



**The role of Intellectual Property Rights, Innovation and Competition
Law in the European Software Industry**

- **If there is no promise of monopoly would there be any incentives to innovate?**

Master Thesis

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ABSTRACT

The thesis analyses and identifies the relationship between the management of innovation, intellectual property rights and competition law in the European software industry. Furthermore it points out important factors which are necessary to create a healthy market for the industry, in particular by 1) balancing IP law and competition law and 2) promoting choice and technological neutrality, in form of standards and interoperability.

There is an ongoing debate regarding the use of intellectual property rights to foster innovation in the software industry. With emphasis on innovation and software patents, the thesis is questioning the intellectual property rights in the software industry and the monopoly situations they provide, will there be any incentives to innovate without them?, are they necessary for innovation in the software industry? And one should ask one self – if they do no good what harm may they cause?

The thesis is using a 'law and economics' approach, with both a positive and a normative inquiry. The software industry has been researched by looking at competition law and intellectual property law separately and combined to observe the effect on innovation. Case law has been provided to give another perspective and a better understanding of the theory presented.

The thesis concludes by discussing the consequences of strong intellectual property regimes and shows that innovation happens without patents, they are not directly needed to encourage innovation. Where the intellectual property system creates market failures, society has found alternative ways to secure knowledge and technological innovation by encouraging open standards and open innovation.

LIST OF ABBREAVATIONS

CEN:	European Committee for Standardization
CII:	Computer-Implemented Inventions
CSS:	Closed Source Software
EPC:	European Patent Convention
EPLA:	European Patent Litigation Agreement
EPO:	European Patent Office
EU:	European Union
FLOSS:	Free/Libre/Open Source Software
ICT:	Information and Communication Technology
IE:	Internet Explorer
IP:	Intellectual Property
IPR:	Intellectual Property Right
ISO:	International Organization for Standardization
MPEG:	Moving Picture Experts Group
OS:	Operating System
OSS:	Open Source Software
R&D:	Research and Development
SIPO:	State Intellectual Property Office
SME:	Small and Medium sized Enterprise
U.S.:	United States
UEAPME:	The European Association of Craft, Small and Medium-sized Enterprises

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1. INTRODUCTION

Innovation is in general a key focal point when explaining economic growth and the European software market is no exception. Intellectual property rights (IPRs), for example patents, play an important role in this innovative market, affecting the diffusion of knowledge, innovation process and economic efficiency. These IPRs have usually been granted by governments as a way to protect inventions and then promote further innovation through a limited monopoly. This is obvious to the point that the software market is a rapid changing high technology market, where the products developed are a result of investments in research and development (R&D). These costs must be regained, and in cases like this, patents provide a good protection against imitation. With that said, there exist an economic argument in favour of monopolization of ideas which believes that without the beneficial government granted monopoly, there will be a lack of incentive to innovate.

Software IPRs are by no means new to the industry, but its complex nature and debated effects on innovation make it a difficult but interesting area to explore. While some champion IPRs, others oppose them.

It is well known that art. 52 of the European Patent Convention regulates patenting activities within the Union and expressively do not allow software and business methods patentability. This exception is not completely applied in practice. The evolution of the judicial treatment of the patentability of software over the last two decades has led to a remarkable increase in the number of patents on software and of firms seeking protection in this area. Critiques of the increased patentability of software have argued that this transformation will deter innovation and competition by holding up the development of technology that builds on patented prior art and that it holds back inventors because of patent infringement suits. Bessen & Maskin (2000) argue that because innovation in software is sequential and complementary, increased patent protection led to decreased innovation in the software industry.

1.1. Problem Statement

It is assumed that there is a positive correlation between both the IPR system and innovation and between innovation and economic growth. In addition, it is assumed that the IPR system has a positive effect on, or at least doesn't inhibit economic growth, and so overall has a positive influence on the societal economic growth. However, the transition from industrial to knowledge society has led to a series of significant changes in innovation-patterns and market

conditions which in turn has led to new criteria within the IPR system. There is a risk that the ongoing adjustments of the IPR system could fall behind the rapid development of technology, making the system become characterized by inertia.

It is an intention of this thesis to evaluate whether the basic grounds of the IPR system are correct. Does the current IPR system, especially patents, meet its supposed goal – to stimulate innovation and economic growth? In relation to this, the thesis will examine if there are any incentives to innovate without the granting of IPRs, and if so, how efficient alternative systems to a monopoly setting would work, regarding competition and innovation for the market.

1.2. Methodology and Sources

The thesis has a “law and economics” approach, in other words, economic analysis of law. There are two distinct theories of legal efficiency, and arguments based on both are supported by law and economic scholars. Positive law and economics uses economic analysis to predict the effect of various legal rules and in general states that common law is efficient, while normative law and economics makes policy recommendations based on the economic consequences of various policies and in general states that the law should be efficient. Put another way, it can be said that positive analysis describes, explains and predicts, while normative analysis compares alternatives and proposes solutions.

The thesis will use both a positive and a normative analysis. A positive approach will be used to describe economic effects of IPRs on innovation in the market. This will include an analysis of the current legal framework and practices in the EU. A normative enquiry will be used to give recommendations on the positive findings in the thesis, as well as comparing alternatives to the IPR system and in the end propose how the system can be made more efficient.

1.2.1. Sources

Main source of material will be theory based on academic books and articles along with rulings of court, policy statements and decisions and notices by the Commission. Online sources will also be used to a certain degree in order to follow progress in recent case law.

