

III. DEVELOPMENTS IN SOFTWARE AND BUSINESS-METHOD PATENTS IN EUROPE AND THE U.S.

It is considered vital to have a policy structure that supports the positive development of the ICT industry. Developments that relate to software and business-method patents are part of that framework. Consequently, academic, political and legal trends in this field have relevance to companies, organizations and individuals who operate, or are about to operate, in the ICT sector, and to those affected by developments in the industry.

It was established in the previous chapter that, due to practical flaws in assessing the patentability of software and business methods, and their unknown effects on innovation, this is one of the most problematic areas in the patent system. It was also explained that changes in their patentability took place during the pro-patent era, and that technological and commercial developments promoted this transition. Similar developments occurred in the field of biotechnology. The history of software and business-method patents and their future development are explored more deeply in this chapter.

It will be demonstrated how scholars, legislators, courts and patent offices in the U.S. and Europe have spent the last three decades working out exactly how the concepts of the industrial-age patent system should be applied to the ground-breaking combination of hardware and software, "the virtual machine". In fact, the problem of assessing the patentability of software and business methods culminates in finding appropriate limits, and it is not likely that these limits will be found in the future either. Thus, although the discussion on the usefulness and effects of these patents is relevant, it should not be restricted to their suitability as patentable subject matter per se, and thus detract attention from pressing topics such as the other patentability criteria and patent scope.

A. THE SITUATION IN EUROPE

The leading development in the area of software and business-method patents so far has been the change in the scope of patentable subject matter. Gradual modifications to the patentability regime have typically taken place first in the U.S., and Europe has followed suit a couple of years later[232]. Europe does not usually directly plagiarize U.S. models, however, but the trends do have a strong influence. There is great concern about Europe's ability to compete in international markets, and sufficient patent protection is regarded as one element in achieving that success. This is evident, for instance, in EU innovation policy and its new legislative initiatives.[233] Moreover, U.S. influence on international treaties can be extremely direct, although recent trends appear to indicate pressure also in the other direction, from

[232] *See e.g.* Carl Westling, *Patent på datorprogram och affärsmetoder – tillika en kommentar till EG-kommissionens förslag till direktiv för datorprogramrelaterade uppfinningars patenterbarhet*, at 537 (NIR, Vol 71, No. 6, 2002, 533-544).

[233] *See e.g.* European Commission, *Green Paper on Innovation* (COM(95) 688, December 1995); European Commission, *Green Paper on the Community Patent and the Patent System in Europe* (COM(97) 314, June 1997); European Commission, *Innovation Policy in Europe 2001* (2001). The developments in the U.S. and Japan as well as the obligations posed by TRIPS were also discussed in the two EPO Board of Appeal's IBM-decisions (T 935/97 and T1173/97).

Europe to the U.S[234]. Negotiations regarding the Substantial Patent Law Treaty (SPLT), provide a good illustration of the arising controversies. It is not so much European versus U.S. interests than that of developed and developing countries that are in the course of collision, though.[235]

Despite various international treaties, patent protection is largely based on national legislation. In fact, Europe does not form a united front in this regard[236]. Although national patent laws are currently quite similar, and are typically in line with the EPC, PCT and TRIPS agreements, there are slight variations in the wording of the laws, and in patent office and court practices[237]. Therefore, the emphasis in the following is mainly on the European Patent Convention (EPC) and European Patent Office (EPO) practice, including the decisions of the Boards of Appeal (BOA). I will also go through the EU-level initiative concerning the patentability of computer-implemented inventions. The directive would have, if passed and implemented, harmonized the national patent laws of EU member states in relation to software patents. It would not have directly affected the practice of the EPO: the European Patent Convention has nothing to do with the European Union, although they do have common member states and the implementation of another initiative, the Community Patent Act, would require the EU to join the EPC. All things considered, it is essential that there are no substantial differences between the national and the EPO levels. Indeed, we have already witnessed a similar type of EPO-EU level coordination in relation to the patentability of biotechnological inventions[238].

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234 These considerations include the potential adoption of a first-to-file system, and European type patent opposition procedure, for instance. (*See* the Patent Reform Act of 2005, GRAIN (2003); FTC, at Executive Summary, 8, Chapter 5, 17-18 (2003) and NAS, at 95-103 (2003).

235 GRAIN (2003).

236 To gain international patent protection, patents must, as a rule, be granted and enforced separately in every country. Of course, the European Patent Convention, which was drafted in order to make it easier to file patents in Europe, has improved the situation: The European Patent Office has the power to grant patents to many EPC member countries at the same time. Afterwards, however, these patents are treated in the same way as those granted by national patent offices. "European patents" must be enforced separately in every country in accordance with that country's legislation. On the other hand, if the Community Patent Act is passed, community patents will be in force within the EU and disputes about their validity and infringement can be solved in a separate Community Patent Court. This means that the European patent system would comprise not two, but three types of patents; national, "European", and community patents.

237 In this context, however, the wording of national patent laws corresponds to that of the EPC Article 52, and differences in interpretation lie mainly in the form of allowable claims. In fact, evolution concerning the patentability of software and business methods in national patent offices has practically followed the EPO interpretation. For instance, the Finnish Patent Office made a decision on 14 January 2003 that it will follow EPO practice and accept so called product claims (PRH, *Päätös tietokoneella toteutettavia keksintöjä koskeviin patenttihakemuksiin liittyvästä PRH:n patentti- ja innovaatiolinjalla noudatettavasta käytännöstä*, 14 January 2003 <http://www.prh.fi//fi/uutiset/111.html> (last visited 6/17/05). Furthermore, Swedish Regeringsrätten has stated in its Philips ruling (RÅ 1990 ref. 84) that it is not possible for a small country such as Sweden to maintain its own practice: the practice of the EPO should be taken into consideration when interpreting the patent law. Also the German Bundesgerichtshof has recognized the status of EPO case law. (Hansen, at 182 (2004)). Further information regarding the national patent law developments (Sweden, Germany, Norway) can be found for instance in Törnroth (1999); Wolfgang Tauchert, *Patent Protection for Computer Programs – Current Status and New Developments* (IIC, Vol. 31, No. 7-8/2000, 812-824), and Jarle Roar Saebo, *Patent på datamaskinprogrammer – oppfinnelsesbegrepet* (NIR, Vol. 70, No. 3, 2001, 351-380).

238 Tritton, Davis, Edenborough, Graham, Malynicz & Roughton, at 109 (2002).

(i) Patentability: the Technicality Requirement

An invention has to be new, inventive and susceptible to industrial application in order to be patentable. In addition, it should be technical in character. For the most part, it is this technical character, or lack of it, that has been the focus of articles written by scholars doing research on software and business-method patents[239]. This is no wonder given the resemblance of computer programs, or algorithms, to mathematical methods, the close relationship between the data that is being processed and the program[240], and the dual character of programs as both text and function-generating instructions[241]. Although the distinction has begun to fade, programs are written in programming languages (source code) resembling English and then transcribed into a machine-readable form (object code), the instructions, which cause a general-purpose computer consisting of a microprocessor and a memory to perform[242]. Nonetheless, it should be kept in mind that, as a patentability requirement, technicality is not nearly as important as novelty and inventive step: in year 1999 less than 1% of patent applications related to software were denied on the grounds of non-technicality[243].

The technicality requirement is not explicitly stated in the European Patent Convention, but it can be construed from EPC rules 27 and 29[244]. Article 52 is also regarded as a reflection of this requirement.[245] The article contains a list of subject matter that is not considered to be an invention in terms of patent law and is not patentable *as such*. Programs for computers, as well as methods of doing business, belong to this category, as do discoveries, scientific theories and mathematical methods, aesthetic creations, schemes, rules and methods for performing mental acts and playing games, and the presentation of information. This means that a mathematical method, for instance, cannot be claimed by itself, but the patent must apply to a practical application based on the mathematical formula.

The list in EPC Article 52 (2) is not meant to be exhaustive: it merely gives some examples of material that was thought to be abstract and non-technical in nature[246] and thus not patentable at the time the EPC was signed in 1973.

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239 Most software and business-method patent related articles that discuss the situation in Europe, and have been published for instance in NIR (Nordisk Immateriellt Rättskydd), IIC (Industrial Review of Industrial Property and Copyright Law), and EIPR (European Intellectual Property Review) concentrate on this issue. These articles include Törnroth (1999); Saebo (2001); Oliver Jan Jüngst, *Novely and Industrial Applicability in Computer Programs in Europe* (NIR, Vol. 71, No. 5, 2002, 490-499); Kim G. Hansen, *Kommentar til EU's forslag til et direktiv om computer-implementerede opfindelsers patenterbarhed* (NIR, Vol. 71, No. 6, 2002, 545-551); Westling (2002); Tauchert (2000); Jonathan Newman, *The Patentability of Computer-related Inventions in Europe* (EIPR, No. 12, 1997, 701-708); Larry Cohen, *The Patenting of Software* (EIPR, Vol. 21, No. 12, December 1999, 607-608).

240 Keith Beresford, *European Patents for Software, e-Commerce and Business Model Inventions* (World Patent Information, Vol 23, Issue 3, September 2001, 253-263).

241 Pamela Samuelson, Randall Davis, Mitchell D. Kapor & J.H. Reichman, *A Manifesto Concerning the Legal Protection of Computer Programs*, at 15 (Columbia Law Review, Vol. 94, December 1994).

242 Ceruzzi, at 80 (1998).

243 Eva Liesegang, *Software Patents in Europe*, at 48 (Computer and Telecommunications Law Review, Issue 2, 1999, 48-51).

244 Keith Beresford, *Patenting Software Under The European Patent Convention*, at 22 (Sweet & Maxwell 2000).

245 EPO, *Guidelines for Examination,* at Part C, Chapter IV, 1 (2005).

246 EPO, *Guidelines for Examination*, at Part C, Chapter IV, 1 (2005).

There are many reasons why computer programs were originally placed in the category of non-patentable subject matter. According to van den Berg (1996), software seemed to be far away from the real world of engineering[247]. In fact, computer programs were viewed as close relatives of mathematical methods[248]. In addition, there was a fear that examining software applications would entail going through program listings written in programming languages. Since this would require examiners to have knowledge of these languages, the examination process was anticipated to become time-consuming and uneconomical. Indeed, the Patent Co-operation (PCT) Treaty of 1970 still includes rules 39 and 67, according to which the International Searching Authority and the International Preliminary Examining Authority are not required to search or examine an international application of which the subject matter relates to computer programs to the extent that these authorities are not equipped to search prior art concerning such programs. Although the rationale behind these rules is quite different from the purpose of the list of non-patentable subject matter, it has, in practice, affected the formulation of Article 52(2).[249] One of the most significant aspects of the EPC 52(2) rationale, however, was that it was not generally recognized how technically and economically important software would become[250]. Although independent software vendors had already began to appear, and producers of mainframe computers had unbundled their software product offerings from their hardware products thereby separating the pricing and distribution of software and hardware, software was not generally recognized as a major investment opportunity.[251] At the same time, there was an ongoing discussion on whether computer programs should be allowed copyright protection[252].

Information technology has obviously evolved a lot since 1973. In particular, the development and diffusion of desktop computers has produced explosive growth in the traded-software industry. The number of packaged versus tailor-made software has also increased, and there has been significant growth in networking between desktop computers and other devices. In addition, the Internet has created new, low-cost distribution and marketing channels, and this has facilitated open-source software development, for instance.[253] Furthermore, computerization of things that have traditionally been conducted manually and/or in person, is changing the protection structure of various lines of businesses, the service providers being particularly in a state of flux. Therefore, the interpretation of patentability in terms of computer programs has changed during the last twenty years, and will continue to adapt in the future. It should be noted, however, that although it is often claimed otherwise, the intention was never to exclude computer programs from patentability altogether[254]. In fact, two tendencies can be detected in early discussions: 1) the need to come up with a clear principle on how to threat computer programs in terms of their patentability, and 2) the recognition that the door should be left ajar in respect to patentality of true inventions that happen to contain a software component.[255]

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247 Paul van den Berg, *Patentability of Computer-Software-Related Inventions, The Law and Practice of the Enlarged Board of Appeal of the European Patent Office during its first ten years,* at 31 (Köln – Berlin – Bonn – München 1996).

248 Beresford, at 19 (2000).

249 Beresford, at 17-18 (2000); Van den Berg, at 31 (1996).

250 Van den Berg, at 31 (1996).

251 Graham & Mowery, at 221 (2003); Software History Center, *The Software Industry in the 1970s*, <http://www.softwarehistory.org/history/d_70s.html> (last visited 6/17/05).

252 Van den Berg, at 31 (1996); Westling, at 535 (2002).

253 Graham & Mowery, at 221-223 (2003).

254 Beresford, at 20 (2000).

255 Westling, at 536 (2002).

The following sections trace some of the main aspects of the development of software patenting and describe the situation at the moment. Basically, the problem with software patents in Europe is that it is extremely difficult to draw the line between technical and non-technical computer programs, in other words computer programs as such. One reason for the problem is that computer programs are already at a different abstraction level than scientific theories or mathematical methods, for example, which are also mentioned in the EPC Art. 52(2). Consequently, it is not easy to determine when a computer program is "applied" in a way that the invention can be regarded as technical. Many explanations have been presented during the last two decades, and it can be said without hesitation that the issue of technicality is complex.[256]

(ii) European Patent Office Practice

In its early years the European Patent Office (EPO) developed its first interpretation regarding computer-implemented inventions, defined by the EPO to mean inventions that involve computers, computer networks or other conventional programmable apparatus whereby prima facie the novel features of the claimed invention are realized by means of a program or programs[257]. It interpreted the EPC to mean that if an invention did not differ from the prior art by at least one hardware feature, it was not patentable[258]. This interpretation was officially changed in 1985 when the EPO reformed its Guidelines for examination. It adopted the approach its Board of Appeal had presented earlier in the VICOM (T 208/84) decision: if an invention is patentable according to conventional criteria it should not be excluded from patentability merely because software is used for its implementation. What was decisive was the kind of technical contribution the invention considered as a whole made to the known art.[259] Similar interpretation was applied in the Koch & Sterzel/X-ray apparatus decision (T 26/86)[260]. This change was driven by the undeniable fact that since hardware and software are theoretically interchangeable[261], it was not reasonable to allow hardware inventions but not equivalent inventions embodied in software to be patentable[262].

The concept of technical contribution was first introduced in the previously-mentioned VICOM decision, but it has been interpreted in many ways since. The actual "contribution approach" applied by the Board of Appeals during the 1980s and 1990s was presented in decision IBM/Text Processing (T 38/86) in which BOA stated that it appeared to be the intention of the EPC to permit patenting only in cases in which the invention involved a

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256 Risto Sarvas & Aura Soininen, *Differences in European and U.S. Patent Regulation affecting Wireless Standardization* (International Technology and Strategy Forum, Workshop on Wireless Strategy in the Enterprise: An International Research Perspective, Berkeley, 15-16 October 2002).

257 European Patent Office, *Case Law of the Board's of Appeal of the European Patent Office*, at 2 (4th edition, December 2001).

258 Van den Berg, at 31 (1996); Beresford, at 23 (2000); Jonathan Newman, *The Patentability of Computer-related Inventions in Europe* at 707 (European Intellectual Property Review, Number 12, 1997, 701-708).

259 Van den Berg, at 33 (1996); VICOM (T 208/84).

260 In this case BOA examined whether an X-ray apparatus incorporating a data processing unit operating in accordance with a routine was patentable. The Board found that the routine produced a technical effect by controlling the X-ray tubes. (EPO, *Case Law of the Board's of Appeal of the European Patent Office*, at 2-3 (4th edition, December 2001).

261 Messerschmitt & Szyperski, at 22 and 268 (2003); Samuelson, Davis, Kapor & Reichman, at 13 (1994).

262 Westling, at 536 (2002).

contribution to the art in a field not excluded from patentability.[263] In this case, the invention related to a method for automatically detecting and replacing linguistic expressions which exceeded a predetermined understandability level in a list of linguistic expressions. According to BOA the invention did not involve a technical contribution but had a linguistic character and effect.[264] Liesegang (1999) found that the logic behind the contribution assessment was the following:

- "Where subject-matter as defined in Article 51(2) EPC is explicitly claimed as such, *e.g.* in a "computer program product" claim, this will not be allowed, irrespective of the contents of the computer program;
- otherwise, the closest prior art in relation to the claimed subject-matter is determined and the difference between this piece of prior art and the claimed subject matter is identified;
- the effect of this difference as well as the problem solved by said effect within the context of the claimed invention is identified;
- the area in which the problem resides (e.g. financial, mathematical, technical, etc.) is identified;
- finally, the skills needed to understand what is realized by the invention–and how it is realized–should be identified."[265]

If the required skills did then reside in fields excluded from patentability, such as aesthetics, mathematics, finance, pure programming and linguistics, the invention was not of patentable subject matter[266].[267] Thus, the focus in the assessment of technical contribution was more on what the program did that was technical, than on how it did it. For instance in the EPO decision ATT/System for generating software source code (T 204/93) the Board ruled that generating concrete software programs from supplied generic specifications, *i.e.* reusable software modules, involving computer programs as such, and a computer implementation of mental acts, did not make a contribution in a field outside the range of excluded matters.[268]

The contribution approach was criticized for mixing assessments of technicality, novelty and non-obviousness, and therefore for not making an appropriate distinction between different patentability criteria[269]. Consequently, it was abandoned as an indicator of technicality in three Board of Appeal decisions, the IBM/Computer program product (T 1173/97, T 935/97) and the PBS Partnership/Controlling pension-benefits system (T 931/95). Nevertheless, apart from the first bullet point in Liesegang's presentation, it is still useful for examining the inventive step, which means that the process of determining patentability, but not the end result, has changed[270]. The pension-benefits case (2000) is one example of this

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263 Van den Berg, at 35 (1996).

264 IBM/Text Processing (T 38/86).

265 Liesegang, at 49 (1999).

266 Liesegang, at 49 (1999).

267 For this reason it has not been possible to obtain patent protection for word processing, the generation of data components, tabulating programs, data encryption, authentication and time-series analysis, for example. Then again, protection has been allowed for control engineering, CAD/CAM, digital-signal processing, operating systems, aid programs, data compression and client management. (Blind, Edler, Nack & Straus, at XXII (2001).

268 ATT/System for generating software source code (T 204/93).

269 Beresford, at. 44 (2000); Van den Berg, at. 40 (1996); Liesegang, at. 49 (1999); Yannis Skulikaris, *Software-Related Inventions and Business-Related Inventions, A Review of Practice and Case Law in US and Europe* (Patent World, Febuary 2001, 26-33).

270 *See e.g.* Jüngst, at 496 (2002).

"new" interpretation. It also clarifies the EPO's position regarding business-method patents. One thing did change, though: prior to 1999 it was thought that electrical manipulation of a computer by a program was not a technical process. The IBM decisions confirmed, however, that the execution of a program always involves physical effects. Such normal physical effects just are not enough to fulfill the requirement of technicality. Further technical effect is required.[271]

In the pension-benefits case, the invention was claimed as both an apparatus and a method. In the Board's opinion, all the features of the method claim represented steps in the processing and producing of information and were purely administrative, actuarial and/or financial in character. Therefore, it had no technical merit. The apparatus claims, on the other hand, were considered to have a technical character: a computer system suitably programmed for use in a particular field has the character of a concrete piece of apparatus in the sense of a physical entity, man-made for a utilitarian purpose. However, the improvement envisaged according to the patent application was essentially an economic one and thus resided in the field of economics. It had no technical contribution and could not be considered inventive.[272] In sum, if a computer-implemented invention has technical characteristics, it may be of patentable subject matter even though it is used in business. If, however, the actual invention resides in the business side, the patent is ultimately denied. This interpretation was also affirmed in the Board of Appeal's RICOH/Order management (T 172/03) and HITACHI/Auction method decision (T 258/03). Here the Board went even further than it did in the Pension Benefits decisions, however, and noted that, in general, a method involving technical means is also an invention within the meaning of Article 52(1) EPC[273]. The CATALINA/Discount certificates decision (T 531/03) issued on 17 March 2005 gives further lead to treatment of non-technical aspects in the assessment of inventive step. In this case BOA came to the conclusion that although an invention may contain a mixture of technical and non-technical features and still be considered to have a "technical character", the invention cannot be considered as "a whole" when assessing inventive step. Here the objective technical problem was to be reformulated in terms of providing a technical implementation of the underlying marketing strategy. The skilled person faced with the technical problem would not require any inventive skills to solve it, and thus the invention was not considered patentable.[274]

As explained previously, the technical nature of an invention is eventually established when the inventive step is assessed. If there is no technical contribution, the invention cannot be considered inventive. This has been clarified also in the Guidelines for Examination (2005), in which it is stated that if a claimed invention does not have a *prima facie* technical character, it should be rejected under Arts. 52(2) and (3), although in practice it might be more appropriate for the examiner to proceed directly to the questions of novelty and inventive step, without considering beforehand the question of technicality. If there is no objective technical problem for the invention to solve, the claimed subject matter does not satisfy the inventive-step requirement, at least.[275]

When, then, does an invention have a prima facie technical character, and when is it thought to contribute to the field of technology as regards to the inventive step assessment?

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[271] Jüngst, at 494 (2002).

[272] PBS Partnership/Controlling pension-benefits system (T 931/95).

[273] HITACHI/Auction method decision (T 258/03).

[274] CATALINA/Discount certificates decision (T 531/03).

[275] EPO, *Guidelines for Examination* at Part C, Chapter IV, 1-5 (2005).

According to the EPO Guidelines and the Board of Appeals' decisions, a computer-implemented invention is considered to have a technical character if it brings about a further technical effect when run on a computer, for example. A further technical effect is defined as something more than the normal physical effects involved in using a computer: it is to be found in controlling an industrial process or processing data representing physical entities, or if technical considerations are required in order to carry out the invention. Moreover, if it solves a technical problem or contains technical features relevant to the problem solved it may become patentable.[276] In practice, the technical effect or technical advantage could be improved processing speed, the economical use of memory, improved or more convenient user interface, or easier image creation and manipulation[277]. It should be pointed out that inventive programming is not subject of patent protection. Software source code cannot be patented.

(iii) Types of Claims

As the status of software patents has become established in the EPO, computer programs have been claimed as both apparatus and processes. The claims cover the same invention but differ in form: those for apparatus cover the program and the underlying computer machine or computer network executing the program, while process claims are understood to cover processes implemented by means of a computer or computer networks. The problem is that these two categories leave the actual invention, the computer program, less protected when it is not executed, such as when it resides on a separate carrier in the form of a portable diskette, for example.[278]

Patent protection for computer programs on their own is particularly relevant in terms of distribution. Programs can be easily replicated, copied and distributed without directly infringing apparatus or process claims. Nevertheless, distributing them on a carrier or via the Internet, for example, might constitute an indirect patent infringement in most European countries. This is more difficult to prove, though, and in practice gives less protection to the patent holder by making the enforcement of rights uncertain. It must also be recognized that there is no indirect infringement if someone does not infringe the patent directly. Thus, the export of items which constitute part of a claimed combination for putting it into practice in a country not covered by the patent is neither direct nor indirect infringement.[279]

The problem was eased when the Board of Appeals extended the protection for computer programs by allowing an invention to be claimed in itself or as a record on a carrier. This new "computer program product" category was first introduced in the IBM/Computer program product (T 1173/97) decision. It is not an independent claim category, though, but reference to product and/or process claims has to be made.

The extension of allowable claims had no impact on what constitutes patentable subject matter. Nevertheless, many assume that the form in which computer programs are patentable defines what "computer programs as such" means, and by giving up this requirement, the EPO interpretation is in contrast to the EPC. Although it is true that a computer program does not do anything unless it is combined with hardware, in my opinion

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[276] EPO, *Guidelines for Examination,* at Part C, Chapter IV, 4 (2005); *See also* Newman (1997); Beresford, at 39 (2000).

[277] Beresford (2001). *See also* Beresford, at 38-39 (2000).

[278] Sarvas & Soininen (2002); Beresford (2001).

[279] Beresford (2001); Beresford, at 90 (2000).

this type of argumentation could be seen rather as an implication of the U.S. style of interpretation than something that draws a rational line between technical and non-technical subject matter. Technicality is one of the patentability requirements. It is not directly connected to the allowable claim format.

Another dilemma in the discussion on software patents relates to the fact that computer programs can be described and understood in various ways. For example, from the user point of view the result accomplished by using a program, its function, seems to be its most important characteristic. Then again, from the software engineer's viewpoint, the source code is still in many cases the most essential part of the software although the ideology of combining components producing different functionalities is strongly present when systems are being integrated. In the patent context, the actual source code is irrelevant, however. It cannot be patented in itself in Europe or in the U.S. where computer-program listings are regarded as non-functional descriptive material[280]. More abstract, functionality-based description is usually used for drafting a patent application. Means plus function claims are typical in the U.S., for example. Nevertheless, compared to other inventions traditionally protected by patents, software-related inventions are much more difficult to concretize, making it challenging to apply even the basic patent law concepts to these inventions.

Since the source code may be the practical implementation of the applied idea described in the patent, it is in my interpretation protected in practice, and can be attached to patent applications in the U.S. as an example of an invention reduced to practice. This is not necessary, however, and despite patent protection, the source code could be subject to trade-secret protection. The source code is also a subject to copyright protection.

(iv) Harmonization Efforts at the European Union Level

The European Commission (EC) published its directive proposal on the patentability of computer-implemented inventions in February 2002. The objective was to harmonize EU member states' national patent laws concerning computer-related inventions.[281] The proposal was grounded on EPO practice, but it did take opposing views on certain issues. Compared to the European Patent Convention, it was more detailed in terms of the patentability of computer programs.

The most noticeable difference between the Directive Proposal and EPO practice was the form of the claims accepted for computer-implemented inventions. As explained earlier, the European Patent Office accepts claims related to a computer program in itself or to one on a carrier, as long as further technical effect can be found.[282] The directive proposal explicitly refused these types of claims[283]. It was also pointed out in the directive proposal that granting pure business-method patents should be avoided, which required codification of the technical contribution requirement in the context of assessing non-obviousness[284].

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280 United States Patent and Trademark Office, *Examination Guidelines for Computer-Related Inventions* (1996).

281 Commission of the European Communities (EC), *Proposal for a Directive of the European Parliament and the Counsil on the Patentability of Computer-implemented Inventions* (COM (2002) 92 Final, Brussels, February 2002) <http://europa.eu.int/comm/internal_market/en/indprop/comp/com02-92en.pdf> (last visited 6/21/05.

282 EPO, *Guidelines for Examination,* at Part C, Chapter IV, 4-5 (2005).

283 EC, *Directive Proposal on the Patentability of Computer-implemented Inventions* (2002).

284 *Ibid.*

The EC's directive proposal positioned itself based on hearings, which began in October 2000[285]. The Commission received a large quantity of submissions arguing that patents tended to restrict innovation in fields such as software development. These responses were mainly from supporters of open-source development. The Commission also received submissions from organizations such as the European Information and Communications Technology Association (EICTA), the Union of Industrial and Employer's Confederations in Europe (UNICE), and the European IT Services Association, which together represent thousands of companies. These associations were arguing mainly for the *status quo.* In their opinion, the directive should be consistent with EPO practice concerning computer-implemented inventions and the TRIPS agreement, and thus support European competitiveness in relation to U.S. and Japanese firms. Certain economic reports as well as the practices of the main trading partners such as the U.S. and Japan were also taken into account. Concerns about low-quality patents and the possibility that business-method patenting could stifle innovation in e-commerce were taken seriously during these considerations.[286]

According to the Commission, the objective of the directive was to achieve the right balance between making patents available where appropriate in order to reward and encourage innovation, while avoiding stifling competition and open-source development.[287] The directive proposal was not considered to be far-reaching enough by the Council of Ministers, however, which then made amendments to bring it in line with EPO practice. Thus, product claims to computer programs were accepted if further technical effect could be found.[288]

The directive was voted on in the European Parliament in September 2003, and radical changes to patent protection were accepted after intense lobbying. There was great concern about compatibility, for instance, and thus the European Parliament stated that "Member States shall ensure that, wherever the use of a patented technique is needed for a significant purpose, such as ensuring conversion of the conventions used in two different computer systems or networks so as to allow communication and exchange of data content between them, such use is not considered to be a patent infringement." They also suggested the adoption of a six-month grace period. There is currently a 12-month grace period in place in the U.S.[289], which means that the inventor can freely publish his invention without losing patent rights if he applies for a patent within the grace period. The European Parliament also attempted to ensure that inventions related to data processing could not be patented,

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285 *See* PbT Consultants, *The Results of the European Commission Consultation Exercise on the Patentability of Computer Implemented Inventions* <http://europa.eu.int/comm/internal_market/en/indprop/comp/softanalyse.pdf> (last visited 6/21/05).

286 EC, *Directive Proposal on the Patentability of Computer-implemented Inventions,* at 4-5 (2002).

287 The European Commission, *Proposal for a Directive on the Patentability of Computer-implemented Inventions — frequently asked questions* (20 February 2002) <http://europa.eu.int/comm/internal_market/en/indprop/comp/02-32.htm> (last visited 6/21/05).

288 Counsil of the European Union, *Interinstitutional file: 2002/0047 (COD)* at 8 (Brussels, 8 November 2002) <http://register.consilium.eu.int/pdf/en/02/st14/14017en2.pdf> (last visited 6/21/05).

289 Arlene McCarthy, *Patentability of Computerised Inventions* (PAR2, Parlement Européen, Ref: 03A_DN(2003)09-24, debate 23 September 2003, vote 24 September 2003) <http://www2.europarl.eu.int/registre/presse/debat_du_jour_daily_notebook/2003/en/03A_DN(2003)09-24(PAR2)_EN.doc> (last visited 6/21/05); *Position of the European Parliament Adopted at First Reading on 24 September 2003 with a View to the Adoption of Directive 2003/... ./EC of the European Parliament and of the Council on the Patentability of Computer-implemented Inventions* (24 September 2003) <http://www2.europarl.eu.int/omk/sipade2?PUBREF=-//EP//TEXT+TA+P5-TA-2003-0402+0+DOC+XML+V0//EN&L=EN&LEVEL=3&NAV=S&LSTDOC=Y> (last visited 6/21/05).

and that the production, handling, processing, distribution and publication of information, in whatever form, could never constitute direct or indirect infringement of a patent, even when technical apparatus would be used for that purpose.[290]

If the Council of Ministers had accepted these major changes the European Parliament made to the directive proposal, the role of patents especially in relation to standardization would have changed drastically. Patents relating to interfaces are the most significant in terms of leverage. However, the Council of Ministers adopted a less radical view. It was affirmed in the Political Agreement on the Council's Common Position that so-called product claims to computer programs are allowed in defined situations. Data processing was not excluded from patentability, and there was no mention of a grace period. As far as interoperability was concerned, it was stated in the Common Position that patents should not restrict the rights provided in the copyright regime in respect of decompilation and interoperability (Directive 91/250/EEC, Articles 5[291] and 6[292]), and that "the provisions of this directive are without prejudice to the application of Articles 81 and 82 of the Treaty, in particular, where a dominant supplier refuses to allow the use of a patented technique which is needed for the sole purpose of ensuring conversion of the conventions used in two different computer systems or networks so as to allow communication and exchange of data between them ".[293] However, the Political Agreement did not hold, as Poland, among other countries required the directive to be dropped from the agenda[294]. After that the Council of Ministers reached consensus and the directive was put for the second time before the

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290 *Position of the European Parliament Adopted at First Reading on 24 September 2003 with a View to the Adoption of Directive 2003/... /EC of the European Parliament and of the Council on the Patentability of Computer-implemented Inventions* (2003).

291 Article 5 Exceptions to the restricted acts: "1. In the absence of specific contractual provisions, the acts referred to in Article 4 (a) and (b) shall not require authorization by the rightholder where they are necessary for the use of the computer program by the lawful acquirer in accordance with its intended purpose, including for error correction. 2. The making of a back-up copy by a person having a right to use the computer program may not be prevented by contract insofar as it is necessary for that use. 3. The person having a right to use a copy of a computer program shall be entitled, without the authorization of the rightholder, to observe, study or test the functioning of the program in order to determine the ideas and principles which underlie any element of the program if he does so while performing any of the acts of loading, displaying, running, transmitting or storing the program which he is entitled to do ".

292 Article 6 Decompilation: "1. The authorization of the rightholder shall not be required where reproduction of the code and translation of its form within the meaning of Article 4 (a) and (b) are indispensable to obtain the information necessary to achieve the interoperability of an independently created computer program with other programs, provided that the following conditions are met: (a) these acts are performed by the licensee or by another person having a right to use a copy of a program, or on their behalf by a person authorized to do so; (b) the information necessary to achieve interoperability has not previously been readily available to the persons referred to in subparagraph (a); and (c) these acts are confined to the parts of the original program which are necessary to achieve interoperability. 2. The provisions of paragraph 1 shall not permit the information obtained through its application: (a) to be used for goals other than to achieve the interoperability of the independently created computer program; (b) to be given to others, except when necessary for the interoperability of the independently created computer program; or (c) to be used for the development, production or marketing of a computer program substantially similar in its expression, or for any other act which infringes copyright. 3. In accordance with the provisions of the Berne Convention for the protection of Literary and Artistic Works, the provisions of this Article may not be interpreted in such a way as to allow its application to be used in a manner which unreasonably prejudices the right holder's legitimate interests or conflicts with a normal exploitation of the computer program. "

293 Counsil of the European Union, *Interinstitutional File: 2002/0047 (COD)* (Brussels, 24 May 2004) <http://register.consilium.eu.int/pdf/en/04/st09/st09713.en04.pdf> (last visited 6/21/05); Counsil of the European Union, *Interinstitutional File: 2002/0047 (COD)* (Brussels, 10 May 2005) <http://register.consilium.eu.int/pdf/en/04/st09/st09277-ad01.en04.pdf> (last visited 6/21/05).

294 Lucy Sherriff, *Poland Halts Software Patent Directive* (The Register, 21 December 2004), http://www.theregister.co.uk/2004/12/21/patents_dropped/ (last visited 6/21/05).

European Parliament[295] which rejected it by 648 votes to 14 with 18 abstentions. Attention is likely to move next to the proposed Community patent Act, that is currently being discussed in the Council, and has been mentioned by a number of MEPs as the appropriate legislative instrument to address the issue of software patentability.[296] The software patent directive was not the first patent-related directive proposal that has faced the same fate, however. In March 1995 the European Parliament rejected the then proposed biotechnological patent directive. The main reason for such a rejection was that the directive was considered by many to remove too many restrictions regarding the patentability of life forms. In the end the Commission came up with an amended proposal which took into consideration also the ethical dimensions. The directive entered eventually into force on 16 June 1998.[297]

B. THE SITUATION IN THE U.S.

(i) Statutory Requirements

U.S. patent law originates from the Constitution. Under Article I, Section 8 Congress is given the power to enact laws relating to patents in order to promote the progress of useful arts, which can be done by securing for limited times to inventors the exclusive right to their respective discoveries. Congress has used this power to enact various patent laws. The current version came into effect on 1 January 1953.

The patentability requirement, which has created problems in patenting computer programs in the U.S., is that an invention must belong to at least one of the statutory categories. Under the statutory requirement, any invention that falls into the process, machine, article of manufacture, or composition of matter category can be patented if it also fulfils the other patentability requirements of novelty, non-obviousness and utility, set in the Patent Act (§ 101).

The use of the term "any" in § 101 has been interpreted to mean that Congress did not intend to put any restrictions on patentability beyond those specifically mentioned in the Patent Act, but intended § 101 to extend to "anything under the sun made by man"[298]. In fact, if all statutory subject-matter classes are put together, they do include practically everything. Nevertheless, the Supreme Court has identified three categories of non-patentable subject matter: the laws of nature, natural phenomena and abstract ideas[299].

Mathematical algorithms were originally thought to belong to the category of non-patentable subject matter. It was ruled in the Gottchalk v. Benson case (1972) that they are not patentable to the extent that they are mere abstract ideas. Practical applications of these

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295 Ingrid Marson, *Software Patent Directive Adopted* (ZDNet UK, 7 March 2005), <http://news.zdnet.co.uk/business/legal/0,39020651,39190497,00.htm> (last visited 6/21/05).

296 Rocard (2005).

297 Tritton, Davis, Edenborough, Graham, Malynicz & Roughton, at 168-169 (2002).

298 *See e.g.* reasoning in case Diamond v. Chakrabarty 447 U.S. 303, 206 U.S.P.Q (BNA) 193 (1980). Reference to S. Rep. No. 1979, 82d Cong., 2d Sess., 5, 1952; H. R. Rep. No. 1923, 82d Cong., 2d Sess., 6, 1952.

299 *Ibid*.

ideas may be patentable.[300] Nevertheless, the effect of this decision was essentially to prevent the patenting of computer programs,[301] specifically mathematical algorithms.

Almost a decade after the Benson decision, the Supreme Court recognized in the Diamond v. Diehr case (1981) that computer programs did sometimes deserve patent protection. In its view, the respondents in this case were seeking to patent not a mathematical formula *per se,* but the use of that formula in the context of a process of curing synthetic rubber. It further explained that a process is not non-patentable simply because it incorporates a law of nature or a mathematical algorithm. An application of a law of nature or a mathematical formula to a known structure or process may well be worthy of patent protection.[302]

The invention in the In re Alappat (1994) case was about the means for creating a smooth waveform display in a digital oscilloscope. To be more specific, the claims referred to a machine, a "rasterizer", and incorporated the "means for determining a vertical distance of vectors" and the "means for normalizing the vertical distance and elevation." The physical devices used to perform these tasks included digital computational devices.[303] According to the Federal Circuit, the invention was not a disembodied mathematical concept. It was a specific machine that produced a useful, concrete, and tangible result. Consequently, a computer operating pursuant to software may very well represent patentable subject matter if the claimed invention also fulfils the other patentability criteria.[304]

In the State Street Bank & Trust Co. v. Signature Financial Group (1998) case the useful, concrete and tangible result was achieved by something as abstract as the "transformation of data representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price". It was in this case that the "ill-conceived" business-method exception was laid to rest. The Federal Circuit stated: "Business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method".[305]

The treatment of business-method patents is firmly connected with the patentability of software. In fact, most inventions involving business methods that have so far been tested in Court have been software-implemented. This does not mean that there is combination of software and business methodology involved in all these inventions, however. Unlike in Europe, the novelty and non-obviousness can very well reside on the business side.[306]

The non-patentability of business methods has its own, rather long history, too. The earliest known case, which is often cited as establishing the so-called "business method exception" doctrine, and was ultimately thrown out in the previously mentioned State Street bank

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300 Gottchalk v. Benson 409 U.S. 63, 175 U.S.P.Q. (BNA) 673 (1972).

301 IPWatchdog.com, *Software Patents* (2003) <http://www.ipwatchdog.com/softwarepatents.html> (last visited 6/21/05). *See also* Merges & Duffy, at 164 (2002).

302 Diamond v. Diehr 450 U.S. 175, 209 U.S.P.Q. (BNA) 1 (1981).

303 Curtis R. Harrington, *Computer-program Patentability Update* (Reed Business Information, 12 June 1995) <http://www.manufacturing.net/dn/index.asp?layout=article&articleid=CA151434> (last visited 6/21/05).

304 In re Alappat 33 F.3d 1526, 31 U.S.P.Q.2d 1545 (Fed. Cir. 1994).

305 State Street Bank & Trust Co. v. Signature Financial Group 149 F.3d 1368, 47 U.S.P.Q.2d 1596 (Fed. Cir. 1998).

306 Nolo, *Obtaining a Business Method Patent* (2005) <http://www.nolo.com/lawcenter/ency/article.cfm/objectID/C2DBFF26-7097-4B7B-AE36DA00499851EE> (last visited 6/21/05).

decision, was Hotel Security Checking Co. v. Lorraine Co. (1908). In that case, the court held that systems for transacting business, such as a bookkeeping system to prevent embezzlement by waiters, were non-patentable.[307]

While many subsequent cases decided by the Federal Circuit have made reference to the business-method exception, they were all ultimately decided on other grounds. The problem with interpreting the Court's earlier decisions is that the concept of an invention was different before the Patent Act was modified in 1952. There was no clear distinction between patentable subject matter and non-obviousness.[308] Hence, it could be argued, as the Federal Circuit did in the State Street Bank decision, that there never was a business-method exception.

Business-method patents are not new in practice either. Indeed, they have been issued at least since 1971[309], and, in 1985 the USPTO granted almost a thousand patents that could be described as covering business methods, and it is currently granting approximately 10 to 12 thousand such patents per year. However, given a more narrow interpretation (class 705), there are less than 1,000 of them granted every year.[310] The reason for the dramatic increase in filings has been claimed to be the recent Internet boom combined with the State Street Bank decision, which brought the possibility for patent protection to everyone's attention[311]. Hence, within the last five years a large number of patents have been granted to software and Internet companies that have invented novel ways of doing business. Online ordering and reservation processes, Internet advertising schemes, auctions, credit card services, brokerage services, banking services and tax-preparation services are examples of these so-called business-method patents[312].

It is not only software and Internet companies, but also non-technology companies such as banks, insurance companies and even health-care service providers that are no longer relying merely on trade secrecy or claiming imitation to be an unfair business practice, but are continuously filing software and business-method patents. For example, the Cardiac Intelligence Corp. has several patents on its systems for the automated collection and analysis of cardiac information and remote patient care. Health Hero Network patented a networked system for communicating information to patients as well as for remote monitoring. True Position, Inc. was granted a patent for a wireless health-monitoring system.[313]

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[307] Hotel Security Checking Co. v. Lorraine Co.160 F. 467 (2d Cir. 1908).

[308] Merges & Duffy, at 171 (2002).

[309] Jaffe & Lerner, at 117 (2004).

[310] Hall, at 3-4 (2003).

[311] Michael J. Meurer, *Business Method Patents and Patent Floods*, at 12-13 (Boston University, School of Law, Working Paper Series, Law and Economics, Working Paper No. 02-02, 2002)). *See also* Glazier, at 23-24 (2000).

[312] Robert W. Morris, *Software and Business Method Patent Licensing* (Practising Law Institute, Patents, Copyright, Trademarks and Literary Property Course Handbook Series, PLI Order Number G0-01BF, September 2003 - January 2004); Hall, at 3 (2003).

[313] Scott J. Fields & Joan M. Roediger, *Health Care Business Method Patents* (September 2001), <http://www.physiciansnews.com/business/901fields.html> (last visited 5/24/04).

(ii) Problems in Assessing Novelty and Non-obviousness: Actions Taken Regarding the Poor Quality of Business-method Patents

Particularly Internet business-method patents have attracted a great deal of attention in the media as well as in the academic world[314]. Economists above all have been trying to determine whether granting these patents actually benefits society[315]. It is the purpose of the patent system, stated in the U.S. Constitution, to promote the progress of useful arts. If this does not take place, the system could be held unconstitutional.

As suggested earlier, in Chapter II C (Changes in Academic, Political and Legal Thinking), there is still a long way to go before it could be claimed that the U.S. patent system is unconstitutional, and more research that looks beyond technological innovation is required. Nonetheless, the system does need improvement. For instance, the lack of expertise and resources in the United States Patent and Trademark Office (USPTO) in terms of determining whether claimed software and business methods are actually novel and inventive has been heavily criticized[316]. Examiners are allowed as little as 18 hours per patent during the entire application procedure and they are rewarded for getting applications out of the door. It is simply easier to grant a patent than to continue the everlasting application procedure.[317]

The USPTO has responded to the criticism and has taken action to improve its patent scrutiny. It has improved the technical training of patent examiners and expanded their search activities: as regards some business-method patents (patent class 705), there is a mandatory search in certain databases and a second-level review conducted by senior patent examiners.[318] This resulted in a notable decline in patent grants in that particular class in 2001 and 2002[319].

In addition, Congress has taken action. The American Inventors Protection Act, which was approved in 1999, contains a special defense against infringement claims related to business-method patents. The new defense is based on earlier invention, and was brought in to cover a party that has, in good faith, reduced the subject matter to practice at least one year before the effective filing date of the patent he or she is claimed to have infringed. Commercial use of the subject matter before the effective filing date is required.[320] The problem is, however, that it is not determined what is meant by methods of doing or conducting business in this context. The legislative history of the American Inventors Protection Act does not give any hint of a useful definition either. This leaves it to the courts to determine which patents are and which are not subject to the first-inventor defense available only for business-method

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314 John R. Allison & Emerson H. Tiller, *Internet Business Method Patents* at 259 (in Wesley M. Cohen and Steven Merrill (eds.) *Patents in the Knowledge-Based Economy*, National Academy Press, Washington, D.C. 2003, 259-282).

315 *See e.g.* Hall (2003).

316 Allison & Tiller, at 260 (2002).

317 Mark A. Lemley, *Rational Ignorance at the Patent Office*, at 2 (Northwestern University Law Review, Vol 95, No. 4, 2001), <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=261400> (last visited 6/21/05); *See also* Malone (2002).

318 United States Patent and Trademark Office, *Business Methods White Paper* (2000).

319 Hall, at 4 (2003).

320 Merges & Duffy, at 173 (2002).

patents[321]. Ironically, the Federal Circuit had already made a statement against this kind of division. In the State Street Bank decision it stated: "Any historical distinctions between a method of 'doing' business and the means of carrying it out blur in the complexity of modern business systems".[322]

The Business Method Patent Improvement Act was drafted in 2000. It was not passed then and a new version was presented to Congress in 2001. Had it been approved, changes would have followed. The application domain of this Act was broadly defined. According to Section 2, the term 'business method' means in this context

(1) a method
    a. of (i) processing data; or (ii) performing calculation operations; and
    b. which is uniquely designed for or utilized in the practice, administration, or management of an enterprise;
(2) any technique used in athletics, instruction, or personal skills; and
(3) any computer-assisted implementation of a method described in paragraph (1) or a technique described in paragraph (2).[323]

Then again, the term 'business method invention' was defined as to mean (1) any invention, which is a business method (including any software or other apparatus); and (2) any invention, which is comprised of any claim that is a business method.[324]

Under the proposed Business Method Patent Improvement Act, mandatory publication within 18 months of the original filing date of all patent applications that claim a business-method invention should have been introduced. Moreover, the implementation of a European-type opposition procedure for challenging granted business-method patents was suggested, and the Act proposed changes to the validity presumption both before and after the patent is granted. At that time and also today all patent applicants are entitled to a patent unless the USPTO can show that the patentability requirements are not met. Equally, the Courts base their decisions on the presumption of validity. The proposed act that never became law sought to reverse this presumption with regard to the non-obviousness of business-method inventions.[325] It is clear that propositions concerning business-method patents are, to a large extent, similar to those suggested in the FTC and NAS reports and the Patent Reform Act of 2005, which relate to reforming the entire U.S. patent system.