1.3. Limitations

There has been a lot of focus on IP in the software industry in the EU, thus a lot of material has been written regarding the subject. For this reason, the research which the thesis is built upon mainly concerns IPRs and the effect they have on: 1) Innovation and competition in the market; 2) Incentives to innovate in the market and 3) Network effects and standards. These factors are mainly applied to the European software industry, but when relevant, comparisons to other industries and geographical areas will also be made.

The starting point of the thesis is that the IPR system is appropriate as long as a balance is maintained between competition and IPRs. The purpose of the thesis is therefore to highlight some of the current IPR system's inherent problems concerning innovation and competition and propose some suggestions to counter these problems. The proposals must be seen as a limited review of the current system.

The analysis which is made has a general critical view of the IPR system, and the supposed purpose to stimulate technological innovation with a view to increase the total societal economic growth. When it comes to protection of IP, the thesis focuses mostly on patents but when relevant the thesis will also, to some degree, place emphasis on copyrights. The other two, trademarks and trade secrets, are left out because trademarks extend to symbolic features, and software code in itself cannot be protected by trademark. Trade secrets are a good alternative but offer a poor protection because of the increased knowledge to understand the source code of a programme. The analysis deals with the broad aspects of the patent system, including general trends, problems and possible solutions. There will not include a detailed examination of the evolution of the various laws and international conventions, which constitute the global patent system.

Throughout the thesis the abbreviation "IPRs" is made, the author is aware of the fact that this is a common name for copyrights, patents and trademarks – three separate and different entities involving three separate and different sets of laws. However, "IPRs" is used in the thesis and refers in general to patents and to the 1) general purpose of encouraging innovation and 2) general situation where the owners are granted the right to exclude others from access to, or the use of, the protected subject matter, thus creating a monopoly situation. These must be interpreted based on the various statements they are located in. The word monopoly is also used number of times throughout the thesis and refers in most cases to a legal monopoly, which IPRs give, granted by the government.

Furthermore the author is aware of different aspects of the patent debate, and that it concerns different issues. But as mentioned above, the focus will be on how the system affects innovation. Nevertheless, during the course of researching for the thesis, a lot of interesting and important developments have occurred regarding the software industry. The constant development in the market and the enormous amount of patents issued (and litigations) makes it a difficult industry to keep up with. Currently there is a case in the U.S. which is of great importance for software patents, and can even affect the European software market. The case is named *Bilski*. Although the master thesis focus mostly on incentives to innovate, the current case in the U.S. is important to mention because it can help clarifying the boundary between patentable and non-patentable software.

1.4. Structure

The thesis will approach the problem statement by first, in part two, stressing the importance of balance between competition law and IP law. Then in part three it will comprehend the European software industry and look at factors which are important for a healthy industry and present a recent case law regarding Microsoft, applying analysis and economic and legal theory provided. I have decided to split up the parts in this section to provide a better overview, so the next parts also fit under part three, but have their own part. The parts in concern are part four, five, six and seven. Part four looks at intellectual property and software and deals with different types of protection. Part five takes a closer look at standards and interoperability and stresses the importance of open standards to foster innovation. Part 6 focuses on the economics of software which includes network effects and how this affects the market. Finally, part seven will present case law regarding Microsoft, based on the previous parts. After the presentation of the Microsoft case, the thesis moves on to part eight which addresses market structure and incentives to invest in the presented structures. Part nine introduces the reader to innovation and recognizes trends in the market corresponding to a collaborative environment. Part ten is closely linked with part nine, and focuses on patents, an introduction to the current legal framework will be given followed by potential market failures which will be illustrated by case law. Then the part moves on to open source software, which is an alternative to proprietary software, and handles other initiatives to the current patent system. Part eleven takes the reader to a near future, based on market trends, and explains that innovation happens without IPRs and patents especially. Finally, the conclusion is presented in part twelve.

2. CENTRAL POLICIES AND ECONOMIC THEORIES

2.1. The general purpose of intellectual property law

IPRs are like any other property rights; they allow the creator, or owner of a patent, trademark, or copyright to benefit from his or her own work or investment. Broadly speaking, intellectual property is the legal rights associated with creative effort in a certain industry and includes computer programs, films, designs, inventions, artistic and literary works etc. (Bainbridge, 2009, p. 3).

Intellectual property rights are usually separated into two major areas. The first one is “industrial property” which includes rights connected to industrial designs, trademarks, patents and trade secrets. The other one is “copyright” which can be said to protect artistic and literary work, as well as the rights of performers and broadcasting organizations (WIPO, 2004, chapter 1).

We have intellectual property laws for basically two main reasons. The first reason is a moral and an economical one (WIPO, 2004, chapter 1). The idea behind this is to give the inventor an incentive in the first place, so that when the idea is put to life he can benefit from the effort put in to that subject. It also prevents free riding, because those who free-ride benefits from other people’s investment and by that disrupt the goals of the IPR system. The other reason is for the promotion of creativity, the distribution and application of its results. What lies behind this is the aim of galvanizing fair trade and the contribution to social and economic growth (WIPO, 2004, chapter 1). Intellectual property rights are supposed to work as an incentive for others to invent as the creation of intellectual property is the result of personal creative work but has to a large extent already been inspired by existing work.

At first glance it would seem as though if such protection were not granted for new products the results would be that the economic and personal incitements for creation would vanish. The risk of free riding would reduce incentives to innovate and would contravene with the development of new products, which would result in a society which suffers from stagnation.

But is this the case for every intellectual property right?

Is it true that intellectual property achieves the intended purpose of creating incentives for innovation and creation that offset their considerable harm?