It is somewhat incongruous that, despite the critique and reforms relating to business-method patents and the drive to renovate the U.S. patent system, in the international context the U.S. is continuously suggesting that other countries should follow its lead and adopt similar patent regulation[326]. In fact, this is one of the actively discussed issues in the ongoing SPLT negotiations: in return for giving up its first-to-invent system the U.S. is interested in

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[321] Jerry Riedinger, *Building Fences in Cyberspace: Business Method Patents and The Internet. Analysis of Recent Internet/E-Commerce Business Method Patents*, at 12-13 (prepared for the Practicing Law Institute Program on Patenting the New Business Model, Building Fences in Cyberspace, 16 June 2000).

[322] Merges & Duffy, at 173 (2002); State Street Bank & Trust Co. v. Signature Financial Group 149 F.3d 1368, 47 U.S.P.Q.2d 1596 (Fed. Cir. 1998).

[323] Tech Law Journal, HR 1333, *The Business Method Patent Improvement Act of 2001* (introduced 3 April 2001) <http://www.techlawjournal.com/cong107/patent/bus_method/hr1333ih.asp> (last visited 6/21/05).

[324] *Ibid.*

[325] *Ibid*.

[326] *See e.g.* Herbert C. Wamsley, *Achieving Additional Harmonization of Patent Laws* (Opening Statement at USPTO Public Roundtable Discussion, 19 December 2002) <http://www.uspto.gov/web/offices/com/speeches/openingst121902.htm> (last visited 6/21/05).

expanding the scope and power of the patent system, for example by reducing the exceptions to patentability or removing the technical character requirement[327].

C. CRITICISMS

Obviously, the patentability of software and business methods is old news in the U.S. Even Congress, which has the ultimate power regarding changes in patent law, seems to have accepted the patentability of business methods. Consequently, the academic debate has focused on the soundness of the examiner's decisions about novelty and non-obviousness of claimed software and business-method inventions[328]. Today, despite the critical views, only a few scholars are suggesting that computer programs or business-methods should not be patentable at all[329].

Nonetheless, it has been demonstrated in the U.S. that technological complexity and cumulative, rapid innovation, which are characteristic of software development, make strong patent protection less attractive in these areas[330], and it is on this basis that the optimal scope of patent protection covering software and business methods has been studied. It has been suggested, for example, that the doctrine of equivalents should be applied very carefully in relation to software patents. A limited right to reverse-engineer patented computer programs has also been advocated since, unlike in most European countries, there is no fair-use or reverse-engineering exception in the U.S. Patent Act.[331]

Opponents of software patenting have entered the fray in Europe. Although much of the discussion in the media has been filled with misconceptions, hype and half-truths, and in many cases the discussants do not appear to have a very good understanding of the patent system, valid questions about its efficacy have been raised. The common claims are that software patents pose threats to open-source development, interoperability and standards, that small companies do not have the resources to file for patents and therefore large firms are favored, and that patent protection is not needed in the software industry as copyright provides the appropriate level of protection. Claims that software is different from other patentable inventions and should not therefore be patentable, as well as the fear of inadvertent patent infringement, also play a role in the opposition.[332]

The discussion on the role and effects of software patenting is valuable, but it is not likely that the result will be what its opponents are hoping for. The reality is that software has been patentable in Europe for decades. There is no evidence that software patents stifle innovation in Europe, and according to the TRIPS agreement, patent protection should be

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327 GRAIN (2003).

328 Lemley, Menell, Merges & Samuelson, at 259 (2000).

329 One of these scholars is Dreyfuss. *See e.g.* Rochelle Cooper Dreyfuss, *Are Business Methods Bad for Business?* (Public Law and Legal Theory Working Paper Series, Working Paper 17, March 2000) <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=219574> (last visited 6/21/05).

330 *See e.g.* Robert Hunt, *Patent Reform: A Mixed Blessing for the U.S. Economy?* (Federal Reserve Bank of Philadelphia, Business Review, November/December 1999, 15-29); Gallini (2002); Dominique Foray, *Intellectual Property and Innovation in the Knowledge-Based Economy* (ISUMA, Spring 2002).

331 *See e.g.* Cohen & Lemley (2001); Dan L. Burk & Mark A. Lemley, *Designing Optimal Software Patents* (Stanford Law School, Public Law & Legal Theory Working Paper series, Research Paper No. 108 and University of Minnesota law School, Legal Studies Research Paper series, Research Paper No. 05-11, March 2005).

332 PbT Consultants (2001); Jeremie Zimmermann, *Europe Struggles over Software Patents* (IEEE Spectrum, September 2004, 61-63).

available in all fields of technology. Thus, it is unlikely that the EU would ultimately pass a directive that turned the situation upside down, although the parliament rejection of the directive was certainly a temporary victory for the opponents. However, the issue is not black and white: it is not merely a question of software being patentable subject matter, and opponents have raised a lot of good questions about the benefits. In fact, although, unlike in the U.S., patent protection does not cover private and non-commercial utilization, and there are specific exemptions for experimental use even for commercial purposes, limiting patent holders' rights in certain situations could be considered so that user-innovation would be promoted even though it took place on the Internet. Clarifying the exhaustion doctrine in the context of software patents is also a topic that deserves more attention[333], and the interpretation of patent claims in infringement cases and determining what constitutes direct and indirect infringement are also open to question. Moreover, although the technicality requirement is likely to keep pure business-method inventions out of the patentable arena, as has been witnessed in the U.S., the boundary is not clear. The time for this discussion is now, not after 20,000 patents have been issued covering (pure) business methods as a response to the urge for protection arising from the shift towards service-oriented information economy. It is also probable that the industrialization of the ICT meaning the automation of coding, for instance, will increase the pressure in accepting patent claims regarding inventions that today are usually though as contributing to the field of programming. Global scale patent law developments may also affect the situation in the future.

D. SUMMARY

Patent offices and courts have spent the last three decades determining how concepts of patent law developed for the industrial world should be applied to the ground-breaking combination of hardware and software. Just as in the field of biotechnology, it has not been possible to find any exact limits, and practitioners have been operating on a sliding scale. For instance, the EPO's interpretation of the technical character of computer programs has shifted from excluding all software inventions from patentability to applying the technical-contribution approach, and further to examining their further technical effects, and finally to determining an invention technical if it contains technical elements. Currently, however, the assessment of technicality is factually conducted in relation to determining whether an invention is inventive meaning that the determination is basically the same as before. It is simply conducted in a later stage of the examination process. Then again, the reasoning in U.S. courts has swung from assuming that software is merely a concatenation of non-patentable algorithms to the view that as long as useful, concrete, and tangible results can be achieved, computer programs are patentable. Further, unlike in Europe, patents for business-method inventions are accepted in the U.S., and although a large proportion of these inventions are implemented in software, the invention itself may reside in the area of business. In Europe the technicality requirement is likely to keep pure business methods out of the sphere of patentable subject matter, but pressure to their acceptance may be hard to resist. On the other hand, if the developing countries are able to form a united front and

333 It might turn out that a patent holder's rights are never exhausted in the software context. If making a copy of a computer program while using it is interpreted to be manufacturing, it might not be possible to use the program without the patent holder's consent even after the product has been legally sold or licensed. This is because, unlike the right to distribute further and to use that specific product, the right to manufacture is not subject to exhaustion. Moreover, process claims are not usually subject to exhaustion at all. In the software context, however, despite the actual form of the claims, the subject matter is the same. Although it seems rather absurd to interpret patent laws like this, it would lead to more control concerning the resale of patented products.

promote stricter patentability requirements, the pro-patent pressure resulting from international patent law harmonization driven by the interests of developed countries could be downgraded.

As mentioned above software inventions (although not inventions of coding) can be patented in both Europe and the U.S., the differences residing mainly in the construction of the claims. Further differences can be found in the ways in which national patent offices apply their patent laws. Consequently, to harmonize patent office and court practices within the EU, the European Commission proposed a directive on the patentability of computer-implemented inventions. The directive proposal faced serious criticism that undermined its whole basis. In the end the European parliament rejected the proposal. Nevertheless, and although the still ongoing discussion on the need for and effects of software patents is relevant, it is unlikely that specific limits on patentability will be found in the future. Indeed, the scope of the discussion needs widening. To have any practical effect, it should in my opinion focus more on increasingly pressing topics such as assessment of the inventive step and the interpretation of patent scope.

IV. PATENT STRATEGIES REFLECTING BUSINESS TRENDS IN THE INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

It has been established in the previous chapters that the company perspective on patent protection differs from that of academics, legislators and the courts. Rather than making decisions with society's best interests at heart, firms typically focus on their own agenda, in other words generating profit for their shareholders. In this they utilize the means available at a given time, and these means include patents. Thus the perspective in this chapter differs fundamentally from that adopted so far.

It was demonstrated above that patents as well as other intellectual property rights have become imperative for firms today due to the shift from an industrial to an information economy. In fact, a company's market value is to a large extent derived from its intangibles[334]. For instance, it has been estimated that in 2000 93.5% of Merck's, 97.8% of Microsoft's and 98.9% of Yahoo's value was based on intangible assets[335], which include knowledge, competence, intellectual property, brands, and customer relationships among others[336]. The problem with intangibles is that they can be easily leaked to competitors and their valuation is difficult. Intellectual property rights give some intangible assets a form, however, and provide the company with a limited right to exclude others from utilizing patented inventions, copyrighted works or registered/established trademarks. At the same time they offer the company something explicit to exchange. Although it is not at all easy to put a price tag on a right to manufacture patented inventions or to copy and distribute copyrighted works, for example, there is at least someone who has a defined right and who is entitled to give it away. Yet, the market value of intellectual property is always context-dependent and thus different for everyone[337].[338]

As the value of intangibles within companies' resource pools has risen and intellectual property rights have been increasingly used as a means of protecting and transferring these assets, firms have started to pay a lot of attention to managing these rights more effectively[339]. Well-thought-out IPR and patent strategies have emerged, and instead of being one of the supporting functions nobody pays any attention to, IPRs, and patents in particular as they provide the strongest protection, have assumed a more central role in companies' everyday business[340]. In fact, a glimpse at the prevailing business literature gives an idea of the recent interest in managing and utilizing patents and other intellectual

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334 Parr, at 273 (2002).

335 Ron Laurie (Inflexion Point Strategy, Ltd), *The role of Claims Construction in Patent Valuation* (IP Society, Advanced Topics in IP Valuation Seminar, Palo Alto, 13 July 2004).

336 Teece, at 3 (2000).

337 Ron Laurie (Inflexion Point Strategy, Ltd), *IP Valuation – Magic or Myth* (IP Society, Intellectual Property Issues in M&A Transactions Seminar, Palo Alto, 29 April 2004).

338 For further information about the "valuation problem" *see e.g.* Blair, Hoffman & Tamburo (2002).

339 *See e.g.* Anthony L. Miele, *Patent Strategy, The Manager's Guide to Profiting from Patent Portfolios,* at. 1 (John Wiley & Sons, Inc. 2000).

340 *See e.g.* Jackson Knight, *Intellectual Property "101" What Executives and Investors Need to Know About Patent Rights and Strategy*, at 4 (in Bruce Berman (ed.), *From Ides to Assets. Investing Wisely in Intellectual Property (*John Wiley & Sons 2002, 3-26).

property rights.[341] This chapter examines ways of managing and utilizing patents in the ICT sector. It will be shown that, although the objectives companies have set for their patent functions in conjunction with their business strategies have generally evolved and patents have become more entangled with everyday business, the variations are many. To some firms patents provide one way or even the only way to generate revenue, to some they give the freedom to innovate, some seek status value, and to some they are a nuisance to be avoided. On the whole, it is clear that the protective value of patents is not as high in the ICT sector as in some other fields such as pharmaceuticals[342], and that it is competition that drives the innovation in this field[343]. Nonetheless, at the moment patents provide a useful means for improving a firm's position in the market.

As mentioned in previous chapters, standardization is a significant aspect of the business climate, particularly in the ICT sector. The problem with patents and (open) standards is that patents can potentially hold up standardization processes or prevent others from using the established standard. This may have serious repercussions for the development of the industry. Standardization is an interesting setting also for other reasons: in many cases it represents an exception to companies' licensing models[344]. Thus, following a discussion on patent strategies and their evolution in general, a more limited application will be examined. The question of how patents can be employed in the context of standardization will be addressed.

Finally in this chapter, the focus turns to the societal implications of ICT patent strategies, and the discussion will thus tie in with that in Chapters II and III. One of the key findings is that, although many problems potentially posed by patents are not impediments in practice, due to the hold-up problem particularly the U.S. patent system in its current form supports the type of opportunism in which having a patent that impinges on other firms' value streams is all that matters.

A. TRENDS AND CHALLENGES

The term "patent strategy" can be used to mean a lot of things, but in my mind it refers to the long-term goals companies have set for their patent activities and to the implementation of these goals. Hence, it includes rewarding employees for patent disclosures and thus encouraging inventiveness. It includes filing and acquiring patents, making use of them in business through blocking others from using a technology, licensing and selling technology and patents, and enhancing the company's reputation. Enforcing patent rights and giving up those that are no longer useful is also part of it. The purpose is to unify the company's patent activities so that they support its business appropriately.[345] Naturally, the patent strategy goes hand in hand with the company's IPR and technology strategies, offering

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341 *See e.g.* Julie L. Davis & Suzanne S. Harrison, *Edison in the Boardroom, How Leading Companies Realize Value from Their Intellectual Assets* (John Wiley & Sons, Inc 2001); Rivette & Kline (2000); H. Jackson Knight, *Patent Strategy for Researchers and Research Managers* (2nd edition, John Wiley & Sons, LTD 2001); Miele (2000); Glazier (2000); Megantz (2002); Bruce Berman (ed.), *From Ides to Assets. Investing Wisely in Intellectual Property (*John Wiley & Sons 2002).

342 *See e.g.* Cohen, Nelson & Walsh (2000); Levin, Klevorick, Nelson & Winter (1987); FTC, at Chapter 3, 31, 46 (2003).

343 FTC, at Chapter 3, 31, 46 (2003).

344 Interview data U.S. (2004).

345 *See also* Deepak Somaya, *Theoretical Perspectives on Patent Strategy,* at 3-4 (Robert H. Smith School of Business, Maryland, Draft, 2002); Miele, at 1 (2000): Knight, at 14-17 (2002).

guidelines when decisions are made in individual cases. IPR and patent "strategies" concerning particular technological fields, products and their distribution, as well as other decisions that are made on separate occasions, could be called tactics.

The significance of patents to firms varies, as do their optimal patent strategies. Davis and Harrison (2001), for instance, divided companies' IP strategies into a value hierarchy of five levels. On the bottom is the defensive level, on which IPRs are generally viewed as legal assets. Next comes the cost-center, level, when companies focus on reducing the filing and maintenance costs of their IPR portfolios, but still primarily consider them as legal assets. It is on third level that firms begin to look at IPRs as business assets that have the potential of bringing in additional revenues. On the fourth, integrated level, IPRs are no longer managed in one department, but are integrated into day-to-day operations, procedures and strategies. The top level is the visionary level, on which IPRs are deeply integrated into the company's functions and are taken into account when its future is being planned.[346] The value hierarchy, based on the different expectations companies have about the contribution their IP function should be making to their corporate goals, is illustrated in Figure 4.

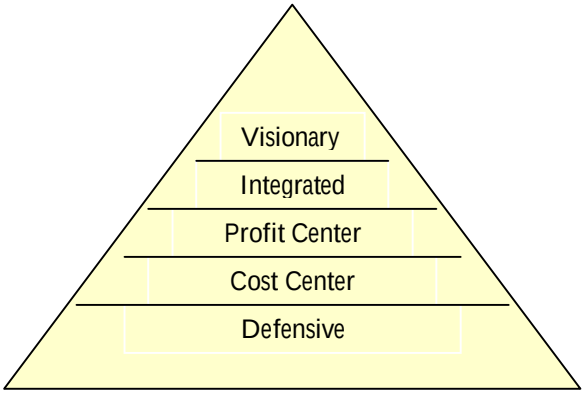

FIGURE 4. THE VALUE HIERARCHY[347]

In academic literature patent strategies are often divided into two categories: offensive, and defensive[348]. Some add the third, transactional strategy[349]. In practice, the strategy is company-specific and seldom fits in only one category. Patents can serve many functions at the same time, and the purposes for which they are used may change over time. Nevertheless, firms' strategies could be characterized as being more offensive, more defensive, more active, more passive[350], more adaptive or more static than those of other companies. The goal is to use patents so as to enhance competitive advantage. The value of

346 Davis & Harrison, at 12-14 (2001).

347 Davis & Harrison, at 12 (2001).

348 Granstrand, at 214 (1999); Rahnasto, at 7 (2003); Knight, at 19 (2002); Anthony Arundel & Pari Patel, *Strategic Patenting* at 3-4 (Background Report for the Trend Chart Policy Benchmarking Workshop New Trends in IPR Policy European, Trend Chart on Innovation, Luxemburg, 3-4 June 2003).

349 Barton E. Showalter & Jeff D. Baxter, *Strategic use of Software Patents,* at 5 (Practising Law Institute, Patents, Copyrights, Trademarks, and Literary Property Course Handbook Series, PLI Order No. G0-004D, February-March, 1999).

350 For instance Rahnasto has referred to active and passive patent strategies as strategies employed before the importance of IPRs increased and business-oriented view became prevailing. He has characterized these strategies as follows: "A passive intellectual property strategy meant that a company adopted a strategy of investing in intellectual property as little as possible. An active intellectual property strategy meant that the company was actively organizing the detection of new innovations, was patenting its innovations, protecting its trade marks, clearing new products against prior rights and attacking imitators." (Rahnasto, at 6 (2003)).

the firm's intellectual capital should be maximized and the overall value of the enterprise boosted. Patents may be included in the company's risk management, too. In essence, the strategy is about getting more money or saving money.

In my perspective, a firm does not need patents for it to have a patent strategy. It may, for example, decide not to file for patents, but rather to publish its inventions contributing to "prior art". It may also protect its inventions in other ways and thus save money otherwise sunk in unutilized patents, their preparation and application. These resources could rather be invested in R&D. It could also adopt a strategy that does not involve patents in order to diminish the risk of infringing others' patent rights. I call this approach a "no patents" strategy. The strategy can be independent but it can also be perceived as complementary to all the other patent strategies: companies make negative decisions about applying for patents[351], licensing and asserting them, for example.

There are clear differences between legal and business cultures in the U.S. and Europe. These dissimilarities are echoed in patent strategies employed by U.S. and European ICT firms. In general, European companies do not consider patents as valuable to their businesses as their counterparts in the U.S. do[352]. Nonetheless, it is clear that the influence of the strategies is not limited to certain geographical areas. In the ICT sector, for instance, the aggressive nature of U.S. strategies affects the prospects of developments in Europe, partly because the U.S. firms had a head start in the software-patent rush[353]. Even today, they own a large proportion of the ICT patents granted in Europe[354], giving them strong leverage in these markets[355]. More importantly, the internationalizing business environment, and the Internet as a marketplace, make it extremely difficult for ICT companies today to refrain from paying any attention to patents irrespective of their business model and countries of operation. Given the number of patents issued for Internet business methods and software-implemented inventions, the risk of infringing someone's patents on the Internet is considerable. On the other hand, patent enforcement is challenging if the alleged infringement has taken place on the Internet. The market is international, and different parts of the patented processes may easily be carried out under different jurisdictions meaning that there may be no infringement. Patent rights are also national and must be enforced

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351 There are many reasons why firms do not consider patenting as worthwhile. In Cohen, Nelson & Walsh's study the share of companies that reported difficulty of demonstrating the novelty of an invention as a reason for not patenting was 31,2%, the amount of information disclosed in a patent application was supported by 24,3% of respondents, 15,7% named the cost of applying, 3.2% the cost of defending a patent in court, and 24,6% the ease of legally inventing around a patent. (Cohen, Nelson & Walsh, at 14 (2000)).

352 Interview data Finland (2003) versus Interview data U.S (2004). *See also* DLA (2004); Blind, Edler, Nack & Straus (2001); Vonortas, at 33 (2003).

353 Since it has been possible to patent software in the U.S. for longer than it has been in Europe, U.S. companies have been the ones filing patents for software-related inventions in Europe, while many European companies have been held back by the confusing wording of the European Patent Convention and of national patent laws. (Fred Blakemore, *Patenting Computer Software*, at 159 (Engineering Management Journal, August 1999, 157-160)).

354 OECD, *Key ICT indicators, Share of countries in ICT patents at the EPO, according to the residence of the inventors, by priority year* <http://www.oecd.org/dataoecd/20/9/34083345.xls> (last visited 6/20/05).

355 Naturally, U.S. companies file a lot more patents in the U.S. than they do in Europe. One of the U.S. companies interviewed stated that of the patents that are filed in the U.S., the industry average for filing them internationally as well varies from 10% to 50%. The U.S. is a bargain when it comes to patents. (Interview data U.S. (2004)).

separately in every country, making both filing and enforcement extremely costly[356]. It costs more than 100 000 euros to patent across Europe[357].

Four types of patent strategies are described in more detail in the following, and the trends that can be perceived in the ways in which ICT companies exploit patents are explored. Some of the discussion relies on empirical research data on Finnish and U.S. ICT firms. Finland is currently one of the top ICT countries[358], essentially because of Nokia's international success, and as such it represents the leading edge of Europe's ICT sector. The proportion of ICT patents compared to other patents is also particularly high in Finland[359].

(i) Offensive Strategies

Offensive patent strategies are based on strategic planning of the use of patents in business, proactive litigation, and active lobbying for new legislation[360]. They include generating revenue by preventing others from utilizing patented inventions and/or through licensing technology and patents[361]. Both of these methods are based on the patent holder's right to forbid others from utilizing the patented invention. In some cases the patent holder may even be able to prevent others from selling products that incorporate the invention described in the patent claims, even though the patent does not cover the entire product or process. Particularly, patents to so-called bottleneck inventions, which are difficult to design around and often relate to interfaces that enable complementary products to work together give a lot of leverage to the patent holder and are thus regarded as the most influential.[362]

If blocking others from utilizing patented inventions helps a company to fight off competitors and makes its products distinctive, the patent holder or the exclusive licensee may be in a monopoly position. It can price its products more highly than it could without a patent/patents[363]. The active enforcement of a patent holder's rights is naturally required in these cases.

In many cases, however, patents do not confer monopoly in practice: although they do offer stronger protection against imitation than copyrights, for instance, it is not easy to monopolize a product, process or technology through patenting in the ICT industry. First, it is costly to file and acquire patents, and in many areas, unlike in pharmaceuticals, one or two patents are seldom enough for providing wide enough protection. It is often necessary to file some broad applications covering the key elements of the products or processes, and to follow this with some narrower applications in order to develop a related portfolio. Alternative ways of achieving the same result are also usually included in these applications,

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356 Wherry, at 20 (2002).

357 Vortonas, at 37 (2003).

358 *See e.g. The Global Information Technology Report 2001-2002: Readiness for the Networked World*, where Finland was ranked first and the U.S. second in countries 'information technology readiness index. In *The Global Information Technology Report 2003-2004* the U.S, held the first place and Finland was third after Singapore.