These are some of the questions which this thesis would like to explore a bit further. Due to the patent discussion in Europe, and theoretical background, it's unclear if we need such strong protection in the software industry, which often causes situations referred to as "intellectual monopoly" (Boldrin & Levine, 2008). With this said we are also moving into a new "era" where open innovation and open source software plays an important role for the spur of dynamic efficiency in the market. Participants in these communities are not concerned about free riding, because in disconnected markets there does not exist a feeling that other users take advantage from one's innovation, hence the counter theory of free riding.

2.2. The general purpose of EC competition law

The basic purpose of EC competition law is built upon Article 3(g) of the EC Treaty which in the end tries to keep the internal market effectively competitive. In the EU, the free movement of goods in Articles 28-30, is a right which is greatly valued, and therefore the competition rules are seen upon as a very essential addition to this value (Kent, 2008, p. 270). The general aim of the EC is to make the market undistorted. This is easier said than done but it requires the authorities to keep the markets open to new competitors and at the same time protect the existing competition. In this way, the protection of the undistorted competition is shielding the consumer from exploitation by ensuring a high level of competitiveness, and therefore the existence of Articles 81 and 82 in the Treaty. These provide frameworks to protect against concerted practices as well as exclusionary conduct by dominant firms (Kent, 2008, p. 270).

Article 2 refers to the creation of a common market which focuses on a balance between economic activities and economic policies in the member states.

"The Community shall have as its task, by establishing a common market and an economic and monetary union and by implementing common policies... to promote throughout the Community a harmonious, balanced and sustainable development of economic activities...a high degree of competitiveness and convergence of economic performance..., the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States." (Article 2 of the EC Treaty)

The main objectives of the competition policy within EC can be divided in to three parts, firstly; "market integration", which seeks to create and preserve a single market for the interest of the consumers and producers. The second is "equity", which aims to prevent large undertakings for abusing their dominant position. The third is "efficiency" where the goal is

to influence and convince firms to keep up and adjust themselves to the technical progress as well as rationalizing their production and distribution (Kent, 2008, p. 270).

EC competition law has always had a policy of fostering economic integration, and it is important to keep in mind, when trying to understand the decisions taken by the EC institutions, that EC competition law acts both as an economic function and at the same time tries to fulfil their community objective by implementing common policies between Member states (Joelson, 2002, p. 200). Competition policy is a changeable factor which shows the current values of the society, it is really important that these policies change along with new insights, technology and views (Whish, 2003). This is why sometimes there is tension in competition law, especially in the software industry. The reason for this is because the software industry is characterized by rapid change, standards and different business models like proprietary and open source software. This really tests if the law is up to date, does it meet the needs of our modern society?

2.3. The relationship between EC competition law and IP law

To fully understand the software market regarding competition and IPRs it's important to focus on the underlying issue, which is whether competition law and IPRs are in conflict or if they pursue the same goals.

2.3.1. Conflict or common aim?

If we compare competition law and IPRs, it would at first sight seem like IPRs and competition law may have different effects. While IPRs grant a permitted legal monopoly or exclusive right which excludes others from using this subject, competition law on the other hand tries to prevent monopoly power and exclusion of competitors in cases not conforming to the law. But if we examine these two a bit closer, the objectives of the two in the end are essentially the same: to further the progress of innovation and investment to the advantage of consumers (Dolmans, O'Donoghue & Loewenthal, 2007). An example of this can be found in *Magill* (1995), the first case regarding the refusal to license an IPR which could be contrary to article 82: General Gulmann stated that "it must not be forgotten... copyright law, like other intellectual property rights, also serves to promote competition." This means, in the short run, that consumers are granted an additional choice, although monopoly price. When the patent expires at a given date in the future, the long run effects will be higher production at a lower cost for the whole industry (Merkin, 1985). Today the relationship between these two are not seen upon as very divergent, but if the short term effect on competition counterbalance the

long run efficiencies, EC competition law steps in to regulate (Haracoglou, 2008, p. 101). An example of this regarding welfare is that consumers might be better off in the short run if a product is at a low price, but long term effects of weakened competition might outweigh any short term gains (Predatory pricing). Another example is where a patent holder, beyond the original date, is granted or manages to continue his legal monopoly, which again is often overlapping with an economic monopoly or not conforming to EU competition policies (Haracoglou, 2008, p. 101).

2.4. The market mechanism

The market mechanism is an economic term that mentions the use of money exchanged by consumers and suppliers. The system is an open and understood arrangement of value and time tradeoffs to produce the best distribution of goods and services. The next sections will now explain how the market should function with a fine balance between IP rules and competition rules and how they both strive towards a common goal.

2.4.1. Efficiency goal

Competition law does not protect the market for its own sake, but because efficient markets offer a diversity of products at the lowest price. Competition is known as the driving force behind the market mechanism and it is important that it should lead to efficient market performance. Competition should also act as a catalyst putting pressure on suppliers to invest in R&D, to boost innovation, and at the same time share the remains resulting from efficient practice with consumers in form of lower prices. If this is achieved it will benefit the interest of consumers and the society.

Innovation today is probably and generally accepted as the main cause of increases in economic welfare. In the short run it can be very clear how the price system in the market mechanism conduce to an efficient allocation of resources but on the other hand it is not so clearly defined how innovation is affected by the market mechanism. If we look at the whole functioning of the market mechanism we can see that it is relatively clear that there is a connection between this and the incentives the players on the market have to innovate (Drexl, 2008, Part 1).

The primary aim of competition laws and competition policy is to protect competition and assure an efficient behaviour of the market mechanism. The main focal point has been the protection of the price system, so that in the short run the allocation of resources is protected.

Furthermore it may then be said that the competition rules have had a static view on allocative efficiency. This can for instance be clarified by the Commission's Guidelines on the application of Article 81(3) where it describes the general objective of Article 81(1): 'The objective of Article 81 is to protect competition on the market as a means of enhancing consumer welfare and of ensuring an efficient allocation of resources' (Commission Notice 1).

When discussing the efficiency goal dynamic efficiency has not been given the same amount of focus as static efficiency in the enforcement of the competition rules. However, innovation today is a very important thing to discuss, especially regarding resources and welfare. It is now generally accepted to take into account dynamic efficiency as a part of the efficiency goal when interpreting Article 81 and 82 (Drex1, 2008, p. 5).

The efficiency goal is usually divided in to three dimensions and static and dynamic efficiency are two of them. (The third is efficient use of resources inside the production entities) The driving force, which is competition, furthers both static and dynamic efficiency in the market mechanism. It needs to be said however, that competition does not guarantee to maximize both static and dynamic efficiency. It can, for example, be shown that in the market structures with a lot of small suppliers competing hard against each other, resources will be efficiently allocated, but that hard and intense competition will limit the finances which are meant for dynamic efficiency. Opposite, in the concentrated markets, the suppliers tend to be more innovative because they have larger possibilities and incentives to invest in R&D. This should not automatically mean that protection against competition should be given to inventors. The holder of an IP should or must be pressed to further innovation and improvements to the interest of consumers and society. If this is to be done there must exist a certain level of competition on the market. There are a lot of things that effect dynamic efficiency and economic theory help to explain how market structure does exactly this, and that has implications for the management of market conduct (Drex1, 2008, p. 5).

It can easily be said that static and dynamic efficiency are two dimensions that are in conflict with one another, this is because if the concentrated markets boost dynamic efficiency to a larger extent than markets with a lot of small suppliers we will have an uneven balance. Therefore a conclusion can be made, the issue is not to further the increase in static and dynamic efficiency respectively, but to increase the sum of both together. If we are to make the best of the society's scarce resources, the focal point must be to find the interpretation of

Articles 81 and 82 that gives the best result, in the notion of competition. The key issue is to develop an analytical structure that captures the effects on dynamic competition and dynamic efficiency in the analysis of the conduct which is supposed to be contrary to Articles 81 and 82. When it comes to managing IPRs this is especially important because of the risk of hindering a conduct which may have a constructive effect on dynamic efficiency. Therefore it is very important to take into consideration, in competition law analysis, that the common goal of IPRs is to further the technological progress and innovation. When taking into account whether conduct based on IPRs is contrary to Articles 81 and 82, it is important to evaluate the effects of both static and dynamic efficiency. If the sum of these is negative it shows that the conduct is contrary to the efficiency goal of Articles 81 and 82 (Drexl, 2008, p. 5-6)

2.4.2. Dynamic efficiency as a common goal for competition law and IP law

Competition rules and rules on IPRs differ in a great deal of ways, but it is worth mentioning that IPRs are not based on the same economic rationale as competition rules. Usually, in legal discussions, IP law is expressed in a non economic term. Furthermore it can be discussed whether economic welfare analysis has the same relevance when interpreting rules on IP law as when interpreting Articles 81 and 82. Then again it is important not to forget that IP rules has as one of its goals to spur dynamic efficiency, which is more likely to be in an economic sense. If there could be formed, in the economic analysis, an accepted goal of dynamic efficiency in both competition law and IP law, it could mean that the accepted theoretical framework could work as a principle for an analysis of conduct founded on IPRs under Article 81 and 82 (Drexl, 2008, p. 6).

IPRs give the holder a right to exclude others from using the subject or resource, and hinder others from free-riding on the efforts put in to the subject. The economic value put in to the subject is then realized in the market; hopefully it will give more money back than is spent on the investments. This is what any investor would expect from using time and resources on R&D (Drexl 2008, p. 6).

A public good which is common for an innovator is knowledge. If this knowledge is not protected to a certain degree, it can be circulated with only minor costs. If the knowledge is allowed to be used for others for free, the innovator will have a big problem in collecting revenue of the great deal of investments associated with the R&D. From society's point of view it would be most efficient to share the knowledge to all who can benefit from it, at a price that covers the distribution costs. This will have a serious impact on the incentives to

innovate. This is because this static view will provide a really small incentive to innovate in a world without some kind of protection. Knowledge, when produced, is an IPR that gives the right to utilize it in a way which gives potential innovators economic incentives to innovate (Drexl, 2008, p. 7).

If the goal of IPRs in the long term is to secure efficient use of resources, it is important that the right balance between dynamic and static efficiency is drawn. The monopoly right which is given gives an opportunity to harvest profit for a period of time, this works again as a motivation and a promotion for more R&D. The protection time given should not be exaggerated because it can cause unnecessary allocative harm to the disadvantage of consumers (Drexl, 2008, p. 7).

The key factor through all this is balance. This can clearly be seen when we put for example the duration of IPRs into perspective. It is important to balance the profit sides IPRs give society, for example the furtherance of innovation, against the costs – higher prices and competition reduction – that IPRs lead to. In economic terms this method is the same approach used for regulating the activity of IPRs under competition law. This is because dynamic efficiency is a common goal for both competition rules and IP rules, and a balanced approach can be used for the regulation of the activity of IPRs under both sets of rules (Drexl, 2008, p. 7).