359 OECD, *Science, Technology and Industry Scoreboard 2003 – Towards a Knowledge-Based Economy*.

360 Rahnasto, at 7 (2003).

361 Showalter & Baxter, at 5 (1999); Granstrand, at 214 (1999); Knight, at 19 (2002).

362 Somaya, at 9 (2002). For instance Gillette has a number of patents on the interface between their blades and razor handles enabling it to maintain its "cheap razors – expensive blades" business model (Somaya, at 9 (2002)).

363 Showalter & Baxter, at 5 (1999).

or they are patented separately: the aim here is to make the designing around more complicated and costly. Improvements developed later may also be patented in order to maintain the protection level.[364] Consequently, as start-up firms can only afford to patent those technologies which have greatest value to the business[365], portfolio building has often been considered a privilege of large and medium-sized companies, and even in these cases patents rarely block others from bringing comparable products onto the market. It is often possible to achieve the same functionality in different ways and to design around the patents[366]. Second, there are always those who could not care less about others 'patents, and even if a company had good individual patents or a patent portfolio, unless the technology in question was imperative to it, the source of competitive advantage, it may not have the will or the resources to prevent others from using its patented inventions in practice.[367] Indeed, considering that it is difficult to tie a patent to a particular product and the products change too quickly for patents to provide return on investments, strong first mover advantages had previously been thought as the best protection method in the semiconductors, for example. Texas Instruments changed the game, however, when it started to assert its patents against competitors in mid-1980s. In 1999 TI's licensing revenues represented more than 55 % of its net income.[368]

Although active enforcement is expensive, and has therefore often been thought of as an option only for large and medium-sized companies, there has recently been a trend for small companies to win patent-infringement suits over large corporations in the U.S[369]. For example, in 1994 the court ordered Microsoft to pay Stac Electronics $120 million in damages for the unlicensed use of two Stac Electronics patents. These cases demonstrate that patents can also protect small firms,[370] and small high-tech companies in the U.S. have become more active in filing patents, building their own portfolios and also defending their rights[371]. Barely 5% of patents went to start-up firms and other first-time patentees in 1972, but by 1995 the proportion had grown to 23% of patent recipients. In addition, in the realm of Internet business methods, small companies and individuals hold a larger share of these patents (35.78%) than general patents (28.2%)[372]. The increase in patenting activity among small companies corresponds with the birth and development of the venture-capital industry[373]. Transactional patent strategies are discussed later on. As regards to patent litigation in Europe, it has been estimated that two-thirds of patent cases is originated by small and medium sized firms[374].

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364 *See e.g.* Knight, at 48-53 (2001); Rice talks about so-called "rifle" and "shotgun" approaches. In the former only a few patents covering the technology are obtained, and in the latter the aim is to obtain as many patents as possible in a particular area of technology. The risk with "rifle" strategy is that if the core patents are found invalid, the patent holder does not have any fallback protection. The latter strategy is rather expensive. (Rice 2003).

365 Washington CORE, at 6 (2003).

366 Interview data Finland (2003). *See also* Jacob, Alexander & Lane, at 48 (2004).

367 Derived form the Interview data Finland (2003), and Interview data U.S. (2004).

368 Jaffe & Lerner, at 57 (2004).

369 Arlen L. Olsen, *Patents Are Big Moneymaker These Days for Companies* (The Business Review, 11 August 2000).

370 Showalter & Baxter, at 6 (1999).

371 Washington CORE, *Patent Strategies for Venture Firms: Experiences from the Uniter States,* at 1, 5 (March 2003) <http://www.iip.or.jp/e/index.html> (last visited 6/21/05).

372 Allison & Tiller, at 275-276 (2002).

373 Washington CORE, at 4-5 (2003).

374 OECD, at 31 (1997).

Patents may be used not only for preventing others from utilizing patented, commercially valuable inventions, but also for acquiring external resources, including manufacturing, distribution and marketing capabilities, technologies, other IP, and capital[375]. Well-documented IP assets can be used as a basis for a joint venture, or a strategic alliance for instance, or they can otherwise assist a company in getting favorable deals[376]. In fact, a paradigm shift from closed to open innovation has taken place, making it necessary for companies to look for resources beyond their own borders: although firms used to be self-reliant, conducted most of their R&D internally, and marketed, distributed, supported and serviced their products on their own, the growing mobility of highly experienced and skilled people, the growth of the private venture-capital industry, and the increasingly fast time to market for many products and services have eroded the ideology that successful innovation requires control.[377] Increased R&D costs, rapid technological change, product complexity, specialization among firms and technological convergence have also been driving companies towards further dependency on other firms.[378] Hence, they cannot afford to block all others from using their patented inventions, but need to license their technologies to others to manufacture, distribute, use, and develop further, and vice versa. Well-reasoned licensing strategies complement and enhance the firm's product line, and assist in positioning it favorably in the markets[379]. Nevertheless, the interviews with the U.S. ICT firms revealed that, although it has become common to outsource manufacturing and distribution, R&D is still largely maintained within the company, and licensing in technologies is often limited to non-core elements[380]. Companies are afraid of giving up too much control to the licensor. Moreover, with the exception of open standards, technology out-licensing beyond the firm's own value network was limited[381]. Nonetheless, attitudes appear to be changing little by little, and markets for technology licensing are expanding. It is the (patented) technologies that firms do not utilize themselves in a certain market, for instance, that are the first to be licensed, sold or even donated to other firms, but if the price can be agreed upon, technologies incorporated into the company's own products and processes may also be available for license[382]. It has been estimated that over 95% of patents are currently unlicensed, and over 97% never generate royalties. This is often because the technology they cover is not useful, feasible or marketable.[383]

In the technology-licensing context, patents in conjunction with other IPRs enhance the technology's value. Patents can also be utilized in order to push the other party to license their essential technology. Japanese companies, for example, have been keen on practicing the so-called surrounding tactic, which means that the desired key technology is surrounded by improvement patents and patents covering alternative applications so that it is not possible to develop it further without licensing patents from a particular company. The

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375 Somaya, at 11-12 (2002).

376 Rice (2003); Miele, at 51-58 (2000); Somaya, at 4 (2002).

377 Chesbrough, at xx-xxv (2003).

378 OECD, at 16 (2004).

379 Megantz, at 80 (2002).

380 Interview data U.S. (2004).

381 Interview data U.S. (2004).

382 Derived from Interview data Finland (2003) and Interview data U.S. (2004). *See also* Somaya, at 11 (2002); Rice (2003); Megantz, at 80 (2002).

383 Samson Vermont, *The Economics of Patents and Litigation,* at. 332 (in Bruce M. Berman (ed.) *From Ideas in Assets, Investing Wisely in Intellectual Property*, Wiley & Sons, Inc., 2002, 327-372).

licenses for improvement patents are conditional upon licensing the key technology.[384] Various patenting tactics are further illustrated in Figure 5.

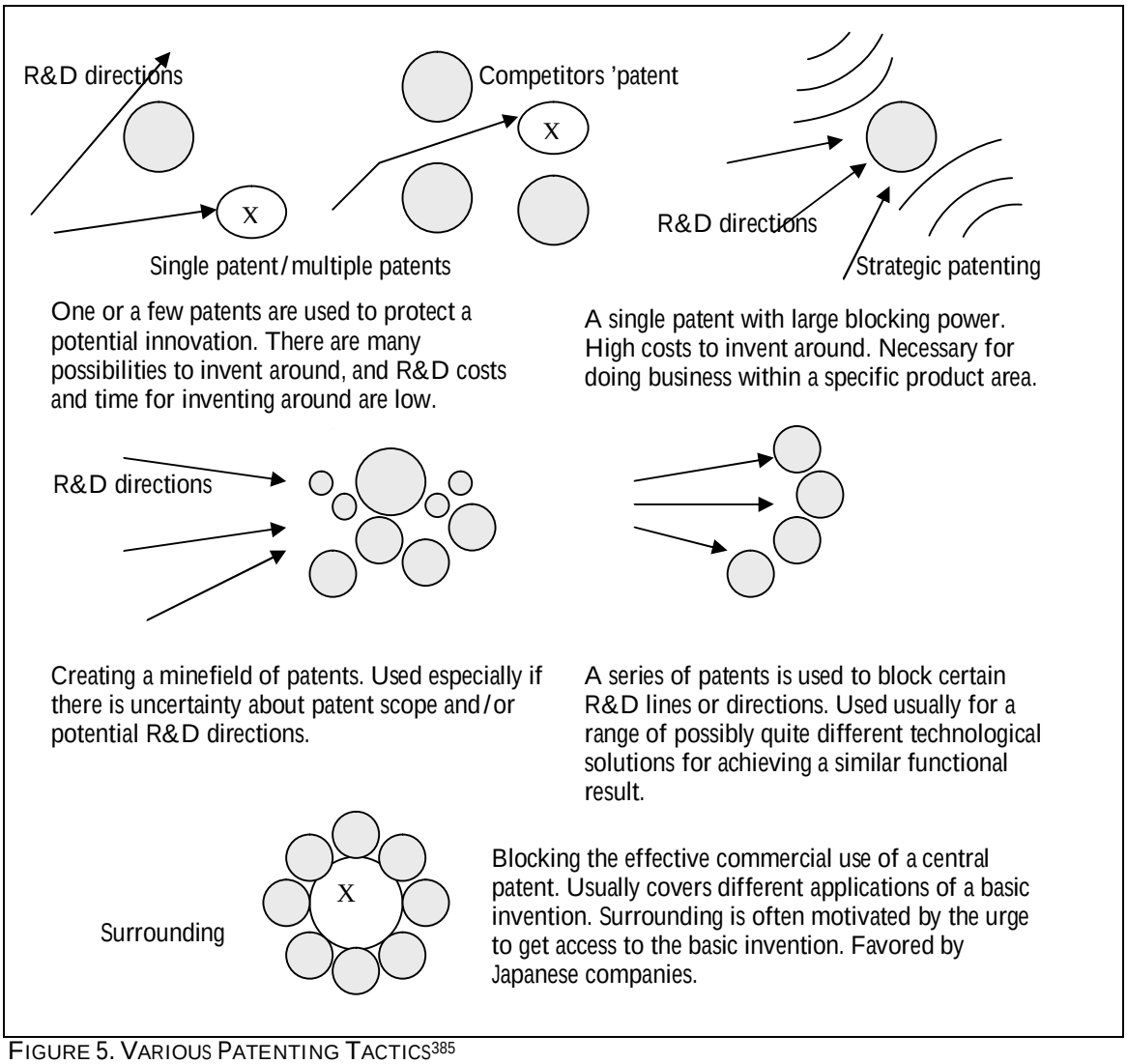

FIGURE 5. VARIOUS PATENTING TACTICS[385]

As mentioned above, patents are serving more and more as currency for acquiring intellectual property, other assets and direct licensing payments from other firms. This trend has probably been facilitated by the fact that, as a result of the increasing numbers of patents, it has become more challenging, and in many cases impossible, to avoid infringement[386].[387] This applies particularly in areas in which processes and products often consist of multiple components, many of which involve various patentable inventions, and many of these patentable inventions can be used in multiple products. Therefore, on the one hand a patent holder may have leverage concerning multiple innovations, and not just one product, but on the other hand, the product may involve inventions patented by others, and

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[384] Donald M. Spero, *Patent Protection or Piracy –a CEO Views Japan* (Harvard Business Review (September-October 1990): Granstrand, at 221 (1999); Knight, at 53 (2001).

[385] Granstrand, at 219-222 (1999).

[386] Interview data U.S (2004).

[387] "Stick licensing" (patent infringement likely) is generally more profitable and less difficult than "carrot licensing" (voluntary license) because in the former situation the licensee is typically in a poor negotiation position. All its investments may be lost if it does not take a license. (Alexander I. Poltorak & Paul J. Lerner, *Essentials of Licensing Intellectual property*, at. 45-47 (John Wiley & Sons, Inc 2004)).

licenses from other companies are, at least in theory, required in order to manufacture, sell and distribute these products. In sum, a company may easily be in a position in which it has developed the technology independently but finds out later that, in order to actually market and sell the product or use the process it needs a license from someone.[388] As a result, it is not only patent licensing combined with technology and know-how licensing, but also bare patent licensing that has gained in popularity in recent years[389]. Bare patent licensing means that the licensee obtains the rights but no other deliverables.

Markets for bare patent and patent licensing combined with a know-how license, for example, have intensified, but the question remains as to whether this has affected ICT companies' operations. Are business synergies about to change due to patents? Recognition of the licensing option is, in fact, evident from companies' internal reorganizations. Many ICT firms in the U.S. are currently in the process of establishing new, more aggressive licensing programs or modifying their existing licensing operations to make them more effective.[390] The change begins with modifying the patenting processes. In order to establish a successful licensing program a company needs to actively file for patents that "read on" technologies employed or potentially employed by its prospective licensees. It is not enough, for instance, to rely only on in-house R&D and other employees' invention disclosures, and only to patent those inventions. The patenting process has to be more interactive and more business-oriented, and claims should be drafted and amended with the strategic market potential in mind.[391] It is also possible to acquire patents through direct sales, which is an increasing trend according to the U.S. companies interviewed[392].

Another perceptible change in companies' operations relates to the licensing negotiation process itself. An example of a successful operational reform is when IBM simplified its licensing-negotiation processes in 1992. According to DePalma (2004), the company used to enter the negotiations with a huge stack of patents, claiming infringement of at least one of them and trying to get results by wearing down the opponent. After 1992, it focused on one patent claim at a time and demonstrated the infringement to the potential infringer in a simple way so that even non-engineers could understand it. The results were remarkable; IBM's licensing revenues went up from $150 million in 1992 to $800 million in 1995.[393] During 1999, 2000 and 2001 its yearly royalty rates were over 580 million dollars[394]. Asserting one's patent rights over someone, even competitors, and requiring licensing fees or for them to license their key technologies/patents in return may, however, turn out to be problematic in the prevailing business environment characterized by coompetition. Competitors in some fields may very well be business partners in another. Therefore infringement proceedings and licensing negotiations may affect a company's regular business

388 *See e.g.* Shapiro (2001).

389 Somaya, at 4 (2002).

390 Companies are establishing subsidiaries with the sole purpose of managing and licensing their technology, for example. Furthermore, many are using their technologies as the basis for new businesses and strategic alliances. (Parr, at 277-278, 2002).

391 *See e.g.* Stephen P. Fox & Guy J. Kelley, *Making Innovation Pay, Aligning Patent Rights with Business Strategy*, at 191-205; James Jorasch, *The Process Laboratory, Developing Business-Driven Patents in the Information Age*, at 139-156 (Both in Bruce M. Berman (ed.) *From Ideas in Assets, Investing Wisely in Intellectual Property*, Wiley & Sons, Inc. 2002).

392 Interview data U.S. (2004).

393 Vince DePalma (DMF & Associates), *Process Packaging Technology* (IP Society, Licensing Semiconductor IP Seminar, Palo Alto, 3 June 2004).

394 Somaya, at 4 (2002).

with that same partner.[395] This is a growing concern that needs to be addressed when a company is thinking about accusing someone of patent infringement.

In addition to the traditional technology-intensive firms that develop and produce products and services but also license technologies and patents to other firms, there appear to be more and more companies basing their entire businesses on licensing patents and/or patented technologies. Lemelson Medical, Education and Research Foundation, which has generated $1.2 billion revenue since 1988, and Ronald A. Katz Technology Licensing, which has received $350 to $450 million in licensing fees since 1994, can be mentioned as examples of companies in the licensing business.[396] These companies acquire "interesting" IP from other firms, but they may also have their own R&D activities for licensing purposes. They usually do not manufacture any products themselves. The challenge they face is to keep up with technological developments and to file patents covering inventions that will become pervasive in the future[397]. It is always difficult to predict the technology that will be adopted in five to 10 years, and without direct feedback from the marketplace it is even more challenging. However, according to one of the U.S. companies interviewed, close cooperation with the licensee gives a company some reference concerning a specific market and its future developments[398].

Another difficulty in the licensing business is to find potential and actual licensees, and if they are not already utilizing the invention, to get them to manufacture and market it so that a royalty stream can be expected in the long run. This means that the protected technology has to have value in the market place, and that the licensor must have a deep understanding of the licensee's business in order to be able to contribute to making the product line profitable. The risk is on the licensor's side, and his revenues depend on the licensee's willingness to employ, develop and market the technology instead of designing around the patent and choosing another technology.[399] One method of finding a customer base for licensing purposes is to do it the "Qualcomm way": there are multiple industry standards that incorporate Qualcomm's patented technology, thus licenses from Qualcomm are required in order to use them. A further possibility is to start "patent trolling", which has become common in the "down" economy. Patent trolls are organizations that purchase patents particularly from bankrupt firms, and then target companies whose technology these patents "read on". They use the threat of litigation to generate significant revenue streams from royalties.[400] Actually, even European companies that finance patent litigation in the U.S. have emerged. The idea is to file an infringement suit in court at first and then begin to negotiate, and settle the case with good profit.[401] The problem from society's perspective is

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395 Interview data U.S. (2004).

396 Brenda Sandburg, *You May Not Have a Choice. Trolling for dollars. Patent enforcers are scaring America and they are getting rich – very rich – doing it* (The Recorder, 30 July 2001), <http://www.phonetel.com/pdfs/LWTrolls.pdf> (last visited 6/21/05).

397 Companies utilize scenario processes to enhance the development of cognitive maps of possible future realities, and to further understanding of the fundamental drivers of business, markets and technological trends and changes. (Pia Hurmelinna, Jukka Bergman & Ari Jantunen, *Appropriability Strategy in Assessing Future Business Development. Case: Wireless Communication Technology* (International Journal of Learning and Intellectual Capital, 2004).

398 Interview data U.S. (2004).

399 Kent Richardson (Rambus, Inc), *Patent Licensing in the Semiconductor Industry* (IP Society, Licensing Semiconductor IP Seminar, Palo Alto, 3 June 2004).

400 Rice (2003). *See also* discussion in FTC, *Patent Reform Workshop*, *Litigation Panel* (2004).

401 *See e.g.* www.anadeus.com.

that these firms do not typically produce anything, so there is no technology exchange involved. It remains to be seen whether this business concept will prevail in the future.

As far as Europe is concerned, it has also been argued that European companies use patents actively in their businesses, and that they enforce their patents aggressively even if it is virtually certain that no actual infringement has taken place[402]. Yet, none of the 11 Finnish ICT companies I interviewed during spring 2003 was vigorously and continuously attacking its competitors or other companies by claiming infringement. They usually did not actively search for patent infringements, or react before patents were granted, and even afterwards it had to be likely that an infringement had actually taken place. If one was detected, they contacted the likely infringers politely by letter. They specifically avoided filing patent suits, and none of them had initiated a public patent litigation.[403] Taken as a whole, there are only approximately 30 to 40 patent disputes (not just infringement cases) in Finland every year, half of which are settled.[404] To give some perspective, 7,834 patents were granted in Finland in 2004[405].

On the whole, the interviewed Finnish companies drafted their patent applications with maximum protection in mind so that one patent would cover as much as possible. Portfolio building was preferred in order to avoid the limitations of single patents. Nevertheless, patents seldom established an actual monopoly position. They were thought to be crucial, however, if the company manufactured products incorporating standardized technology, and hence licensing/cross-licensing was mandatory. In this context, patents were assumed to affect the company's ability to maintain a competitive price. Nonetheless, according to the interviewees, they would continue to innovate although patent protection was not available.[406]

Efforts to license patents and to create a revenue stream had turned out in many cases to require too many resources compared to the incoming money flow. One Finnish company was actively setting up a patent-licensing program, however, and at the time of the interview had hired agents in other countries to find potential licensees. Thus far, it had only licensed two of its patents (no technology was involved). Generally speaking, licensing was an afterthought, and although the firms did pay attention to the licensing option when they made decisions about patenting certain inventions, most of them were not actively seeking to patent technologies that had licensing potential in the marketplace. In fact, nearly all of the firms considered patents a waste of time and money, and relatively unimportant to their companies' core operations.[407] Clearly, patent portfolios were not regarded as "profit centers". Actually, when comparing the European and U.S. litigation atmosphere, associated risks and costs, it is easy to understand why the threat of litigation is not nearly as effective in terms of reaching an agreement in European countries than it is in the U.S.

Most of the U.S. companies interviewed did not view patents as profit-generating assets either. One of them clarified the situation by stating that it did business by selling innovative

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402 Petri Fiilin, *Patentti osaksi strategiaa* (Fakta 2001).

403 Interview data Finland (2003).

404 Annika Havaste, *Patenttiriitojen määrä ja oikeudenkäyntikulut patenttiasioissa* (in Sampo Teollisuusvakuutus, Vastuutiedote 3/2001).

405 Patentti- ja rekisterihallitus, *Myönnetyt patentit* (2004) <http://www.prh.fi/fi/patentit/tilastoja/patentit.html> (last visited 6/21/05).

406 Interview data Finland (2003).

407 Interview data Finland (2003).

products, not patents, and that it already had a high profit margin to which licensing patents would probably not contribute appreciably. He added that many of the firms that currently had an active patent-licensing program were not successful with their core businesses: if you have a low profit margin, a very high profit margin from licensing is a good thing.[408]

(ii) Defensive Strategies

Although the trend is towards active and aggressive exploitation of patents, many U.S. and particularly European ICT companies do not consider them one of their key resources. They are rather acquired and used for defensive purposes.[409] The goal is to ensure the freedom to operate now and in the future, and to avoid infringement claims[410]. In fact, the avoidance of litigation also shows in these companies' own infringement surveillance. The interviewed U.S. companies that used patents defensively were not typically very active in detecting infringements or in accusing other companies of it. One of them explicitly mentioned that if there were an infringement it should be concerned with it would find out about it without making extensive monitoring efforts.[411]

The objective of guaranteeing companies' freedom to innovate may be accomplished by building large patent portfolios. Even though having patents does not necessarily provide absolute exclusivity over the technology in question, it gives some assurance that the company's products are proprietary, and that it is in a position to defend its business if the need arises.[412] Alternative technologies may also be patented so that others cannot prevent the firm from developing the patented technologies in the future. The further objective is to prevent other companies from producing functionally similar and thus competing products in the market place[413]. Indeed, according to Cohen, Nelson and Walsh's (2000), 81.8% of U.S. manufacturing companies file product patents for blocking purposes[414]. Furthermore, if a company is likely to infringe the patents of other firms, it customarily makes sure that it has patents that are or can be infringed by those firms[415]. This enables companies to achieve more leverage in potential licensing negotiations, and ensures that they are capable of defending themselves better in case of patent-infringement claims. In fact, in the ICT industry, defensive concerns are often the main reason for licensing patents from other firms[416]. Licensing/cross licensing or forming a patent pool offers a company "not to sue" coverage in relation to a particular technology, although such coverage can also be achieved by adding patent-peace clauses to licensing or other agreements. According to one of the U.S. interviewees, these terms are used especially in various open-source licenses. Patent peace means that if the licensee sues the licensor in relation to the licensed technology, he or she has the right to terminate the license.[417]

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408 Interview data U.S. (2004).