The principle that they both share the same objectives is also expressed by The Commission. It can be recognized by The Commission in its Guidelines on technological transfer: (Commission Notice 2)

“The fact that intellectual property laws grant exclusive rights of exploitation does not imply that intellectual property rights are immune from competition law intervention. Articles 81 and 82 are in particular applicable to agreements whereby the holder licenses another undertaking to exploit his intellectual property rights. Nor does it imply that there is an inherent conflict between intellectual property rights and the Community competition rules. Indeed, both bodies of law share the same basic objective of promoting consumer welfare and an efficient allocation of resources. Innovation constitutes an essential and dynamic component of an open and competitive market economy. Intellectual property rights promote dynamic competition by encouraging undertakings to invest in developing new or improved products and processes. So does competition by putting pressure on undertakings to innovate.

Therefore, both intellectual property rights and competition are necessary to promote innovation and ensure a competitive exploitation thereof.”

2.5. Concluding remarks

From the perspective of society, the aim of IPRs is to promote technological development. It is also important to remember that competition also spurs innovation which means that too strong IPRs can reduce competition in the market to the disadvantage of consumers. It clearly shows that if IP legislation only strengthens the power of right holders and thus gives them opportunity to influence the behaviour of fair competition the common aim of balance is not reached. Therefore it's important to draw a balance between static and dynamic efficiency.

In the previous section the tension between IP and competition law in the market mechanism and how things should work efficiently to foster innovation has been explained. In the next section the focus will be on the main part of the thesis which is innovation and software in the European market. Here the thesis will touch upon a number of issues related to innovation and the application of competition law in the process. The reason for this is because the software industry has been the subject of intense and controversial investigations in competition law. Some argue that the industry requires a new type of antitrust, a more liberal one, while others claim it just needs better analysis to prevent irreversible monopoly. It will explore further the shift from closed to open innovation and the effects of this on society. Questions and fields of exploration in this section will mount down to the patent system, do we need it? Is it designed in the right way?

3. THE EUROPEAN SOFTWARE INDUSTRY

3.1. Why software is important

Over the past few decades the software industry has experienced tense changes and today it is one of the biggest and fastest growing industries in the world. Software is now a widely available product for all consumers who desire it and exists in almost every place you can think of. It is used in your computer that you use every day, in your phone, mp3 player, even your car has software. Software defines the qualities and functionalities of many products and services. Much of the software that is developed today is solely used for increasing efficiency, functionality and quality of production and distribution processes. Furthermore, the European software industry is a key enabler for innovation, growth and employment in almost all sectors of the European economy.

3.2. Significance of software

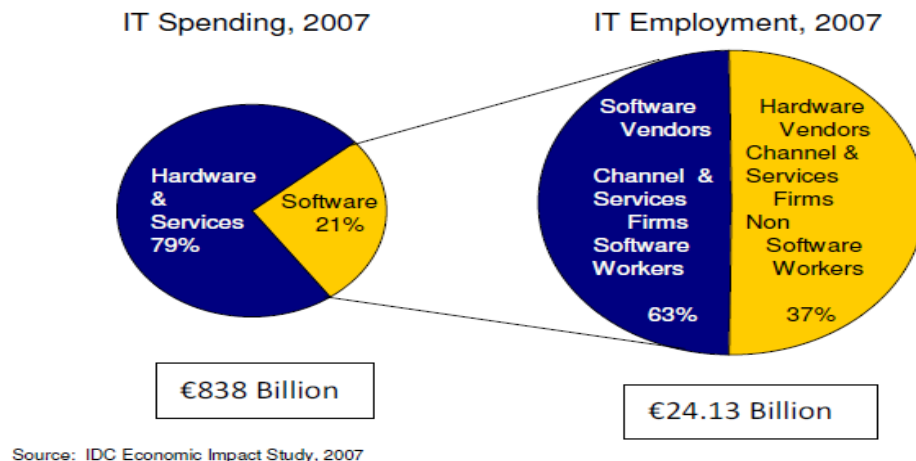
To put things in perspective, software is a €76 billion market or a €216 billion market if you include activities classified as “services” (Commissioner Viviane Reding, 2007, p. 2). Another source is from International Data Corporation (IDC, 2007). They came to the conclusion that in Western Europe (IDC, 2007), between 2002 and 2006, the spending of the Information and Communication Technology (software, hardware and services – not telecommunications) (ICT) sector was €257 billion or 2.57% of Gross Domestic Product.

The software market is a continuously growing sector, and it is estimated that it will grow more swiftly than the ICT sector as a whole. IDC forecasts that, between 2006 and 2011, software in the EU will continue to grow at a ratio of 6.9% per annum, against the whole ICT sector which is estimated to grow at a rate of 6.0% (IDC, 2007).

SPENDING (Figure 1)			
	Western Europe	European Union	Eastern Europe (CEE)
Information Technology Spending (€B)	€257	€258	€31
Estimated ICT Industry Compound Annual Growth Rates 2006-2011	5.7%	6.0%	12.8%
Software Spending, 2007 (€B)	€54	€53	€4
Estimated Software Sector Growth (CAGR) 2006-2011	6.8%	6.9%	14.1%
Software as a % of Information Technology Spending, 2007	21%	20%	13%

Compared to the other ICT sectors, software has the most positive economic influence on the market. Growth in software spending has an effect which provides the market with greater job opportunities and economic multipliers compared to other fields in the ICT area (IDC, 2007).

The Economic Impact of Software



The most remarkable impact is in terms of employment. In 2007 employment in the software industry was estimated to be 4.3 million in the EU, which amounts to 55% of the entire employment in the whole ICT sector (IDC, 2007).

3.3. What is software?

Software has become a common word which everyone uses, but most of us lack an in-depth understanding of the term. To give the best understanding, a comparison to hardware is made: Software is a set of instructions which are executed by a computer, while hardware is the main physical device on which software runs. Software is commonly divided into two main categories: system software and application software. System software helps the computer hardware to run and serves as a base for the application programs. System software can be operating systems like Linux and Microsoft Windows, but the category also consists of compilers. A compiler is the software that reads the human-readable instructions written by a programmer and translates them into a computer-readable language in order to execute the instructions. Application programs are programs that execute specific tasks for the users like for example spreadsheets and word processing (Muffatto, 2006, p. 24).

In all, how software works can be put into three levels: the instructions, the execution and the computing results. The computer programmer writes the instructions which are called the source code. The source code cannot be read directly by a computer; therefore a compiler is

needed to translate it into computer-readable code, which is called object code. The operating system then executes the instructions defined in the code to produce the computing result (Muffatto, 2006, p. 24).

At this point there will be the existence of two kinds of users. Some users are only interested in the software for its computing results, on the other hand there also exist users who want access to the source code so they can read it, copy it and modify it. For these reasons, most commercial software is sold without the source code. They only offer the object code, in other words, denying other software programmers to see the instructions that make the software perform in the way it does. The source code is the program's history and is very valuable for the people behind it; it often contains comments like for example which solutions were tried and failed and how problems were solved (Muffatto, 2006, p. 25). In the end, the source code is the key focal point of any software program and that is why it is in the centre of the debate on software protection (Muffatto, 2006, p. 25).

There are two main types of software companies which is worth mentioning, these are packaged software companies and embedded systems software. Independent software vendors are usually those behind the "packaged software". They offer the software through sale, lease or rental or it could be as a service. Embedded software is computer software which is usually written for special purpose hardware, and this is not mainly computers. The embedded software is "built in" to the electronics in for example cars, airplanes, televisions, telephones etc (Software 2.0, 2009).

The two differ a lot from each other, mainly because embedded software has no user interface with which to interact. Embedded software already plays a great role in the European industry and will continue to grow and drive all major product innovation in the years to come (Software 2.0, 2009). For these reasons, embedded software is not the focus of this thesis. The focus will be on packaged software, like Internet browsers and the importance of standards and interoperability.

The next section will focus on the different types of IPR and how they are applied to software. Because of the lack of space, only later will the thesis explore the field of copyright and to a larger extent patents.

4. INTELLECTUAL PROPERTY AND SOFTWARE

4.1. Why do IPRs exist?

Software interoperability has become a really important issue in a rapid interconnected world. The result of this is that IPR has been given an even more significant role in software and standardization, as technological developments have made piracy and patent infringement easier.

For the software industry to work properly, in economic terms, it highly depends on legal rules which protects from free riding and duplication of products. It is obvious that this is important when there is such a huge difference in costs between developing and (illegal) copying software products. The costs for copying a program are minimal while the costs relating to the creation of a software program can be extensive. Therefore if the developers want their invested capital back it's important that free riding is kept in control (Even, 2006).

4.2. The different types of protection

The protection will vary depending on the type of software, investments and the usage and constraints of the software. Today software is traditionally protected by copyrights, trade secrets and patents (while trademarks are only used to protect a word, name, symbol or most commonly a brand-name). This has led to a number of challenges because the source code of the published software can easily be rewritten.

Trade secrets are used to protect valuable information in a program, but since programming languages and operating systems became more standardized in the 1980s, an increased possibility to understand the source code of a program became evident and trade secrets could no longer be used alone to protect the source code, therefore companies turned to copyright.

Copyright is meant to protect direct copying, but the copying of the idea or concept is still allowed. Said from a more legal point of view, copyright is a contract between an author and a user which specifies what the user can or cannot do with the author's work.

Patents are similar to copyright; it does not protect the underlying idea, but the new technical application of an idea. Furthermore, a patent gives the creator of the product or process, a monopoly right which can last for 20 years. The right to exclude has made patents very effective.

The mixed nature of software makes the protection by IPR complex. The basis of software, which is the source code, is looked upon as an expression of an idea. The developers are given copyright for the source code of the software. When the source code is put to life in compiled form, the software performs technical work and can be defined as an engineering solution. Actually this was the statement in favour of applying the patent system to protect software technologies. In the United States and the European Union, this mixed nature of software is another reason for the great number of ad hoc decisions made in cases of IPR in software technologies (van Wendel de Joode, de Bruijn & van Eten, 2002).

4.3. The two main types of software

Although there are several different types of software, this thesis will only concentrate on proprietary software and open source software (OSS).

A comparison of the two categories: (Source: Muffatto, 2006)

	OSS	CSS
Example	Linux	Microsoft Windows
Free of charge	Yes	No
Unconditional use	Yes	No
Source code open	Yes	No
Freedom to modify	Yes	No
Protects freedom	Yes	No

Proprietary software is computer software which has restrictions, which tells us that somebody owns the right to the software. An example of this is Microsoft Office. If you buy a copy of this, you don't "own" it, but you have acquired a license that makes you an authorized user. This means that you cannot legally copy, sell or lease your purchased software; you have only the right to operate the software yourself for its intended use, which normally is for creating documents. Another term for this kind of software is "closed source software" (CSS) which is contrary to OSS.

Open source software is defined as computer software where the source code and certain rights are provided under a software license that meets the OSS definition (Open source definition). The definition gives us an open source ideology, and outlines the conditions of usage, modification and redistribution of open source software. Furthermore, this means that

the user of the software is allowed to change it or even improve it and finally then redistribute it with or without modifications if the user wishes. Some examples of OSS include the Linux operating system, Apache web-server, Mozilla Firefox web browser and Openoffice.org office suite.