409 Rivette & Kline, at 3 (2000); Interview data Finland (2003); Interview data U.S. (2004).

410 Parr, at 282 (2002); Showalter & Baxter, at 6 (1999).

411 Interview data U.S. (2004).

412 Showalter & Baxter, at 6 (1999).

413 Knight, at 20 (2002).

414 Cohen, Nelson & Walsh (2000).

415 Rivette & Kline (2000); Showalter & Baxter, at 6 (1999); Miele, at 23 (2000).

416 *See e.g.* Washington CORE, at (2003).

417 Interview data U.S. (2004).

From a business perspective, a defensive, or offensive, strategy has become a must, especially in the U.S. where multiple companies have started to use patents offensively, where there is a huge number of patents, and where the culture is far more litigation-oriented than in Europe. Although the number of granted software and business-method patents declined slightly after the USPTO took action to improve the validity of granted business-method patents[418], companies need to be in a position in which it is easy to refuse licensing patents that are questionable or otherwise nonessential, and to be able to avoid expensive and time-consuming litigation and potentially high damages. There are numerous studies reporting that the direct and indirect costs associated with preparing, negotiating, filing, and litigating patent cases have risen over time[419]. In the U.S. the average legal fees for litigating a patent case through trial are at least $2 million per side[420]. Of course, most suits are settled, but this does not usually come to pass until each side incurs more than $1 million in direct legal fees and indirect expenses.[421] Litigation costs are not nearly as extensive in Europe[422].

Negotiation and litigation costs may become even more overwhelming, but how high is the risk of being sued? Has this changed over time? Most patents are never litigated. In fact, according to one estimate, approximately 1.1% of all U.S. patents are litigated[423] and the number of litigations per number of granted patents is going down. For instance, the average litigation rate for semiconductor manufacturers fell by five percent between 1973-1985 and 1986-2000. On the other hand, if the number of case filings is compared with R&D spending, a different pattern emerges: the average rate of litigation for manufacturers rose noticeably between 1973-1985 and 1986-2000. There was a 45% increase in the number of patent cases filed, and almost twice as many were under litigation per R&D dollar in the post-1985 period.[424] Furthermore, in addition to swelling the "regular" magnitude of patent litigation, the current economic slump has intensified rivalry: it has become an established part of e-commerce in recent years, for instance. Yahoo!, Microsoft, AOL and eBay have all been sued for patent infringement.[425] Moreover, despite the high litigation costs, it is not only large companies that sue other firms. ICT companies that are almost bankrupt do not have anything to lose, and litigation may be their last chance. Indeed, such companies have sometimes even been paid to start litigation. A firm claiming licensing fees from open-source software users, for example, is likely to be crucified in the media. It is definitely not an effective tactic for attracting more customers[426]. Hence, middlemen may be used to fight off competing products that are open-source based.

Does a defensive strategy work in practice? It certainly appears that way. According to Lanjouw and Schankerman (2003), the risk of being sued is lower if a company has a large

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418 Hall, at 4 (2003).

419 Rosemarie Ham Ziedonis, *Patent Litigation in the U.S. Semiconductor Industry,* at 204 (in Wesley M. Cohen and Steven Merrill (eds.) *Patents in the Knowledge-Based Economy*, National Academy Press, Washington, D.C. 2003, 180-216).

420 Vermont, at 335 (2002).

421 Vermont, at 328 (2002).

422 OECD, at 24 (1997).

423 Vermont, at 334 (2002).

424 Rosemarie Ham Ziedonis, at 202-203 (2003).

425 Riedinger (2000).

426 Steven J. Franck, *Will Patent Pillage Open Source?* (News.com, 16 April 2003) <http://news.com.com/2010-1071-996906.html> (last visited 6/21/05).

patent portfolio than if it does not. For a small, unlisted U.S.-based company with a small portfolio of 100 patents, the average probability of litigating a given patent is two percent. For a similar company but with a moderate portfolio of 500 patents, the figure drops to only 0.5 percent. In addition, patent owners who are large relative to the disputants may be able to avoid litigation more effectively, or to reach agreement more easily in licensing negotiations than smaller companies.[427] Although it is difficult to measure whether someone has actually been discouraged from claiming patent infringement because of a company's patent portfolio, this was also the firm belief in the U.S. companies interviewed. The ability to cross-license was also claimed to have saved millions of dollars in direct-licensing fees.[428]

However, the "counterclaim strategy", optimally resulting in a win-to-win cross-license, is not viable against pure patent-licensing companies or companies operating in another line of business. They do not have operations that could infringe someone's patents and thus give them a strong negotiating position. Moreover, the lack of an operational side makes it difficult to settle a dispute on the basis of a "business solution".[429] According to the interviewees, patent-infringement claims can come from anyone nowadays, not only from competitors or someone in their value network. In fact, during the last five years more and more letters claiming patent infringement have been pouring in. This poses further challenges, particularly in terms of the patent strategies of so-called deep pockets.[430] However, small firms that do not have the resources to defend themselves against patent infringement claims may also be chosen as targets for demonstration purposes[431]. If infringement is claimed, the associated costs can easily wipe out the entire company.

Developments in intellectual-property insurance markets may very well improve the position of small companies in the future. Although IPR insurance markets are still undeveloped in Europe[432], the U.S. insurance business is broad-based and many companies offer protection against loss due to patent infringement. Liability insurance, which protects the insured against infringement claims by patent holders, is also widely available.[433] The latest development in this sector is that insurance is offered to Linux-using companies as "protection" against potential patent lawsuits. It has been claimed that there are 283 U.S. patents that are potentially infringed by the Linux operating system.[434] Nevertheless, it is unlikely that Linux-backing companies such as Hewlett-Packard, IBM, Novell and Oracle would assert these claims, but Microsoft owns 27 of the patents[435].

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427 Jean O. Lanjouw and Mark Schankerman, *An Empirical Analysis of the Enforcement of Patent Rights in the United States,* at 147-148 (in Wesley M. Cohen and Steven Merrill (eds.) *Patents in the Knowledge-Based Economy*, National Academy Press, Washington, D.C., 2003, 143-179).

428 Interview data U.S. (2004).

429 Rice (2003). *See also* Somaya, at 15 (2002).

430 Interview data U.S. (2004).

431 Jaffe & Lerner, at 13-14 (2004).

432 *See e.g.* Mette Gortz & Merete Konnerup, *Welfare Effects of Patent Insurance – Microeconomic Evaluation and Macroeconomic Consequences* (Policy Modelling for European and Global Issues –conference, Brussels, June 2001).

433 *See e.g.* William N. Hulsey, *Patent Insurance Can Guard Intellectual Capital, Policies Can Help Cover the Costs of Litigation on Either Side of the Infringement Issue* (Austin Business Journal, 12 June 1998) <http://austin.bizjournals.com/austin/stories/1998/06/15/focus3.html> (last visited 5/21/05).

434 Stephen Shankland, *Group: Linux Potentially Infringes 283 Patents* (CNET, News.com, 1 August 2004) <http://news.com.com/Group%3A+Linux+potentially+infringes+283+patents/2100-7344_3-5291403.html> (last visited 6/21/05).

435 Charles Babcock & Larry Greenemeier, *Open Source Stress* (InformationWeek, 9 August 2004) <http://www.informationweek.com/showArticle.jhtml?articleID=26806464> (last visited 6/21/05).

It is also typical for Finnish ICT companies to acquire and use patents for defensive purposes. According to my interview data, patents are applied for in most cases to ensure that a company is able to compete in certain markets in the future, even if someone terminates "the gentleman's agreement" and starts to use its patents offensively. It is assumed that the experience and the information about competitors and other relevant firms gained through patent activities function as insurance for "difficult times". To some companies, patenting was a numbers game particularly in relation to their main competitors. Nevertheless, they seemed to be selective about the inventions they filed patents for: not even half of the inventions that were reported to the employer were patented, and over 90% of the patent applications that were filed were issued in some form.[436]

Regardless of "the freedom to operate" perspective, the interviewed companies focused mainly on their own R&D development and patented only inventions they thought would be useful for their core businesses. They did not seek to patent entire technological fields, or constantly try to direct their patenting behavior to their competitors' R&D fields, for instance. Competitor location was certainly an element that was taken into account when decisions were made about the countries a patent/patent family should cover. Moreover, some Finnish companies applied for patents in the U.S. even though their primary operational area was elsewhere. They did this because software markets have no limits and they had realized that firms in the U.S. exploited their patents in a more active manner than Finnish companies in particular.[437]

While Finnish companies were preparing themselves for war by collecting weapons and comparing their resources to those of their competitors, they were passive in exploiting their patents. Relatively few patented inventions were actually used in their products, and only a few patents were licensed out. Nevertheless, most patents remained in force. It was very difficult to predict which of them might be valuable in the future, and if cost were not a concern, even more relatively unimportant patents would be renewed. As far as detecting infringements was concerned, surveillance was focused on the most important patents and on the company's main rivals.[438] Consequently, small firms and those operating in other lines of business were often relatively free to infringe until they increased in size or entered relevant markets and were therefore considered threats.

The problem with implementing a purely defensive strategy in an environment in which nobody uses patents actively and in which the risk of being sued is low is that it is challenging to prove that patenting actually saves costs. Patents are company assets and they should be used efficiently to benefit the shareholders: it is wasteful if most of them are not utilized. Of course, it is not easy to establish a licensing program or to start to use patents more actively in other ways. This requires, above all, changes in attitudes, in patent practices and possibly even in organization structure. Based on the interviews of Finnish companies a trend towards the more active exploitation of patents seems nevertheless to be on its way[439].

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436 Interview data Finland (2003).

437 Interview data Finland (2003).

438 Interview data Finland (2003).

439 Derived from the Interview data Finland (2003).

(iii) Transactional Strategies

Patents have become important for transactional purposes, including attracting capital funding and prospective partners. Investors have started to pay a lot of attention to whether a company has protected its key innovations before making decisions about granting it financing. It is essential from an investor's viewpoint that a company in which it invests has a secure and defendable position in the market, and that it is able to form partnerships with other companies and thus has access to external resources. Patents also have their value in exit scenarios. A start-up company usually has two exit possibilities: some of it could be sold on the public market through an initial public offering (IPO), or it could all be bought by another company. In either case its patent portfolio affects its value.[440]

It has been argued that venture capitalists do not usually consider the quality of company patents, but their mere existence and quantity are decisive factors[441]. It has to be noted, however, that investors in the U.S. seem to have become more careful when estimating the value of software and business-method patents after the dot-com bubble burst, and their quality has been questioned by academics, the USPTO, the Federal Circuit and Congress. It is no longer the mere existence of patents that makes a difference when companies are raising capital. According to Shelby (2003), companies should expect to have their intellectual property protection measures questioned and second-guessed by investors.[442] In fact, the change from a numbers game to a quality game is also relevant in the context of patent licensing/cross-licensing. The method of valuing a company's patents based on the height of the stack is about to become extinct: it is the technology and what is protected that matter, not the number of patents involved. Quality is appreciated more than quantity[443], although quantity may have other functions, such as discouraging competitors from entering certain markets and reducing the incidence of infringement as explained above. Even a questionable patent can proof very valuable to a firm.

Some small Finnish ICT firms that were interviewed had filed patents for the purpose of attracting investors. They were thought to enhance their negotiation position when financing or partnering was desired, and for small start-up companies, even a single pending patent application was assumed to be better than just a good business idea. Moreover, their counterparts, some fairly large companies, affirmed that they considered patents when they made decisions about buying or partnering with a start-up. On the other hand, one company pointed out that they had changed their policy in this respect: they used to require start-ups to have a patent/patents, or to have filed for one before they came to present their business ideas. Nowadays, this company is not so concerned about patents, but it is not willing to enter into non-disclosure agreements either. It would be challenging to know whether equivalent inventions have already been developed within the company itself.[444] Thus, having a patent or a pending patent application may proof essential for the purpose of being

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440 Showalter & Baxter, at 6-7 (1999); Washington CORE, at 4 (2003); Ron Corbett, *IP Strategies for Start-up eCommerce Companies in the Post-dot-bomb Era* (Texas Wesleyan Law Review, Issue 8, 2002, 643-663); Rice (2003).

441 *See e.g.* Zachary Roth, *The Patent Bubble* (Washington Monthly, June 2005) <http://www.washingtonmonthly.com/features/2005/0506.rothsidebar1.html> (last visited 29/9/05).

442 Jeffrey Shelby, *Business Method Patents and Emerging Technology Companies,* at 116,118 (CASRIP Publication Series: Reconciling Int'l property, No. 7, 2001). <http://www.law.washington.edu/casrip/Symposium/Number7/3A-Shelby.pdf> (last visited 6/21/2005).

443 Ron Laurie (Inflexion Point Strategy, Inc), *IP Valuation – Magic or Myth* (IP Society, Intellectual Property Issues in M&A Transactions Seminar, Palo Alto, 29 April 2004).

444 Interview data Finland (2003).

able to discuss about the invention freely[445]. The U.S. companies also mentioned that, although patents were not typically the only basis for an acquisition, they were a concern that needed to be addressed. They could also turn out to be a very big problem if the company to be acquired had been sued for patent infringement: it could turn a cost-effective acquisition into a very expensive mess.[446]

Because the number of patents is often thought to be one sign of innovativeness, quantity may have status value also to large companies and it can indirectly affect investor preferences. Those with their eyes on technology leadership in particular appreciate them for this reason. Hence, it may be important to them that the name of the company shows in the patent statistics.[447] Of course, a company's entire patent strategy is an element that affects its brand. In addition, many consider patents a sign of a good, even cutting-edge, technology, and U.S. companies in particular tend to mark their products with a "patented" or "patent pending" sign. The marking of products indicates also that the company intends to protect them and the new features incorporated into them from imitation. According to one of the U.S. companies interviewed, however, putting patent notices on products is an administrative and a very time-consuming process.[448] For this reason many companies choose not to mark their products, even though making sure that patents are mentioned also has legal significance: if they are not mentioned, it is not possible to demand damages for infringement that took place before the potential infringer was adequately informed of the patent (35 USC § 287). Patent markings for such a possibility are not required in Europe.

The interviewees were asked about patents as status elements, and whether they were mentioned in their marketing: the Finnish ICT companies did sometimes bring up the number of patents in their investor correspondence, but they were seldom mentioned in the marketing. Many firms actually pointed out that bringing up the fact that the company had patents might have a negative connotation since they are generally opposed on the grassroots level. In spite of this, one of the companies did continuously refer to its "patented technology" in its marketing information. It was hoped that patent marking would alarm potential competitors.[449]

The U.S. companies also recognized that patents may have a negative connotation, but they were not as concerned about it as the Finnish companies. They thought of patents as part of the business, necessary for protecting design freedom and preventing slavish copying. In the view of one company, people who believed that patents were "bad" were probably not educated enough to realize that having them and using them were two different things.[450] Indeed, as IBM and Sun have recently demonstrated, firms may even be willing to "donate" their patents to be used for free in open-source projects, for instance[451]. Actually, a separate patent commons project designed to increase the utility of the growing number of patent pledges and promises that have been made in support of open source software and open

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445 *See also* Knight, at 66-67 (2001).

446 Interview data U.S. (2004).

447 Interview data Finland (2003).

448 Interview data U.S. (2004).

449 Interview data Finland (2003).

450 Interview data U.S. (2004).

451 *See e.g.* Robert McMillan, *Developers Voice Mixed Reactions to IBM Patent Policy* (InfoWorld, 12 January 2005) <http://www.infoworld.com/article/05/01/12/HNpatentreaction_1.html> (last visited 6/21/05); Paul Krill, *Sun Introduces OpenSolaris, Releases 1670 Patents* (InfoWorld, 25 January 2005) <http://www.infoworld.com/article/05/01/25/HNsunsolarispatents_1.html> (last visited 6/21/05).

standards has been established. It provides a central database that comprises of these promises, pledges, covenants and other legal undertakings that have been made by its contributors.[452]

(iv) The "No Patents" Strategy

An alternative or a complement to the offensive, defensive and transactional strategies is to have no patents. Copyright protection added to lead-time and secrecy might be enough to gain competitive advantage, especially in markets in which only a few companies have patents. Further, if it is not easy to detect a patent infringement, if the technology is most likely to be short-lived, or then if the invention is clearly company-specific and has no value to others, patenting may not be a viable option although it was possible.[453] In fact, in many European software firms patents' role could be described as peripheral. There are certain characteristics that pinpoint this marginal role in some ICT business models.

Firstly, the significance of the technology in the business and whether the company aims at technological leadership are decisive in assessing the value of patents to a firm. One of the reasons why they were not thought to be essential in the Finnish companies I interviewed was that they projected the profile of a "customer-oriented service company" rather than a "technology-oriented manufacturer". Although technology was the enabling factor in their operations, their core competitive advantage resided not in the technology, but in the service.[454]

Another factor that affects the role of patents is related to make-or-buy decisions. This applied to some of the Finnish companies interviewed, which licensed in a large share of the technologies they provided their customers with. Since it was generally thought among these companies that patents went hand in hand with their own R&D activities, patents were not a major concern for them.[455]

Software companies producing mainly tailor-made software form the third category of companies for which patents are often not crucial. According to the interviewees, patents added no value for their clients in these cases. It was assumed, however, that they might be somewhat useful if the company had software components it could use as a platform for various applications, or if it manufactured off-the-shelf software products. Nonetheless, short product cycles at the side of application procedures that could last from two to four years were believed to diminish patent usefulness even in this context. Then again, for some companies, software, whether tailor-made or not, was not the most important part of the transaction. It was more important to enhance the lock-in effect and thus secure after-sales-services such as maintenance.[456]

It is not only the role in-house technology plays in a company's business, but also knowledge about patents, attitudes towards them and what competitors do that affect their assumed value. In Finland many software companies, and software engineers in particular, are against patenting and in favor of the free exploitation of others' ideas, and it is rare for

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[452] *See* Patent Commons Project <www.patentcommons.org> (last visited 9/30/05).

[453] Derived from Interview data Finland (2003); Interview data U.S. (2004).

[454] Interview data Finland (2003).

[455] Interview data Finland (2003).

[456] Interview data Finland (2003).

these companies to have more than a couple of patents. In fact, it became obvious in the interviews that Finnish software companies are accustomed to dealing with copyright protection rather than patents. Copyright formed the basis of their contracts and other activities.[457] This also seems to be the case in other parts of Europe. For instance, Blind, Edler, Nack and Straus's (2001) research results indicate that small IT companies are particularly reserved about the benefits of patent protection and simply do not apply for patents regardless of the amount of their R&D investments.[458]

Nevertheless, patents should not be irrelevant to these firms. Although other companies may only have a few relevant patents in a particular market, problems may very well arise when companies extend their operations to other countries or start to use the Internet as a distribution channel. Moreover, even if they base their business partly or entirely on technology licensed from other firms, third parties may well have patents covering the technology. It is therefore essential that the licensor bares the responsibility for potential infringement claims[459]. Other firms 'patents may very well be of essence to firms that do not need their own, and for these companies the "no patents" strategy could be a viable option.

What the "no patents" strategy could mean in practice is that a company acknowledges the existence of patents and plans its operations accordingly. It respects the rights of others and takes the infringement risk into account in its contract practices, its insurance policy and its potential alliances, but does not consider it worthwhile to file or acquire patents even for defensive purposes. One way of averting the risk that someone else will patent the same invention is to publish early, and the threat of infringement claims could be reduced by incorporating "infringement check-points" into process/product-development processes. Then again, if the technology is acquired from someone else, the other party should be asked whether it is aware of any patents that may cover the technology, and what it has done to reduce the infringement risk. It would be valuable to be able to ascertain that there are no patents covering a certain product, process or technology.

There are organizations other than companies for which patents have no direct value. A "no patents" strategy could very well suit research institutes and universities, which generally have the goal of adding to public knowledge. However, the trend for universities in the U.S. in particular is to patent their inventions, license them to companies and hence create a revenue stream for themselves[460]. This trend is starting to affect thinking in European universities and research institutes too. Separate technology transfer units have been

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457 Derived from the Interview data Finland (2003).

458 Blind, Edler, Nack & Straus (2001).

459 In the context of open-source software, for example, in addition to other insecurities inherent in these licenses, it is possible that third parties have patents relating to software licensed under open-source terms, and there is usually no one who takes responsibility for potential legal problems. It is also possible that parties that have contributed to the development of the code and licensed their contributions under the same terms have patents/patent applications that cover their contributions. Furthermore, although approximately half of the open-source licenses do not contain any patent terms, it is not advisable to claim patent licensing fees from future developers once the contributor has allowed the licensees to believe that they actually have permission to use, develop, and distribute the software under the terms defined. In fact, if earlier contributors have patents that cover the software, implied licenses may come to play. Naturally these patents can be used against other applications covered by the patent claims.

460 David A. Mowery, Richard R. Nelson, Bhaven N. Sampat & Arvids A. Ziedonis, *Ivory Tower and Industrial Innovation. University-Industry Technology Transfer Before and After the Bayh-Dole Act,* at 1-2 (Stanford Business Books 2004). *See also* Megantz, at 95-97 (2002).

established, and the legal and regulatory framework has been updated.[461] For instance in Finland a new Act on University Inventions has been introduced. In general, it is regarded essential to stimulate collaboration between universities and the industry, technology transfer and commercialization of university-born inventions.[462] Although it is always helpful for society if universities are able to attract extra financing, in my view it is rather controversial to restrict the flow of information, especially if these institutions are government funded, and if we are talking about software the field in which companies further investments are typically not as extensive as they are in biotechnology or pharmaceutical industries, foe example. Of course the argumentation is that patents make transactions simpler, and if exclusive or non-exclusive licenses can be granted, inventions have more potential to be developed into innovations[463]. On the other hand, as already mentioned, filing patents and granting licenses only to a restricted number of companies may hold back the utilization of that information by others[464]. Moreover, based on my experience researchers often have an agenda to publish their research results as early as possible, and are not keen on keeping their inventions secret until the patent application has been filed, as is required in Europe.

What the "no patents" strategy does not mean, however, is that the company has not acknowledged the existence of patent protection and considered whether patenting could benefit its operations in some way. During the course of this research, some of my and Olli Pitkänen's students conducted interviews in eight Finnish ICT companies that had no patents. They asked why they did not think patenting was worthwhile, and the typical answer was that the company was simply not interested, and that it could not care less about others' patents. The attitude towards patents and their benefits was cynical. Some interviewees also assumed that computer programs were not patentable in Europe and, in general, knowledge about patent protection varied. One company representative stated explicitly that they were not familiar with the patenting process and would not be able to recognize patentable inventions. Since employees have seldom worked in companies in which patents have a significant role, there is no tacit patent tradition that could be passed on. In fact, patenting was also a relatively new phenomenon for many of the bigger Finnish companies that I interviewed: in many cases the first patents had been applied for in the 1980s. Among the reasons mentioned for the change in patenting behavior were the deregulation of national monopolies in the communications sector, and encounters in international markets.[465] In fact, taken as a whole, only a few of the Finnish companies interviewed had the type of patent activities that could be called a patent strategy, and relevant matters were often determined case by case. There was no continuity or clear guidance for possible future situations. This is natural, of course, since most of the companies had no or very few patents.

From the interviews with the Finnish ICT companies, the "no patents" strategy sounds hypothetical. Nonetheless, it does exist in practice, although I have not seen it referred to by that name. One of the U.S. companies interviewed could be mentioned as an example of a

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461 *See e.g.* OECD, at 19-20 (2004); Commission of the European Communities (EC), Communication from the Commission, *The Role of Universities in the Europe of Knowledge* (COM(2003) 58 final, Bruessels, 5 February 2003) <http://europa.eu.int/eur-lex/en/com/cnc/2003/com2003_0058en01.pdf> (last visited 10/3/05).