To complete the short overview of the both, it is important to highlight the difference between commercial and proprietary features of software. Proprietary software is commercial in the sense that it makes profit on licensing fees, but in the case of OSS profits can be made by selling packaging and for example services for the OSS products. Open source software tries to reach a balance between the financial goal of companies and the freedom of OSS (Muffatto 2006, p. 37-38).

5. STANDARDS AND INTEROPERABILITY

Standardization is a major driver of competitiveness and is in general a key factor for the development of the software industry (European Commission white paper, 2009). The role of standards has been debated for years, and the software industry has seen quite few formal standards compared to other industries (The official bodies are: European committee for standardization, CEN, and the International Standardization Organisation (ISO)). Informal industry consortia have been the most preferred when developing common used specifications in the software sector. The development of these standards is an outcome of the high speed at which new technology develops in the software market, at the same time the market itself recognizes which specifications are needed and which are not. The European software industry will gain most in the standards arena, where the standards process is transparent and open to all, and where the success of technologies and different business models are decided by the market rather than government authorization.

5.1. Standards promote interoperability

Standards are specifications for how particular parts of products and services work. In the software industry standards are mostly developed in the private sector, they are then put forward for open consideration and adoption by consensus in any of a range of standards bodies. Standards represent a product-neutral specification that determines certain characteristics of a particular result that is planned to be accomplished. Standards help a product (ICT) or a service to interact and communicate with one another (interoperability). If

this is done, the standards can increase efficiency, reduce transaction and implementation costs, and at the same time spur competition in the market.

An example is the well known MPEG standards; they define different elements for encoding and decoding digital video and associated audio. Anyone can use these standards on reasonable terms to develop software, devices or services that play videos. Interoperability can be recognized with the common codec algorithms and file formats which allows users to play MPEG encoded videos from different sources on different devices without incompatibilities. This promotes efficiency, cost saving and competition because it saves producers from writing their own code for their own software and instead allowing them to compete on other features like design and functionality.

In the end it is important to remember: 1) that standards change over time. This can be because of consumer demands or technology demands. 2) Products that implement standards are also evolving and changing, sometimes by extending the standard to reflect new innovation. The changes of these two are not often in harmony, which leads to interoperability problems between applications, because different products implement different aspects of different generations of the standards at different times. This can also mean that the change was there to improve the consumer welfare, which leads to the conclusion that law which too strictly defines interoperability can hinder the flexibility of this rapid evolving process (European software strategy v2.0, 2009).

5.2. Open standards

In order to avoid a lock-in effect, which is explained in section 6.1.4., it is important to pursue openness, which again is a key issue in areas of software interoperability. An open standard is a standard that is publicly available and has various rights to use associated with it, and various properties of how it was designed. It is not the same as open source - open standards can result from either OS or proprietary routes. If open standards are provided, it will allow all possible vendors to enter the market, which will result in more R&D and ultimately increase consumer choice (European software strategy v.2.0, 2009). Therefore;

“Open standards should be at the core of a strategy that seeks to promote an innovative and competitive European software sector.” (European software strategy v.2.0, 2009)

According to the European software association, the standards in the software industry have to follow and value three principles: (European software association 2007)

- Their initiation and drafting have to be market led
- Their acceptance and usage have to be voluntary and flexible
- The development process should be open and transparent

These aspects are particularly significant for SMEs. Additionally, since the software industry is highly international, it is important to focus on the growth of international standards rather than concentrating on European standards. (Examples of Open standards are HTML, CSS and XML)

5.2.1. SMEs and open standards

According to Openforum Europe (2009), SMEs employ around 81 million people in Europe (66 % of Europe's total employment) and are therefore considered as the backbone of the European economy, contributing to innovation and strengthened competitiveness in the European software industry. Because of this, open standards are vital for SMEs. It lowers the cost of market entry, increases market goods which benefits consumers and the industry and fosters growth and innovation.

5.3. Tension between IP law and standards

An interaction between IP law and standards can be seen, standards are commonly expressed in specification documents - most likely under copyright protection, and technical standards are usually the subject of patent protection.

There exist, however, a tension between the two. While standards aim to spur compatibility through a shared system, IPRs stimulate the creation of innovation by exclusive rights in the market (Drahos & Maher, 2004). This tension between the two can lead to arguments that they are in conflict with each other (Drahos & Maher, 2004). For example, the European Committee for standardisation has developed a document called, CEN/CENELEC Guide 8: Standardization and Intellectual Property Rights, which states:

"The underlying philosophies of standardization and IPR-protection are opposites. Standardization is intended to put ideas into the public domain, whereas protection of IPR makes them private property. Therefore, any use of IPR by a standard is an anomaly, sometimes an unavoidable one, which needs careful management." (CEN/CENELEC)

But this view, that they are opposites, is not shared by everyone. Some argue that it is unusual for one actor to own all technologies within a technological system - which would mean a decentred ownership, IPRs may actually help to create a standard because it allows parties to engage in "pareto-improving trades" (Lea & Hall, 2004).

5.4. Concluding remarks

Open standards are important to promote the wider adoption of standards and the corresponding development of interoperable and innovative technologies. A healthy view of standards (market driven) also gives room for cooperation between industry players which will provide the consumers with standards they want, including the standards the market needs for interoperability, which will also help the European software market to compete in world markets (This is also the Commissions view in COM(2009) 324 final).

In moving towards open standards it is necessary that the legal rights and restrictions that apply to standards and standard specifications are properly managed. In particular, it is crucial that copyright and patent interests are clearly disclosed to all developers and users of standards from an early stage and that the terms upon which these interests are licensed are made clear.