462 *Hallituksen esitys Eduskunnalle laiksi oikeudesta korkeakouluissa tehtäviin keksintöihin sekä laiksi oikeudesta työntekijän tekemiin keksintöihin annetun lain muuttamisesta* (HE 259/2004); OECD, at 19-20 (2004); EC, *The Role of Universities in the Europe of Knowledge* (2003); Arundel & Patel, at 9 (2003).

463 Mowery, Nelson, Sampat & Ziedonis, at 2 (2004); Arundel & Patel, at 9 (2003).

464 Mowery, Nelson, Sampat & Ziedonis, at 1 (2004).

465 Interview data Finland (2003).

company with such a strategy. This company was providing its customers with technology developed by others and it did not have any patents of its own. It had considered the option of developing its own technology and a patent portfolio, but chose not to at the time. Its policy was rather to use others' technology, and if it were to develop something inventive itself, publication could very well be the way to go. As far as licensing in was concerned, it demanded that every contract it made with technology suppliers had a "non-infringe, you will defend, you will indemnify and hold harmless" clause. The aim was to redirect the responsibility for potential legal problems to a larger company with the resources to fight in court.[466]

Although the "no patent" strategy should be recognized, it is not likely to become the mainstream trend of the future. At the moment, as explained earlier, European ICT companies are rather becoming more interested in patents as a means of appropriating returns on R&D investments, and even small and medium-sized firms are developing their own strategies.[467] Furthermore, as ICT companies acquire knowledge about (software) patent protection and traditions, software companies are also likely to become more interested. Then again, in the U.S. patents are currently viewed as one of the most important intellectual property right even in the software industry. Trade secrets are slowly losing their appeal due to the inherent difficulty of keeping things a secret[468], and further because protecting the source code no longer gives the competitive advantage it used to as the bargaining power of customers has increased. Copyright protection has also turned out to be a fairly limited measure[469]. Indeed, U.S. companies realized long ago that they needed to acquire patents and to develop a patent portfolio. Naturally, fast development and short product cycles reduce their value in many cases[470], although in the case of software, although new versions come out every few years and names change, the same code base can be used for decades[471].

If the trend towards weaker patent protection becomes prominent particularly in the U.S., the value of patents will probably diminish, which in turn may force companies to reassess their patent activities. Moreover, as the open-source and other open-licensing models become more popular, and as firms start to utilize the Internet's highly interactive nature to their benefit, a "no patents", strategy particularly as a dual strategy applied to certain products and processes, may become more appealing: copyrights are usually enough to maintain an appropriate level of control over the distribution and modification of software and to recoup derivative improvements made to the code. Naturally, the maturation of ICT, increasing service-orientation and commoditization of technologies do also affect the availability and importance of protecting the technologies by patents, and therefore "no patents' strategy may assume more applicability in the future. Of course there is nothing to prevent a patent holder from licensing its patented inventions without charge or for a low price, and under a non-restrictive license, if this benefits its business, either. As one of the interviewees stated, the existence and use of patents are two different things[472]. A company may seek to enlarge its current markets or to create future markets by promoting the use of

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466 Interview data U.S. (2004).

467 *See e.g. Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under Article 81,* at 18 (2001); derived from Interview data Finland (2003).

468 Reichman, at 26 (2001); OECD, at 15 (2004).

469 Rice (2003); Graham & Mowery, at 225-226 (2003).

470 FTC, at Chapter 3, 55 (2003); Interview data Finland (2003).

471 Interview data U.S. (2004).

472 Interview data U.S. (2004).

its technology, in which case a low or zero price might encourage other companies to adopt the technology. Thus, it is the company's technology that becomes widely used, and the company is in the best position to offer services and other requisites related to it.[473] In the today's business environment, having patents may also prove more efficient from a defensive perspective than relying on partnering or litigation insurance, and in the case of software, copyright protection. In fact, even if a company's business model is such that patents are not vital for protection or licensing purposes, they may still be critical for defensive reasons, particularly if it operates in the U.S. In fact, some open-source companies have recently joined corporations utilizing open-source software, but at the same time known to have large patent portfolios, in the patent race. Linux and open source provider Red Hat, for one, has started to acquire patents for defensive purposes[474].

(v) Implementation of Patent Strategies

Patent strategies are not effective unless they are implemented appropriately. If a company has intended patents to be an essential part of its business operations, the strategies should be integrated into its other strategies and practices, and its organizational structure has to facilitate the implementation of the strategy. In fact, some U.S. companies have tended to modify their organizations so that patent and other IPR activities are no longer managed merely through the legal/IPR departments and, to some extent, R&D, but are better integrated into all its functions[475]. This change is illustrated in two— the old and the new— organization charts presented below. It has also become popular in the U.S. to separate intellectual properties altogether from other corporate liabilities, and even to form IP holding companies.[476] For instance, Hewlett-Packard has created a holding company for managing its IPR strategy and increasing the visibility, coordination and control of its IP assets[477].

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[473] *See e.g.* Shapiro & Varian, at 292-294 (1999); Teece, at 143 (2000).

[474] Red Hat, Inc, *Statement of Position and Our Promise on Software Patents* (2004) <http://www.redhat.com/legal/patent_policy.html> (last visited 6/21/05).

[475] Rivette & Kline, at 90-91 (2000).

[476] The aim is usually to reduce federal and state taxes. Typically the parent company creates a corporate subsidiary in a state or in a foreign country where low or no taxes are imposed (e.g., Delaware, Nevada, Bahamas, Cayman Islands). The company's intellectual property is created by or transferred to the subsidiary and the subsidiary licenses these rights to the parent corporation and to other companies. (Kara K. Smith & Duane K. Schroeder, *Intellectual Property Holding Companies Can Create Significant Tax Savings and Protect Valuable Assets* (Fredrikson & Byron P.A., April 2003)) <http://www.fredlaw.com/articles/ip/inte_0304_kks.html> (last visited 6/21/05)).

[477] HP, *Intellectual Property Licensing* <http://www.hp.com/hpinfo/abouthp/iplicensing/> (last visited 6/21/05).

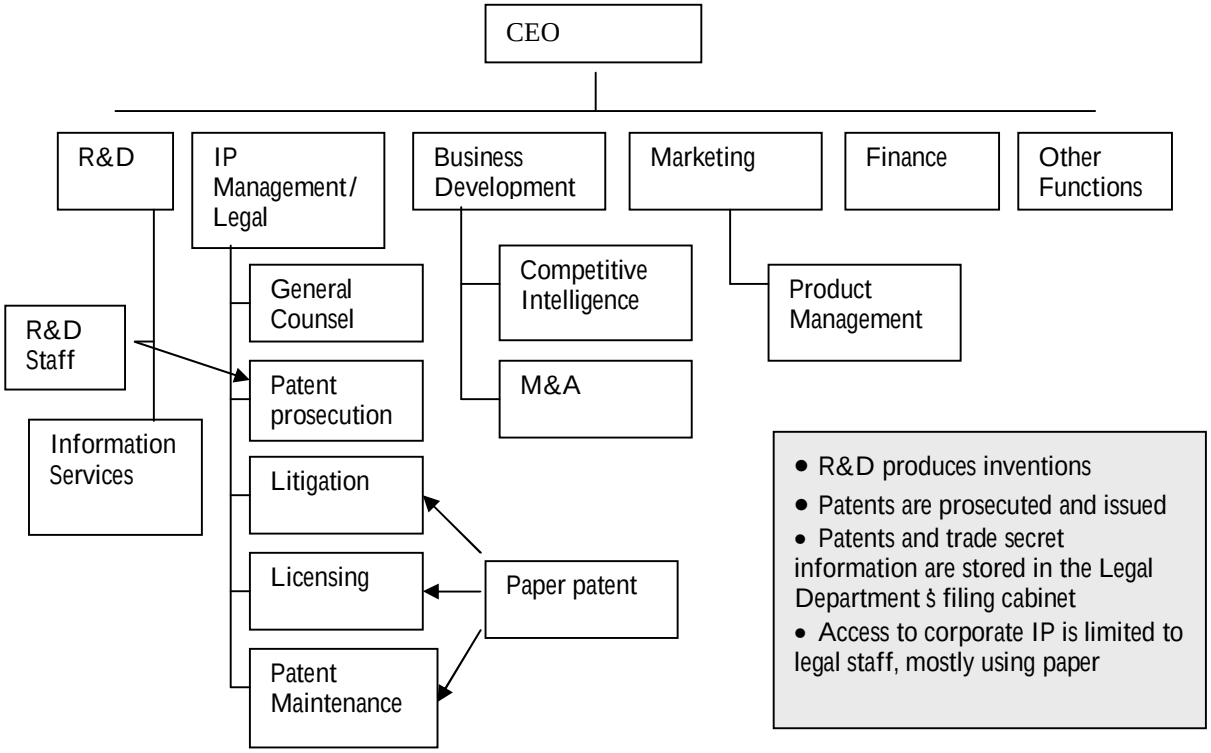

FIGURE 6. THE OLD ORGANIZATION CHART[478]

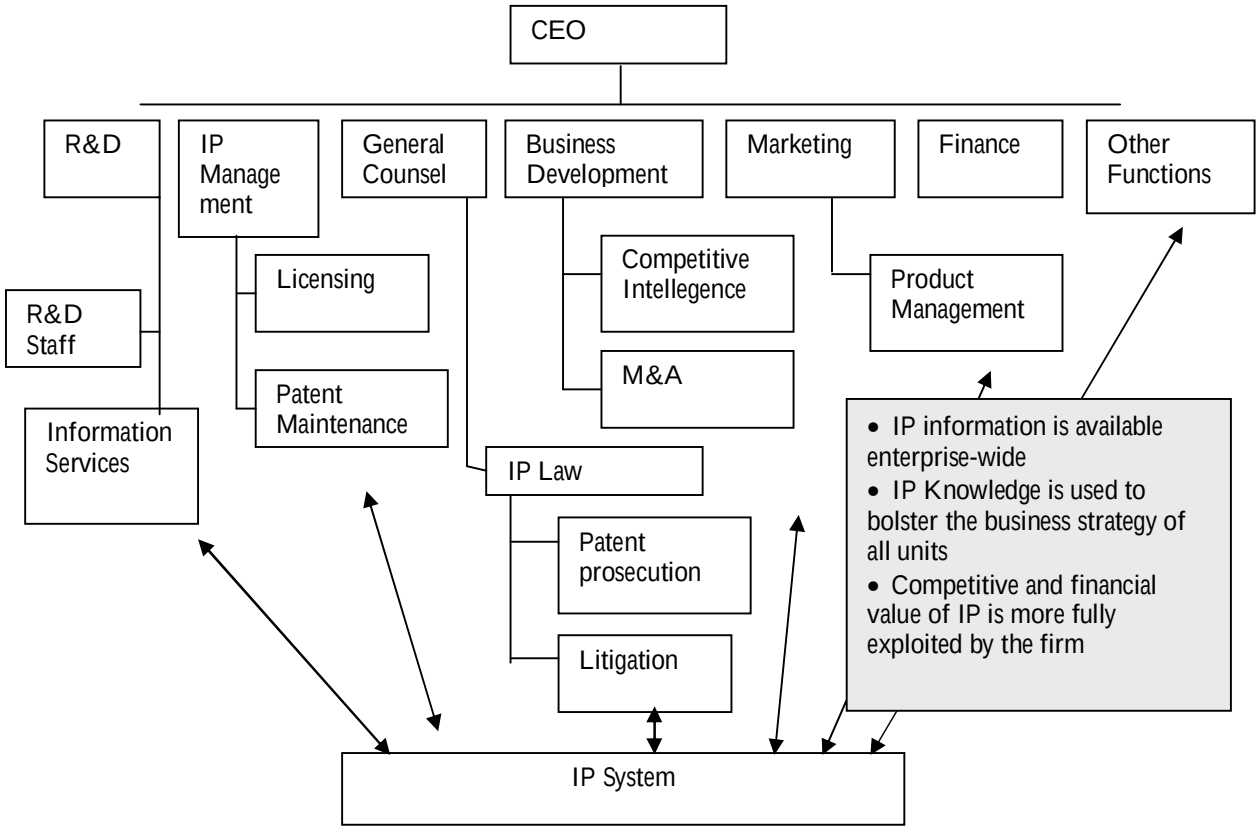

FIGURE 7. THE NEW ORGANIZATION CHART[479]

[478] Rivette & Kline, at 90 (2000).

[479] Rivette & Kline, at 91 (2000).

Many of the U.S. firms interviewed preferred a hybrid organization structure that combined characteristics of the old and the new models: the patent strategy was typically developed/accepted by the CEO and implemented by the legal department, the R&D departments, and special cross-functional patent committees formed in order to evaluate whether something was worth patenting. Some of the interviewees were of the opinion that the patent strategy should be closely, although not necessarily inextricably, tied to the business strategy, so that it was somewhere between an integrated part of the business strategy and separate from it.[480]

Then again, the link between the business and patent strategies was often non-existent in the Finnish companies. Patent activities were usually managed independently through legal or special IPR departments if the company was big enough to have one, and only major changes in business strategy resulted in changes in patent strategy. Sometimes patent activities were managed mainly through R&D departments, and central management was to a large extent not involved. The situation was different in small companies, where patent-related activities were deeply integrated into its operations, which were managed from one facility making communication between the partners and the few employees easy. In general, patents were not a main concern in the planning and amending of the business strategies.[481] Taken as a whole, Finnish ICT companies tended to have a traditional organization structure that accommodated the approach to patents it had adopted. If companies are willing to develop their current practices so as to give patents a more active role in their businesses in the future, organizational changes are likely to lie ahead.

B. STANDARD SETTING AND THE STRATEGIC USE OF PATENTS

Standard setting has its advantages, especially in an environment in which network effects are strong. Making sure that everyone is able to use the same communication protocol, for example, makes it possible for the various products to interconnect so as to ensure that there are complementary and interoperable products and services on the market. Indeed, standards development is essential, particularly in the digital economy: electronic payments systems, security and its service infrastructure, digital-rights management systems and high-speed network technologies all require them[482].

Consumers and manufacturers clearly profit from standards setting. Products are more useful from the consumer's point of view because there are more users with whom to interconnect, and the risk of choosing the "wrong" technology diminishes. Standardization provides consumers with reasonably priced products that are interoperable and interchangeable, which in turn accelerates the acceptance of a new technology.[483] Then again from manufacturer's viewpoint the setting of a standard allows it to have immediate access to a larger customer base than it would have without it[484]. In other words, standards define what is required to serve the market, allowing competition to take place on the

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480 Interview data U.S. (2004).

481 Interview data Finland (2003).

482 Janice M. Mueller, *Patent Misuse Through the Capture of Industry Standards* (Berkeley Technology Law Journal, Volume 17, Issue 2, Spring 2002).

483 Shapiro & Varian, at 233 (1999); Teece, at 141 (2000).

484 Teece, at 141 (2000).

implementation level[485]. Thus, standardization can promote competition and innovation among producers, and lower barriers to international trade. However, it may also restrict competition by reducing variety.[486]

Standard setting can be private, public or semi-public, open or proprietary, national or international. Openness in this context means that everyone is able to participate the standards setting process and the technology is available for everyone to use, not that there is no proprietary technology involved. Hence, using the standardized technology may require licensing.[487] Patent-free standards have traditionally been preferred[488], however, with a view to ensuring their success and promoting their use.

Public standardization is the responsibility of governments or official organizations. The European Telecommunications Standardization Institute (ETSI), the American National Standardization Institute (ANSI) and the International Telecommunications Union (ITU) are examples of these official bodies.[489] The emphasis in the following is on potential patent strategies in the context of open standards set by different standardization organizations. It is not only product interoperability, however, that is driving standard setting, but also public health and safety, as well as global competitiveness[490]. The focus here is on interoperability or compatibility standards, which define the format for the interface between the core and complementary goods[491].

In choosing a standard it is important to be aware of all the IPRs involved, and at least to try to guarantee that everyone is able to use the standardized technology. It is for this reason that many standardization organizations have an explicit IPR or patent policy that more or less obligates companies taking part in the standard setting to disclose their essential patents, and to license them for royalty-free or on reasonable and non-discriminatory terms[492]. Since patent-free standards may be preferred in many cases[493], disclosure may negatively affect what technology is chosen as a standard, and companies may therefore have an incentive to hide their patents. Failing to disclose patents related to the technology in question could also be accidental: this is considered very probable especially for large companies with large patent portfolios. Going through the portfolio is time consuming and expensive.[494]

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485 Scott K. Peterson, *Consideration of Patents During the Setting of Standards*, at 1 (For FTC and DOJ Roundtable, Standard Setting Organizations: Evaluating the Anticompetitive Rules of Negotiating Intellectual Property Licensing Terms and Conditions before a Standard is Set, 6 November 2002); Knut Blind, Rainer Bierhals, Nikolaus Thumm, Kamal Hossain, John Sillwood, Eric Iverser, Rik von Reikum & Bruno Roxius, *Study on the Interaction between Standardization and Intellectual Property Rights*, at 43 (EC Contract No G6MA-CT-2000-02001, 2002).

486 Mark Shurmer & Gary Lea, *Telecommunications Standardization and Intellectual Property Rights: A Fundamental Dilemma?,* at 51 (StandardView, Vol. 3, No. 2, June 1995, 50-59).

487 *See e.g.* Rahnasto, at 186-197 (2003).

488 Steven J. Frank, *Can You Patent An Industry Standard?*, at 14 (IEEE Spectrum, March 2002, 14-15), Mueller (2002); Mark A. Lemley, *Intellectual Property Rights and Standard Setting Organizations*, at 25 (UC Berkeley Public Law and Legal Theory Research Paper Series, Research Paper No. 84, 2002).

489 Rahnasto, at 186 (2003).

490 Mueller (2002).

491 Teece, at 140 (2000).

492 *See e.g.* Frank, at 14 (2002); Lemley, at 23 (2002).

493 Frank, at 14 (2002); Mueller (2002); Lemley, at 25 (2002).

494 Sarvas & Soininen (2002); Jason Kipnis, *Beating the System: Abuses of the Standards Adoption Process,* at 104-105 (IEEE Communications Magazine, July 2000, 102-105).

The obligation to disclose essential patents does not necessarily cover pending patent applications, especially unpublished ones[495]. Since standard setting takes a long time, many years in some cases, companies usually continue to file patent applications throughout the process. They may also modify their existing applications so that their claims cover the standard better.[496] The more patents companies have covering standards essential features, the fewer licensing fees they have to pay to others in case the standard is royalty-bearing[497]. Having patents in standardized technology can also be a valuable source of royalties.

If there is no obligation to disclose pending patent applications, waiting until the standard is set before allowing a patent to be issued does not typically constitute a policy breach[498]. Moreover, since the early disclosure of patents and patent applications can lead to a different standard being set, it is even more probable that many patents surface after it has been agreed upon if the obligation to disclose does not continue throughout the process. Once the standard has been widely implemented it is very difficult to design around a patent or change the specifications. In the worst case, the licensing fees charged after the standard has been established are so high that the only way out is to abandon the standard. One solution is to require that future patents granted in connection with standardized technology must be licensed under the same terms and conditions as the key ones granted before and during the standardization process.

As stated earlier, a royalty-free standard has better chances of being accepted and used as widely as possible than a standard that requires users to pay licensing fees. Manufacturing companies, in particular, may often prefer royalty-free standards, or those for which the cumulative royalty cap has been set beforehand. The fear is that otherwise the cumulative amount of royalties might be elevated to the point of unprofitable manufacture. This is particularly likely if a manufacturing company has no patents included in the standard, which makes cross-licensing with other patent holders challenging.[499] Price setting may be problematic from the antitrust perspective.

If a royalty-free licensing scheme cannot be negotiated, it is in the public interest to get the patent holder to agree to license on reasonable and non-discriminatory terms (RAND). If patents are licensed under RAND or other terms, companies have an incentive to obtain those that are essential for using the technology for the reasons mentioned above. For example, Qualcomm owned 28%, Nokia 16%, NTT DoCoMo 13%, Ericsson 8%, Motorola 7% and Hitachi 5% of the essential patents involved in the CDMA 2000 standard, while Ericsson has 30%, Nokia 21%, Qualcomm 20% and Motorola 14% of the essential patents included in the WCDMA standard.[500] Then again, companies such as Qualcomm, which do not manufacture the product themselves, do not have to pay other patent holders anything. Getting the technology for which they have the patents chosen for a standard guarantees them a royalty stream, and they probably do not have an incentive to license their patents royalty-free.

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495 Lemley, at 24 (2002).

496 Kipnis, at 105 (2000): Mueller (2002).

497 Interview data Finland (2003).

498 Kipnis, at 105 (2000).

499 Jyrki Alkio, *Kovaa peliä patenteilla* (Helsingin Sanomat, 9 March 2003).

500 Alkio (2003).

If a patent holder refuses to license on these vague terms, the standardization process is usually halted and other solutions are sought. In reality, refusing to license is rare, although it is the most influential form of leveraging patent rights[501] and is a feasible tactic for companies that oppose the standard. A company may have reason to oppose a standard if it has proprietary technology that competes with the standardized products, and it may also wish to delay the acceptance of the standard to give it more time to develop standardized products.[502]

The obligation to disclose relevant patents does not continue to apply to those who originally took part in the standard setting but later resigned from it, or to those who did not contribute to defining the standard at all[503]. Given the continuously growing numbers of patents, especially in the field of software, it is likely that third parties hold patents that are essential for using the standard. In these cases the patent holder is in a position to demand royalties even if the standard is royalty-free, and might even refuse to license the patent at all.[504] However, although the patent holder has very strong bargaining power if the patent surfaces after the standard has been established, third-party patents do not necessarily create problems, and reasonable licensing terms can be agreed upon in many cases. The risk of bad publicity is another reason why a patent holder would comply with the standardization organization's policy and license its patents royalty-free even if there is no obligation to do so.[505] Antitrust and competition laws could sometimes, although rarely, be applicable in these situations, too. In the U.S. the obligation to license could potentially be based on the essential-facilities doctrine if the patent holder's "immunity" were interpreted narrowly, whereas it is more likely to be imposed in practice in Europe[506]. In a recent IMS Health case (2004) the European Court of Justice was asked about the conditions under which the refusal by an undertaking in a dominant position to grant a copyright license constituted an abuse of that position. The court came to the conclusion that for a refusal to be regarded as abusive it must prevent the emergence of a new product or service for which there is a potential demand, be without objective justification and be capable of eliminating all competition on the relevant market.[507]

In sum, there are multiple dilemmas in the context of standard setting and patents. Some of these have already been argued in the courts, and as more verdicts based on antitrust, patent misuse, fraud, equitable estoppel, implied license doctrine and unfair or deceptive business practices[508] appear, the rules will ultimately become clearer and best practices relating to standard setting will become more apparent than they currently are. Taking part in various standardization processes and managing the rights involved, including applying for new patents, amending pending ones and disclosing required patent information, is and will

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501 Blind, Bierhals, Thumm, Hossain, Sillwood, Iverser, von Reikum & Roxius, at 47 (2002).

502 Rahnasto, at 191-192 (2003).

503 Lemley, at 31, 36-37 (2002).

504 *See e.g.* Daniel Clark, *Do Web Standards and Patents Mix?,* at 21 (Computer, October 2002, 19-22).

505 Sarvas & Soininen (2002).

506 *Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under Article 81*, at 17 (2001); Mueller (2002); Alkio & Wik, at 387 (2004); Ingo Brinker, *Essential Facility Doctrine and Intellectual Property Law: Where Does Europe Stand in Aftermath of the IMS Health Case?*, at 137 (in Barry Hawk (ed.) *International Antitrust Law & Policy*, Corporate Law Institute, Fordham University School of Law, 2004, 137-150).

507 IMS Health GmbH& Co. OHG v. NDC Health GmbH & Co (C-418/01, Court of Justice, 29 April 2004).

508 Cases based on the FTC Act, Section 5 include FTC v. Dell Computer Corp (Consent order, 1995), FTC v. Rambus, Inc (2003), and FTC v. Unocal, Inc (Consent order, 2005).

continue to be an essential part of ICT patent strategy. Of course, if concerns about patents in interfaces and their potential effect on compatibility rise to the point that these patents are unenforceable, as suggested in the context of the EU software patent directive[509], or that they always have to be licensed to others on reasonable and non-discriminatory terms, the scene will change dramatically.

C. SOCIETAL IMPLICATIONS

Although patents are used more and more vigorously in the ICT industry and some companies are able to generate profit through licensing patented technologies and bare patents, or by preventing others from using patented technologies, it is competition that drives innovation in the sector, not patents[510]. In fact, unlike in many other fields, patents are relatively insignificant in terms of appropriating returns on R&D investments. The reasons for this are many: the rapid pace of innovation, the relatively low R&D investments required for developing, manufacturing and distributing new innovations, and the availability of other forms of protection such as trade secrets and software copyrights.[511] Nonetheless, the patent system with its shortcomings exists, and companies are interested in utilizing whatever helps them to achieve competitive advantage, acquire external resources and keep new entrants from eating away at their market share. Hence, it is only natural that many companies favor strong patent protection.

However, when all patents are put together in an industry such as ICT in which innovation is often incremental and cumulative, problems emerge. In many cases firms have to require access to dozens, hundreds or even thousands of patents to produce one commercial product. Finding all patent holders and negotiating licenses with them is time-consuming and costly, and in most cases impossible. In addition, the cumulative royalty rate may become overwhelming, making it unprofitable to manufacture a product. Then again, if all patent holders are not found *ex ante*, hold-up problems may be awaiting. Thus, patents may slow down further innovation.[512]

Companies are, in many cases, able to minimize the negative effects that would otherwise arise from a non-optimal legal framework. However, these practices are not without cost. For instance, as explained previously, some companies acquire patents for bargaining purposes so that others will not prevent them from developing new products and processes. This in turn increases the potential hold-up problem, and in fact the time and money a company spends on creating and filing these so-called defensive patents, which do not necessarily have any innovative value in and of themselves, could be better spent on developing new products.[513] It has also been claimed that the defensive game prevents new entrants with no patent power from entering the market[514]. Furthermore, it has raised unease in academia that some companies aim at "reserving" as extensive a part of a business sector

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509 *Position of the European Parliament Adopted at First Reading on 24 September 2003 with a View to the Adoption of Directive 2003/... ./EC of the European Parliament and of the Council on the Patentability of Computer-implemented Inventions* (2003).

510 FTC, at Chapter 3, 31, 46 (2003).

511 *See e.g.* FTC, at Chapter 3, 31-33, 44-46 (2003): Burk & Lemley, at 92 (2005), Cohen, Nelson & Walsh, at 6 (2000).

512 Shapiro, at 6-7 (2001), *See also* Foray, at 75 (2002); Arundel & Patel, at 5 (2003).

513 FTC, at Chapter 3, 52-53 (2003).

514 *See e.g.* PbT Consultants (2001): Washington CORE, at 12 (2003).

or a technology domain as possible in order to guarantee their freedom to operate, but they do not necessarily ever utilize their patents[515]. It has been claimed that reserving certain technological fields through patenting may direct research away from these areas and thus inhibit R&D in that particular field[516].

Yet, on the evidence of the interviews conducted in Finnish ICT firms, although some large companies have a lot of patents this is not seen as preventing new entrants from entering the market. The main intention is not to forbid all others from using a patented technology, and if companies face a problem with patents they simply design around it, license it or infringe it if they are likely not to get caught.[517] Also, according to the results of a small-scale Dutch study, IT companies seldom report any patent barriers[518]. Of course, the more popular aggressive patent strategies become, the higher the risk of getting caught for infringement. Licensing, cross-licensing and patent-pooling networks, which have been claimed to deter market entry of small firms[519], are not yet as complex in Europe as they are in the U.S., but even in the U.S. I would not say that it is the small companies that are the main targets of patent-infringement claims. Anyone can be targeted. In fact, the notion that patents improve small firms 'chances of entering markets was given more support than the opposite claim: ever since the mid 1990s U.S. start-up companies have been filing more patents than previously, and a large proportion of Internet patents has been granted to small firms and individuals[520]. This transition corresponds with the development of the venture-capital industry[521]. Good patents do appear to be important in terms of attracting financers and partners.

Although defensive patenting contributes to the hold-up problem, it could be beneficial from society's viewpoint as it might increase knowledge of new technologies through disclosure. Unfortunately, this part of the system is not functioning smoothly. Patents are not typically considered valuable sources of information in the ICT sector: the technology described in them rapidly becomes outdated, many of them do not contain anything that has innovative value, and in the software context, usually no source code is published so reading them may not be worthwhile.[522] Moreover, the tradition prevalent among engineers of actually reading patents may be lacking, or there may be other practical reasons keeping people from utilizing patents as sources of information. Complicated language and difficulties in finding relevant patents were mentioned by some of the Finnish ICT

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515 *See e.g.* OECD, at 29 (1997).

516 Although some studies touch upon the topic, I am not aware of any research papers that establish how severe the problem of not being able to conduct R&D because of patent thickets actually is. For instance, according to the results of a study about research tools and biomedical innovations, a field in which patents are more important for protection and hence utilized somewhat differently than in the ICT sector, only a few companies reported that they had been forced to stop or redirect a research project due to IPR problems (John P. Walsh, Ashish Arora & Wesley M. Cohen, Effects of *Research Tool Patents and Licensing on Biomedical Innovation* 285-340 (in Wesley M. Cohen and Steven Merrill (eds.) *Patents in the Knowledge-Based Economy*, National Academy Press, Washington, D.C. 2003) <http://books.nap.edu/books/0309086361/html/285.html#pagetop> (last visited 6/21/05)).

517 Interview data Finland (2003).

518 Arundel & Patel, at 8 (2003).

519 Washington CORE, at 12 (2003). *See also* Shapiro, at 16 (2001).

520 Allison & Tiller, at 275-276 (2002).

521 Washington CORE, at 4-5 (2003).

522 FTC, at Chapter 3, 49-50 (2003).

companies interviewed as obstacles to learning from them.[523] On the other hand, if patents were read more carefully, companies might be erroneously discouraged from doing research in heavily patented areas. Conversely, the U.S. companies did regard them as sources of information on technological developments in general. They did not believe that their mere existence would prevent anyone from entering into certain areas. In terms of infringement, it was simply not possible to know for sure if a product infringed someone's patents: in fact, due to overlapping, infringements were considered likely. Another intriguing feature that came up during the interviews was the role of patents in encouraging learning through licensing. If the licensor had them the licensee was not afraid of contamination. Contamination is a huge concern, particularly in the context of trade secrecy, and consequently firms often did not want to know anything except the necessary features of the technology they were licensing in.[524]

Although defensive patenting ultimately benefits nobody, it would be a challenge to get out of the vicious cycle or to choose not to be part of it. Companies that base their operations on open-source software have faced this reality. It is becoming increasingly difficult to develop software that does not infringe anyone's patents, and because of their very nature, open-source products have been claimed to be easier to screen for infringements than proprietary software. Therefore the risk of someone claiming licensing fees from open-source software users is regarded as high.[525] Of course, as long as open-source development does not erode anyone's market share, and developers and users are private individuals, the software is likely to blossom. Thus, even if firms were in a position to claim patent infringement against groups of hobbyists, they seldom have the economic justification to do so. Some companies holding rather large patent portfolios may even donate some of their patents to be used freely in open source projects[526].

Another negative aspect of patents in the ICT industry is that they may sometimes pose threats to interoperability and (open) standards[527]. Their use as a protection measure in order to keep something proprietary as well as the opportunity to carefully select one's licensees is at odds with the idea of giving everyone access to the technology at little or no cost. Fortunately, in most cases the market drives companies to modify their strategies and adopt a solution, such as an open standard that benefits the industry and ultimately also the consumers. Of course, diverging and even conflicting business interests may make the standardization process frustrating. The legal framework may also impose limits on potential business solutions: antitrust and competition laws, for instance, often view cooperation between companies, and particularly price setting, as anticompetitive. The risk of holding up technological development does not necessarily come from industry players developing products, though. It may reside in the unexpected sources, companies or individuals who seek to make money through patent enforcement and who did not participate in setting the standard. For these third-party companies, having a patent that "reads on" a widely adopted industry standard can be considered a jackpot.

Companies operate in a constantly evolving business environment. In fact, even the most static element, the legal framework, is currently under construction. Although both patent and antitrust/competition law systems have already responded to some challenges posed by

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523 Interview data Finland (2003).

524 Interview data U.S. (2004).

525 *See e.g.* PbT Consultants (2001).

526 *See e.g.* Patent Commons Project <http://www.patent-commons.org/> (last visited 9/30/05).

527 *Ibid.*

the rise of the knowledge-based economy, much controversy has remained. As explained above, modifications, particularly in relation to improving the quality of software and business-method patents and making it easier to invalidate so-called questionable patents, are likely to follow. It is to be hoped that these revisions will alleviate some of the problems the ICT sector is currently facing. In fact, many suggestions made by the FTC and the NAS have received positive feedback from the industry[528]. Then again, in Europe it is still uncertain how developments in software and business-method patents will evolve. For the most part, the ICT industry has been in favor of *status quo* concerning software patentability, and it supported the EU Commission in its following of EPO practice in its directive on the patentability of computer-related inventions. It was mainly the small software vendors, individuals and supporters of open-source software who opposed patenting.[529] Whatever the legal changes, revisions will naturally affect the ICT industry. However, in the end it is the markets that determine how patents are utilized and what the factual effects of patent protection are.

D. SUMMARY

Patents have many functions. They give protection against imitation, and may thus help a company to differentiate its products from those of other firms. They increase the value of technology and may provide technology-licensing or patent-licensing revenues. They also have a leverage function, which may help a company to position itself favorably in the markets by means of cross licenses, joint ventures, and strategic alliances, for example. Furthermore, patents and the way a company manages its rights affect its brand and its value in the eyes of investors.

The importance of patents to a company determines its optimal patent strategy, and how much weight they carry in its business. They have traditionally been associated with R&D-intensive firms, but although they may be most important to those firms, patentable inventions do not come up only during R&D: some may very well relate to the implementation of technologies or to business methods. Patents are not necessarily relevant to all technology-producing companies either. For instance, lead-time, secrecy or copyrights may be enough particularly if infringements are not easy to detect, the problems solved are company-specific and do not benefit other companies, or the technology's expected life cycle does not exceed two to four years. Then again, even if a firm relies on others' technology, it may not be able to avoid legal problems: the licensor may be reluctant to guarantee that its technology does not infringe anyone's patents as this may be impossible to ascertain, and even if the licensor took the risk, its responsibility would most likely be very limited[530]. Firms down the line are not free from patent concerns either.

As indicated earlier, it is not only the need for protection that makes patents relevant to a company: third-party patents and infringement possibilities also have to be considered. These concerns have been highlighted even more in recent years as many, particularly U.S., firms have started to utilize their patents aggressively. These companies are usually seeking licensing revenues rather than injunctions, however. In fact, a scenario comprising thousands overlapping patents and systemic, interdependent innovations is optimal for the

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528 *See e.g.* Federal Trade Commission, *Patent Reform Workshop* (The Ideas Into Action: Implementing Reform of the Patent System Conference, Berkeley, 16 April 2004).

529 *See e.g.* PbT Consultants (2001).

530 Megantz, at 80 (2002).

licensing business. To give some idea of the recent trends in technology and patent licensing, revenues in the U.S. increased approximately 4000% from 1980 to 1999[531].

In an environment in which many companies utilize patents offensively, it is vital to have a defensive patent strategy or the means to allocate the risk to someone who is able to bear it better (a "no patents" strategy). A company needs to be able to maintain its freedom to innovate, to be in a position in which it is able to refuse to license patents that are questionable or otherwise nonessential, and to be able to avoid expensive and time-consuming litigation and potentially extremely high damages, by cross-licensing, for example. However, the emergence of firms that generate their revenues primarily by licensing patents has posed new challenges to companies with a defensive patent strategy. Patent-licensing companies do not usually manufacture any products themselves, thus settling a dispute via cross-licensing is not a viable option.

In Europe, too, the more active exploitation of patents has aroused interest, although many of the large and medium-sized ICT firms that have a patent portfolio employ a defensive strategy. It also appears that, as awareness about the possibility to patent software in Europe increases, even smaller companies are becoming more interested in patents and in developing strategies. Currently, however, many European ICT companies simply do not have a patent strategy, or patents for that matter. Although patents are clearly not useful for everyone, it would be in these firms 'best interests to review their patent position otherwise they are likely to encounter problems when broadening their operations to other countries or using the Internet as a distribution channel.

The advantages and disadvantages of patenting in the area of software and business methods have been widely discussed in recent years. One of the main concerns in this discussion has been the patent holder's right to prevent others from designing interoperable products. However, having patents and using them are two different things. Although a company may have them, it may be willing to license its patented technology for little or no cost if it claims an open standard, for instance. Further, due to network effects, the development of complementary products usually increases the value of a company's technology, and it may therefore be keen on opening up its interfaces even if there was no standardization process. Naturally, not all firms are willing to relinquish control, and heavy negotiation may be involved before an optimal result can be reached. It is my belief that, from society's perspective, we should nevertheless be mainly concerned about the emerging business model called "patent trolls", facilitated particularly by the U.S. legal system, involving very high litigation costs and damages that can turn out to be overwhelming.

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[531] Vermont, at 330 (2002).

V. DISCUSSION AND CONCLUSIONS

This paper has identified four interconnected and partially overlapping trends in the patent arena. Specifically, developments relating to software and business-method patents have been discussed and perceptions of future trends presented. Trends in 1) academic/public discussion, 2) political views, 3) the law and its interpretation and 4) the business climate, particularly in the patent strategies of ICT companies, have all been considered. Some problems and common misunderstandings have also been pointed out. The key findings are presented below.

A. ACADEMIC TRENDS

Patents have attracted a great deal of attention among academics during the last few decades. This is because legal changes in conjunction with the emergence of the information society have increased their importance in business, and the recent media attention and critique have greatly increased awareness of software and business-method patents in particular, thus adding to the topic's attractiveness[532]. Also biotechnological and pharmaceutical patents have aroused worldwide interest, one of the most intriguing questions being their impact on the developing countries[533].

Many current academic papers deal with patent-related topics, and in particular, interdisciplinary research is becoming more fashionable. Academics by no means form a united front. There is, for instance, slight diversity in the interests of scholars in the U.S. and Europe due to dissimilarities in patent systems and diverging academic cultures. In general, the European style of research appears to be less political but also less practice-oriented than that in the U.S., although there are naturally variations between scholars in this respect: differences between lawyers, technologists and economists could be mentioned. Furthermore, it is my observation that the lawyers in both continents typically approach the patent system from the inside, take the rules as they are and when it comes to their interpretation highlight the coherency of the system. When discussing about the patentability of computer programs, for instance, European lawyers tend to focus on interpreting EPC Art 52 and its coherency with the TRIPS agreement. Then again, (software) engineers have the strongest personal opinions about patents, and they are often concerned about the risk of interference with design freedom. Indeed, many technologists have raised their voices in support of the open-source movement and open standards, and have opposed software patents. Reasons to criticize such patents are many: software is different from other patentable inventions, there is a high risk of non-deliberate infringement, and patents favor large companies instead of the small, innovative firms[534]. Actually, the last mentioned argument has been presented in pharmaceuticals and biotechnology, the field in which the discussion has had a lot to do with hard versus soft values; ethics and humanity. The fact

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532 Writings in the media include *e.g.* Pomerantz (2005); Reback (2002); Wherry (2002); Malone (2002); Hardy (2002); Pfeiffer (2002); Raymond (2002); Economist.com articles mentioned in references; Lohr (2005); Riordan (2004);Varian (2004). For more critical writings *see e.g.* discussion on the Internet at www.eff.org; www.bustpatents.com; swpat.ffii.org. Academic papers discussing about the topic *see e.g.* Merges (1999); Jaffe & Lerner (2004); Lessig (1999); Hall (2003); Perchaud (2003); Cohen & Lemley (2001); Bessen & Hunt (2004).

533 *See e.g.* Drahos & Braithwaite, at 155-162 (2002).

534 PbT Consultants, at 6 (2001). *See also* League for Programming Freedom, *Against Software Patents* (28 February 1991) <http://lpf.ai.mit.edu/Patents/against-software-patents.html> (last visited 9/30/05).

that patents may be used to prevent poor people in developing countries from accessing essential drugs has generated a lot of outrage.[535]

In addition to argumentation founded on legal rationale, personal views and ethics, the patent system has been examined on quantitative and qualitative basis. This has taken place particularly in the U.S: a fashionable research theme in the economics field is how firms' patent practices affect innovation. Moreover, studies have been carried out on the consequences of extending patent protection in the mid-80s, and on whether this benefited society. Defining the optimal patent scope, term and damage level are further research topics favored by economists.[536] Generally speaking, there is a lot more empirically-oriented research being carried out in the U.S. today than earlier. These studies rely primarily on statistical and econometric data.[537]

As a result of research on the economic functioning of the U.S. patent system, academics no longer presume that stronger rights automatically induce more R&D investments. They have reached a consensus that the impact of patent protection depends on the rate and type of innovation as well as on the technological complexity[538]. The intricacy of patent economics has also been realized. Patents are not merely about promoting innovation and restricting competition by providing the means to capture knowledge, and to enable the formation of cartels[539]: they may also have positive effects on technology diffusion and competition[540]. Nonetheless, the efficacy of the patent system has been widely questioned, particularly in the context of software and business methods but also in relation to biotechnological inventions. Primary concerns touch upon the hold-up problem resulting from patent thickets, and so-called questionable patents contributing to the dilemma. Various scholars in the U.S. call for reform. It is essential to prevent further damage to the U.S. economy and to change the patent law, and possibly even antitrust legislation, accordingly. In terms of patent law, changes to the presumption of validity, the obviousness standard and the experimental-use doctrine have been recommended. The adoption of a European-type opposition procedure has also been suggested, and amending the assessment of treble damages in cases in which patent infringement is willful has also been viewed as an improvement. The goal is to improve patent quality, and to encourage the dissemination of knowledge.[541]

In general, scholars in the U.S. have covered the software and business-method patent lifecycle fairly well in their academic writings. Many of the early research papers focused on issues revolving around granting patent protection for these new types of inventions.

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[535] Drahos & Braithwaite, at. 5-10 (2002).

[536] Some of these articles have been referred in the course of this paper. Further academic research papers include *e.g.* Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When is it the Best Incentive System?* (UC Berkeley Working Papers, department of economics, Working Paper No. EOI-303); Mark Schankerman & Suzanne Scotchmer, *Damages and Injunctions in Protecting Intellectual Property* (RAND Journal of Economics, Vol 32, No. 1, Spring 2002, 199-220); Edward F. Sherry & David J. Teece, *Some Economic Aspects of Intellectual Property Damages* (Practising Law Institute, Patents, Copyrights, trademarks and Literary Property Course handbook Series, PLI Order No. GO-007N, New York City, October 7-8, 1999); Ted O Donoghue, Suzanne Scotchmer & Jacquis-Francois Thisse, *Patent Breath, Patent Life, and the Pace of Technological Progress* (Journal of Economics and Management Strategy, Vol. 7, No. 1, Spring 1998, 1-32).

[537] Thomas, at. 6-10 (2003).

[538] *See e.g.* Burk & Lemley, at 89 (2005); Jaffe & Lerner, at 198 (2004); Jaffe, at 24-25 (1999); Hunt (1999); Scotchmer (1991); Merges & Nelson (1990).

[539] Drahos & Braithwaite (2002).

[540] OECD, at 9 (2004).

[541] *See e.g.* FTC (2003); NAS (2004); Jaffe & Lerner (2004).

However, once they became an established part of the U.S. patent system, in addition to identifying the practical problems involved, researchers have addressed topics such as the optimal interpretation of the scope of software and business-method patents[542].

In Europe the discussion on software and business-method patents has mainly concentrated on patentability, particularly in terms of their technical character[543]. There are many more areas that urgently need attention, however. Applying patent-law concepts from the industrial age to the combination of hardware and software is likely to be challenging in related areas, such as infringement determination. There is a scarcity of studies on the patent strategies employed by European companies, and on the efficacy of the European patent system. Even EU legislators appear to have relied on research conducted in the U.S. in this respect[544]. The problem is, of course, that these research papers build on the U.S. patent system, from which the European system differs fundamentally in many ways. It is to be hoped that research related to software and business-method patents conducted in Europe will fill at least some of the gaps, and present a more multifaceted view in the future.

In general, the problem in the academic discussion is that the complex effects of patents are often forgotten in the debate as to whether software and business-method patents promote or impede innovation. Although the goal of the system is to promote innovation through 1) stimulating inventiveness and investments in R&D, 2) encouraging the commercial exploitation of inventions by inducing direct investments in the production and marketing of innovations and by facilitating technology trade, and 3) encouraging the disclosure of technical information and thus furthering technological progress[545], it is often claimed on the basis of only one of the above elements that software and/or business-method patents do not achieve this goal[546]. Moreover, many functions of patents such as their status value are simply neglected if the analysis is not even partly based on primary data, in other words on first-hand empirical evidence. Assessments of the role of software and business-method patents in promoting innovation are also misleading if the focus is only on the software industry or on Internet companies. These patents are paramount in other industries, too. Furthermore, if and when the patent laws are being interpreted to encompass also other than technological innovations, *i.e.* business methods, this new development should be taken into account when assessing the economic functioning of the system as it changes the underlying structures of both the patent system and the business environment fundamentally.

B. POLITICAL TRENDS

The political challenge is to balance the interests of individuals, companies and the general public, and to plan a supportive policy framework that corresponds with those needs at all times. This is not an easy task. The wording of the law is modified infrequently and the legislative process is extremely slow. As a rule, legislators are not able to keep up with

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542 *See e.g.* Burk & Lemley (2005); Cohen & Lemley (2001).

543 *See e.g.* Törnroth (1999); Saebo (2001); Jüngst (2002); Hansen (2002); Hansen (2004); Westling (2002); Tauchert (2000); Newman (1997); Cohen (1999); Beresford (2001); Liesegang (1999); Skulikaris (2001).

544 *See e.g.* the report to the European Commission on the Economic Impact of Patentability of Computer Programs written by Hart, Holmes and Reid (2000). The report bases itself largely to research conducted in the U.S.

545 Granstrand, at 83 (1999).

546 *See e.g.* Bessen & Hunt (2004).

technological, business and societal developments, and it is frequently the case that a law is already outdated when it is passed. Of course, the common-law system in which the courts also have "legislative" power is more adaptive in this sense than the civil-law system.

Typically, topics that are emphasized in the media and in the academic realm, as well as those that are considered important by companies and other countries, affect the direction and focus of political decision-making. Lately, the need to ensure that new inventions in the high technology industries, such as information technology and biotechnology, are developed and brought to market has been highlighted, and in this context, the protection of intellectual property has been one of the key issues. The crucial question concerns what the optimal protection scope is.

Views about optimal IPR and patent protection are diverse. Generally, however, politicians appear to be still very much in favor of strong rights. The concern in the U.S. about industrial stagnation and the lack of innovations led to a pro-patent, or actually to a pro-IPR era in the 1980s, and the idea that strong rights induce more innovations and are beneficial to society has been rooted in people's minds. Nonetheless, now that research papers, particularly the Federal Trade Commission (FTC) and the National Academy of Sciences (NAS) reports, have questioned this policy, it is probable that changes will ultimately follow. Furthermore, global concern over high prices of patented medicines has spurred further discussion on the real R&D costs and risks of the industry, and thus the actual impacts of patent protection[547]. It is not to be expected that U.S. patent law will be completely rewritten, however, or that the patent system will be abandoned entirely. The bottom line is that the U.S. patent system is regarded as one of the keystones of its economy[548]. Yet, it is likely that politicians and the courts will also at some stage start to question the positive impact of patents on innovation. Some signs of this transition can already be detected: new legislation regarding prior user rights has been issued in the area of business-method patents, for instance, and various bills proposing further changes to the U.S. Patent Act have been introduced to the Congress during the last five years. These bills include among others the Business Method Improvement Act of 2000 and 2001, Patent Quality Assistance Act of 2004, and Patent Reform Act of 2005. If the sweeping changes suggested in the Patent Reform Act of 2005 were accepted, the patent holder's position would deteriorate fundamentally.

There has been considerable concern within the European Union that Europe is being left behind the U.S. and Japan in economic development, and harmonizing EU member states' patent and copyright laws and strengthening the position of rights holders have been given priority[549]. However, within the last few years, during the harmonization process related to the patentability of computer-implemented inventions, views about the required protection level have changed. The harmonization process was initially fairly pro-patent, but although it was mainly a question of the technical character of computer programs and the form of allowable claims, general concerns about the efficacy of the patent system were brought up, and the entire basis of the reform was challenged. In the end, the parliament rejected the

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547 Drahos & Braitwaite, at 8 (2002).

548 *See e.g.* NAS, at 1, 18 (2004).

549 *See e.g.* EC, *Green Paper on Innovation* (995); EC, *Green paper on the Community Patent and the Patent System in Europe* (1997); EC, *Innovation Policy in Europe 2001*, at 22.

directive proposal[550]. Similar developments have taken place earlier in relation to biotechnological inventions[551].

In the context of the EU software-patent directive, concerns that patents could be used to slow down open-source development, restrict product interoperability, and make standard setting difficult were paramount[552]. As for business-method patents, since U.S. experiences had not been positive, the question was no longer whether it is a disadvantage to European companies that these inventions cannot be patented in Europe: the goal seemed to be to make sure that pure business methods are not regarded as patentable subject matter in Europe[553]. On this basis I believe that, despite the U.S. influence it is unlikely that such patents will be accepted in the near future. As the ICT industry matures, and becomes more service-oriented, pressure from the industry to accept these patents is about to become more prominent, however. Furthermore, the direction the WIPO-led international harmonization of substantive patent law will take, may also affect this development.

C. LEGAL TRENDS

For the last twenty years the legal regime has favored rights holders: the U.S. Court of Appeals for the Federal Circuit has been patent-holder-minded, and has often kept patents in force. It has also been keen on granting preliminary injunctions providing the patent holders 'an effective tool against the alleged infringers irrespective of the actual validity of their patents. Courts have also relaxed the non-obviousness requirement, issued extensive damages, and new areas have entered into the sphere of patentable subject matter.[554] Then again, in Europe, a pro-patent attitude has taken hold of politicians and lawyers in particular[555], and it has become easier to obtain patents for many European countries at the same time, and the scope of patentable subject matter has broadened[556]. Nevertheless, compared to the U.S. the patent scope is interpreted more narrowly in many European countries[557], and damages issued are also not nearly as extensive. The tendency of harmonizing and at the same time strengthening patent protection is nevertheless likely to

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550 Rocard (2005).

551 Tritton, Davis, Edenborough, Graham, Malynicz & Roughton, at 168-169 (2002).

552 PbT Consultants, at 6 (2001).

553 *See* Commission of the European Communities, *Proposal for a Directive of the European Parliament and the Counsil on the Patentability of Computer-implemented Inventions* (2002).

554 *See e.g.* Gallini (2002); Hall & Ham Ziedonis (2001); Kortum & Lerner (1999); Jaffe & Lerner (2004); Jaffe (1999); FTC (2003); Hunt, at 21 (1999).

555 *See e.g.* Jacob, at 416 (2001).

556 OECD, at 18 (2004).

557 There are more exceptions to patent holder's rights in Europe than in the U.S. For instance, non-commercial and private actions, and experimental use fall beyond the scope of patent protection. There are also differences in the interpretation of the so-called doctrine of equivalents, *see e.g.* Kati Lassila, *Ekvivalenssiselvitys; Patentin suojapiirin tulkinta Suomessa ja muissa maissa* (KTM Julkaisuja 22/2004, Elinkeino-osasto); AIPPI, Question Q175 The role of equivalents and prosecution history in defining the scope of patent protection <http://www.aippi.org/reports/working-guidelines/download/wg_q175_E.pdf> (last visited 9/30/05).

proceed particularly in the patent-enforcement arena in which the international nature of business has diminished the possibilities to enforce one's rights in practice[558].

The trend in the U.S. towards strong patent rights seems to be slowly changing its course. It has been realized that stronger is not always better from society's viewpoint, and that a dysfunctional patent system also harms the companies that utilize it the most. A better balance is needed and is being sought.[559] Official changes that have already taken place include the introduction of the American Inventor's Protection Act, the improved USPTO search facility for business-method patents, and the Supreme Court's clarification of the application of the doctrine of equivalents. To my knowledge, however, courts have not so far cited the FTC and/or NAS reports, and the strong assumption is still that a patent granted by the patent office is valid.

Besides offering strong patent protection, the U.S. antitrust approach has been fairly patent-friendly for the last two decades[560]. Patent holders have not often been subjected to antitrust scrutiny, as their actions can usually be justified from business perspectives. Thus, having patents offers a good explanation for behavior that would otherwise be regarded as anticompetitive. In general, unlike in the mid-20th century, antitrust and patents are considered complementary rather than conflicting.[561] On the other hand, their use is more likely to be considered anticompetitive in Europe, and the opportunities for patent holders to exploit their rights fully there are thus more limited than they are in the U.S.[562]

In the antitrust (U.S.) and competition law (Europe) arena, a balance between patents and antitrust in the "new economy" is constantly being sought. Nevertheless, although it was the FTC that released the report on patents and competition, there is no indication that antitrust laws will be applied more strictly in the future in cases when patent holders utilize their rights in an anticompetitive manner. The trend in Europe has also rather been towards the more flexible application of competition laws[563]. However, the potential problems associated with patents in relation to open standards may affect the application of antitrust regulation in the context of standardization.

Usually, many legal trends flow from the U.S. to the rest of the world, which is evident especially when international harmonization efforts take place. Developments in software patenting in Europe have also followed the U.S.[564], although the basis for granting patent protection in this context is different. The emphasis in Europe is on the lack of technicality, and it is explicitly stated in national patent laws and the European Patent Convention that computer programs as such are not patentable. The problem here has mainly been the

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558 EU has already introduced an enforcement directive (2004/48/EC), and the Community patent Act is currently under discussion. Furthermore, adoption of a European Patent Litigation Agreement has been proposed.

559 *See e.g.* NAS (2004); FTC (2003).

560 *See e.g.* NAS, at 24-25 (2004).

561 FTC, at Executive Summary, 2 (2003); U.S. Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* (1995); *Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under Article 81,* at 10-11 (2001).

562 *See e.g. Commission Evaluation Report on the Transfer of Technology Block Exemption regulation No 240/96 Technology Transfer Agreements under Article 81*, at 17 (2001); Mueller (2002); Alkio & Wik, at 387 (2004); Brinker, at 137 (2004).

563 *See e.g.* the Commission Regulation (EC) No 772/2004 on the application of Article 81(3) (group exemptions).

564 *See e.g.* Westling, at 537 (2002).

difficulty of drawing the line between computer programs producing a technical effect or solving a technical problem, or a software invention incorporating technical means, and computer programs as such. This is because computer programs have many characteristics: on the one hand, software is purely information doing nothing, and on the other hand it causes the computer to perform[565]. Moreover, the close resemblance between algorithms and mathematics has been puzzling legislators, courts and patent offices.

As far as business-method inventions are concerned, the European technicality requirement is likely to hold them outside the patent scope for now. Of course, novel and non-obvious implementations of business methods may already be patentable, and the boundary between the technical implementation and the business method itself is not always clear. Deviating also from the general trend, European patent legislation is apparently regarded as a guideline in the U.S.: for example, as mentioned earlier, prior user rights have been recently introduced in the U.S. Patent Act. Moreover, there has been discussion on the adoption of patent opposition procedure and the first-to-file principle.[566]

D. BUSINESS TRENDS

As a result of the transition from the industrial to the information economy, the proportion of intangible assets has expanded to take up the largest portion of the resource pools of quite a few companies[567]. Firms have also become more specialized, technology has become more complex, technological change more rapid, and innovation processes more decentralized than they used to be in the era of industrialism. Thus, the ability to acquire external resources has turned out to be of key importance.[568] Indeed, the general trend has been from closed innovation in which internal R&D, control over building, marketing, distributing, servicing, and supporting companies 'own products has been essential towards a more open model in which the boundary between the firm and its environment is permeable allowing ideas and knowledge to flow more freely. Firms following the open innovation model may, for instance, commercialize their internal ideas through external channels, such as carve outs, joint ventures and other types of licensing arrangements, or they can bring outside ideas into the company to commercialize them.[569] These changes, combined with the formation of a highly interactive and international market place, the Internet, have affected the role patents have in today's business environment. Further, open, commonly established interoperability standards are critical in the ICT sector.

The role of software in all fields of business, not only in the ICT sector, has increased. Having good databases and the possibility to demand and transfer information as quickly as possible is, in fact, already an infrastructural element of corporate operations. Information and communications technologies are pervasive. They increase efficiency in business and in people's everyday lives. Therefore, although this paper has focused on software and business-method patents, and on ICT companies 'patent strategies, such patents are not irrelevant to companies operating in other technological fields. Furthermore, all Internet

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565 Samuelson, Davis, Kapor & Reichman, at 15 (1994).

566 The Patent reform Act of 2005; FTC, at Executive Summary, 8, Chapter 5, 17-18 (2003); NAS, at 95-103 (2004); GRAIN (2003).

567 *See e.g.* Jorash, at 140 (2002).

568 *See e.g.* OECD, at 16 (2004).

569 Chesbrough (2003).

companies, even those that have not traditionally paid any attention to patents, should keep an eye on developments relating to software and business-method patents and their use.

U.S.-based ICT companies in particular have recently started to utilize their patent portfolios actively and aggressively in order to enhance their competitive advantage[570]. It is not necessarily the legal protection, the possibility to prevent others from utilizing patented inventions, that is the most important function of patents, it is rather their licensing potential and the leverage they offer in negotiations.[571] In fact, many companies have been setting up patent-licensing programs, and even firms that do not manufacture any products and base their entire business on licensing have emerged as posing new threats, particularly to large and medium-sized U.S. firms. The changes that have taken place in the role of patents in companies 'businesses can also be detected in their organization structures, which have recently been modified in order to better support the implementation of the chosen patent strategy[572].

Patents are often essential at the start-up phase of a company. This is no wonder, as the number of patents applied for, issued and litigated in the U.S., as well as the costs associated with litigation, have been on the rise for the last twenty years[573]. The risk of infringing someone's patents and being sued is therefore high. Consequently, even a small company operating in the U.S. should at least consider employing a defensive patent strategy. Venture capitalists typically welcome this approach, too[574].

In the licensing context, it has become more common to license patents even without any physical deliverables[575]. However, the current economic slump and the burst of the dot-com bubble have to my knowledge reduced the wildest attempts to base business entirely on the transaction of rights. Fortunately, also the mad years of evaluating patents on a quantitative basis instead of on subject matter quality appear to have to a large extent passed. This also applies to financing. Venture capitalists have become more careful when estimating the value of a company's patent portfolio[576]. Patents are not valuable in themselves, but the value is attached to the protected subject matter and its relevance or potential relevance in the marketplace. Nonetheless, on the whole, IP markets in the U.S. are developing quickly and they have a great, currently underutilized, potential.

Conversely, many ICT companies in Europe are only beginning to realize the worth of patents to their businesses, and patent strategies are often undeveloped[577]. SMEs as well as large companies are becoming more interested in developing IPR and patent strategies. Generally, the number of firms that are in a position to ignore patents altogether is decreasing. Even if the business model is such that patents have no value as protection measures, there may be third-party patents that the company needs to be concerned about. In fact, although the strategies employed by European and U.S. companies are different,

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570 Rice (2003); Parr, at 283 (2002).

571 *See e.g.* Parr (2002); Rivette & Kline, at 44 (2000); Chesbrough, at 159 (2003): Washington CORE, at 14 (2003).

572 *See e.g.* Rivette & Kline, at 90-91 (2000); Parr, at 277-278 (2002).

573 Ham Ziedonis, at 204 (2003).

574 Showalter & Baxter, at 6 (1999); Rice (2003).

575 Somaya, at 4 (2002).

576 Shelby (2001). *See also* Roth (2005).

577 Interview data Finland (2003); DLA (2004); Vortonas, at 33 (2003); Blind, Edler, Nack & Straus (2001).

their impact is not limited to a certain geographical area. The internationalizing business environment, and the Internet as a marketplace, make it extremely difficult for ICT companies today to refrain from giving attention to patents irrespective of their business model and countries of operation. Thus, it is likely that European software firms in particular will face difficulties when expanding their businesses.

Most technology-intensive companies nowadays have to have a patent strategy. This does not mean that they need to have patents of their own. In fact, although the "not invented here" factor and the fear of losing control are still very strong[578], and the component-based software development appears to increase patents' attractiveness[579], the emergence of "nothing invented here" ideology[580], and particularly the success and the growing popularity of the open-source licensing model[581], combined with weaker patent protection, may very well diminish the attractiveness of proprietary strategies in general. Improvements in the choice of patent-litigation insurances may lessen the need for acquiring patents for defensive purposes, and a "no patents" strategy may therefore become more appealing in the future. Companies adopting this strategy have some concerns about third-party patents, and try their best to diminish the risk of infringing others' patents and being sued for potential infringement. One way of doing this is to contractually allocate the infringement risk to someone else. Of course, having patents does not mean that the firm is not able to use them flexibly, and even "donate" them for the public good, as collaboration in setting open, royalty-free standards and the recent efforts of companies such as Sun Microsystems and IBM to donate their patented inventions for public use have demonstrated[582]. Indeed, one characteristic of the ICT sector, software in particular, is the highlighted role of users. They have traditionally been major contributors in software development.[583]

When looking at the industry developments in the long run, we are able to detect the shift from an information economy focusing first on the infrastructure level and moving then increasingly towards services, followed by its industrialization[584]. These shifts are likely to affect further both the availability and usability of patent protection. It is to be expected, for instance, that at the time technological development shifts and ultimately slows down, many technologies become commoditized, and it becomes more difficult to base one's competitive advantage on technological innovation, ICT-patents' value to firms diminishes as both protection and leverage means. On this basis, I argue that even though patents may become more important in terms of leverage as firms open up their innovation models, when they reach the ultimate level of openness the value of patent protection is likely to become less, and as time goes by, there will probably be more ICT companies operating at this end of the spectrum. On the other hand it is probable that the pressure towards patenting pure business methods becomes prominent as it has already become more difficult to protect the Internet business models via secrecy than it used to be when operating on a conventional market place[585].

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578 Interview data U.S. (2004); Vortonas, at 33 (2003).

579 Derived from Interview data Finland (2003).

580 *See e.g.* R. P. Srikanth, *R&D Investments are No Longer an Indicator of How Innovative a Company Is* (Express Computer 31 January 2005) <http://www.expresscomputeronline.com/20050131/market08.shtml> (last visited 9/30/05).

581 *See e.g.* Weber (2004); Rosen (2004).

582 *See e.g.* McMillan (2005); Krill (2005).

583 *See e.g.* Von Hippel, at 97-101 (2004).

584 Martikainen (2005).

585 OECD, at 15 (2004).

All the trends described in this paper are connected, and developments in one field affect other sectors. The connections between these various trends are illustrated and the trends summarized in Figure 8.

In summary it can be said that the software and business method patent ecosystem is characterized by an interplay between two forces: openness and free flow of scientific and business information on the one hand, and proprietarization of that information on the other. This interplay is present at both a company and a policy level. In fact, there is nothing new about this balancing act. It has been an essential element of the patent system ever since its foundation. Controversies and resulting patent law amendments have followed in cyclical manner. We do not have to look very far into the history to detect a general pro-patent shift (late 19th and early 20th century) that has been followed by an anti-patent attitude (mid 20th century) which has then switched back to pro-patent (late 20th century).[586] Indeed, the ongoing academic and public disputes regarding the patentability of software, business method and biotechnological inventions, and the problems that have arisen due to patent protection have led me to conclude that we will ultimately be heading towards weaker patent protection. As explained above, some signs of the transition can already be detected in the political and legal arenas. In any case, the shift is likely to be more noticeable in the U.S. than in Europe due to the rather stable nature of the European patent system: the atmosphere was never as anti-patentee than in the U.S[587], and also the pro-patent shift was less radical.

[586] *See e.g.* Jaffe & Lerner, at 78-97 (2004).

[587] Jacob, at 416 (2001).

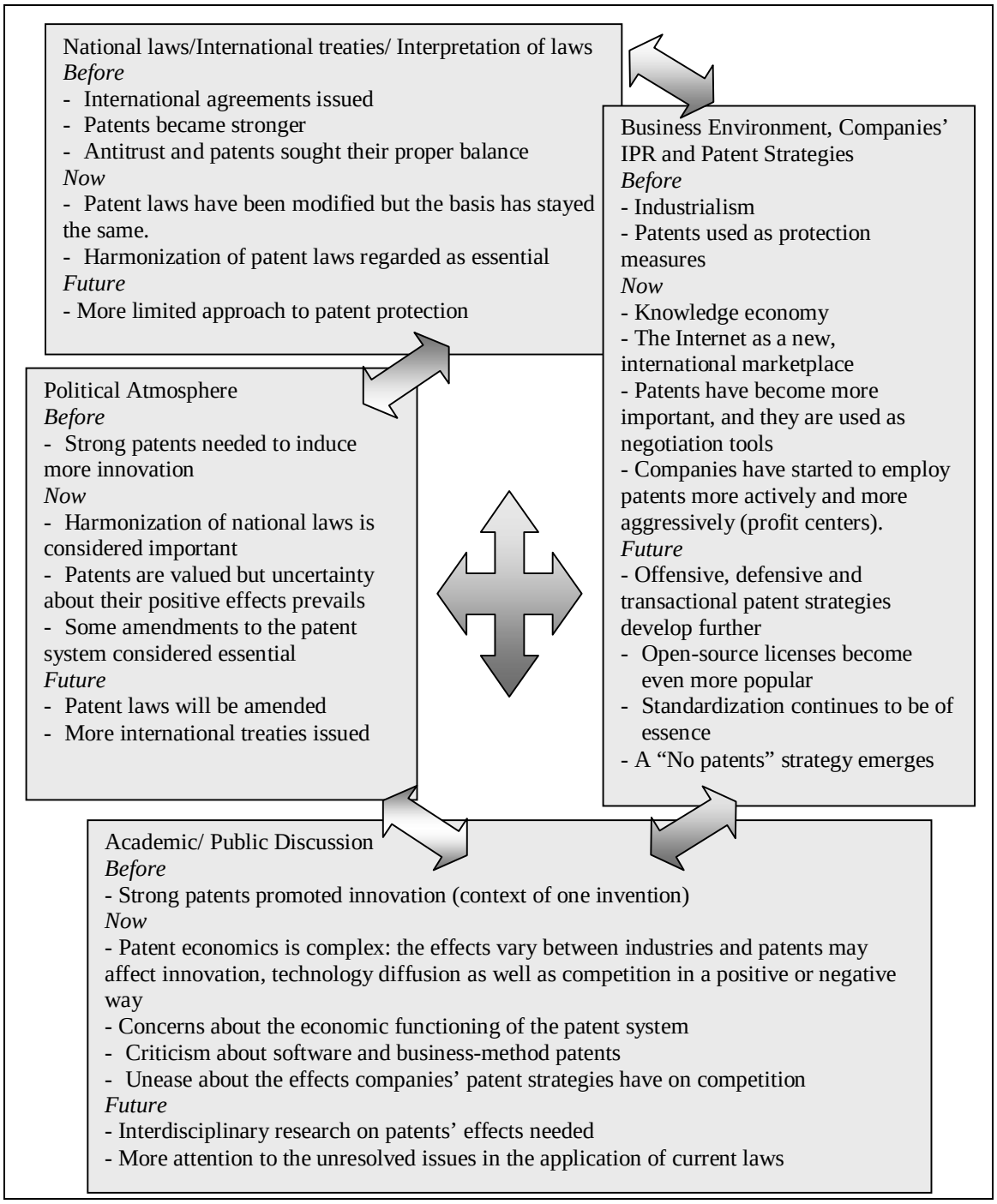

FIGURE 8. SUMMARY OF THE FOUR INTERTWINED PATENT-RELATED DEVELOPMENTS

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Appendix 1

Interview data; Finnish ICT companies that have patents

Gross Revenue	Number of Companies
€0 – 100 000	2
€100 000 – 1 M	1
€1 – 50 M	2
€50M – 1 billion	1
€1 – 7 billion	3
€7 – 25 billion	1
over €25 billion	1
Table 1. Gross Revenue (2002)	

Personnel	Number of Companies
1 – 5	1
6 – 20	1
21 - 100	1
100 - 500	2
500 – 3000	1
3000 – 10 000	2
10 000 – 30 000	2
Over 30 000	1
Table 2. Personnel	

Country	Number of Companies
Finland	11
Other Scandinavian countries	9
Germany	8
Great Britain	6
United States	5
China	4
Baltic countries	6
Benelux countries	5
Japan	3
France	3
Middle East	2
Examples of some other countries of operation: Russia, Kazakhstan, Ukraine, Slovakia, Czech Republic, Switzerland, Italy, Thailand, Brazil, and Poland	
Table 3. Countries of Operation	

Patent Applications/patent families	Number of Companies
0 – 5	6
6 – 30	2
31 – 2000	2
over 2000	1
Table 4. Number of patent applications and patent families (patents concerning the same invention)	

Appendix 2

Interview data; Finnish ICT companies that have no patents

Gross Revenue	Number of Companies
€100 000 – 1 M	4
€1 – 3M	3
Over €20 M	1
Table 5. Gross Revenue (2002)	

Personnel	Number of Companies
1 – 5	3
6 – 20	2
21 - 100	2
100 - 500	1
Table 6. Personnel	