6. ECONOMICS OF SOFTWARE

6.1. Network effects

In economics, a network effect is the effect that one user of a good or service has on the value of that product to other people. When this is present in the market, the value of the network effect will increase as more people use it. For example, the well known encyclopaedia Wikipedia relies on positive network effects. However, other forces could drive the market to the establishment of one single supplier.

6.1.2. Impact of network effects

The market for operating systems is usually characterized as network effects (Lopatkat & Page, 1995). These effects take place when the user experiences benefits other than the product itself, in other words a network benefit which further increases by the number of users of the product (Lopatkat & Page, 1999, p. 12). This creates demand and further turns into positive feedback which can, as we know it today, interfere with antitrust law. Producers in these markets get a constantly increasing return to scale, which strengthens early success

and intensifies early defeats (Lopatkat & Page, 1999, p. 12). This may have a ‘tipping effect’ on the market to one single kind of product. This tendency makes the competition in the market intense and gives the early competitors incentives to use various strategies like price penetration so they can create and sustain market share and become de facto standard (Lopatkat & Page, 1999, p. 12). But it is important to understand that network effects do not essentially mean that a single standard will survive, if the customers in the market have a mixed preference, various standards may well continue in the market (Katz & Shapiro, 1994).

The best example to illustrate the above discussion is the US and the ongoing case in the EU involving Microsoft’s browser, which will be discussed later. For Microsoft the main goal was not to penetrate the neighbouring market alone, but to also maintain its monopoly. The browser market was high priority at Microsoft because one day other applications may be written on the basis of the browser.

6.1.3. The strategic effects of IPRs in network markets

In network markets, IPRs play a very important role because they can be used to create and enforce incompatibility or to introduce compatibility by opening or closing a network standard. Compatibility means that network goods that are based on the same standard need not be produced by the same firm. For example, if an Operating system only supports software that the same firm produces it would be characterized as an incompatible virtual network. On the other hand, an Operating system is more valuable to the consumers if it is compatible with a variety of software. Therefore the conclusion can be drawn that consumer welfare is much higher, in terms of network effects, when there is compatibility between network goods.

6.1.4. Effects on innovation during a lock-in

If a standard race is finished and the network effects have a negative impact on the new technology in the market, we have a lock-in. The standard race is finished with the founding of a single network standard (Drexl, 2007, p. 96).

Incentives for innovation, during the lock-in, along with competitive pressure depend on the market and if there exists compatibility or incompatibility. If there has been a “tipping” of the market as a result of the standard race, it is incompatibility that usually exists in the market. This means that only one network company is active within the standard. This is usually enforced by IPRs. By comparison, compatibility will succeed if the standard race is

terminated by a joint practice. If this is the case, it means that no participant will be excluded from the network market by IPRs in the standard (Drexl, 2007, p. 96). In general, during a lock-in, dynamic competition is slow because it is much harder to innovate than it would have been if the network effects were not present in the market. If IPRs exist in the market, it will contribute to this difficulty of establishing an innovation.

6.1.4.1. Example

An example of this can be seen in the case of Microsoft in the U.S. Since Microsoft successfully exterminated Netscape they have not been very innovative with their web browser. But when the battle was on, Microsoft released 4 new versions of IE in just two years (Wilson, n.d.). After the competition in the market was gone, Microsoft's innovation output had dramatically been reduced, between 1998 and 2001 they only released two new versions, neither a major upgrade (See Baldazo, 2003, & Rapoza, 1999). The next release consumers would see of IE was not until 2006. An analyst commented on the issue:

"This is a common pattern with Microsoft. The company is aggressive about improving its software when it first enters a market. But once it crushes its competitors and establishes an effective monopoly, as it has in Web browsers, Microsoft seems to switch off significant innovation." (Mossberg, 2004)

You could argue that an incumbent monopolist, like Microsoft, has little incentives to spur creative destruction within its own standard, because this would only cannibalize his present monopoly profits. As mentioned in section 8.3., outsiders have a lot more to gain and thus, higher incentives to innovate or improve the network standard. The reason for this is usually that outsiders have a vision of conquering the whole market. If we take an earlier example of Microsoft and the case of its work group server operating system, (Case COMP/C-3/37.792 – Microsoft) we can see that if the network standard is protected by IPRs, the market will be inefficient because outsiders will not be able to improve the present technology, which is a result of Microsoft's lack of interoperability. On the other hand if Microsoft, along with outsiders, used the standard under compatibility it would most likely spur innovation in the market. On the basis of this we can draw the conclusion that IPRs worsen the lock-in effects (Drexl, 2008, p. 99).

7. MICROSOFT VS. EU

To illustrate the above theory and analyses, the next section will focus on recent case law in the EU. The case involves Microsoft and the tying of its Internet Explorer to its Windows operating system.

Much of the problems which come from the recent Microsoft case and even earlier cases exist because of the difference between the relevant markets. This part will outline the products of relevance, economic theory of tying, interoperability issues, and case law and then describe the network effects which supposedly have an influence on the market.

7.1. Operating systems, browsers, and the internet

Microsoft sells a great amount of different operating systems. They have developed a lot since the first operating system called MS-DOS, and now Windows is probably the most used OS in the world. In recent years, they have updated their Windows XP to a version called Vista – and now the new Windows 7 has entered the market of operating systems. The OS controls the operation of the computer and the hardware systems within it. Today, Windows includes a lot of other applications like for example a simple word processor called word-pad, paint – a drawing program and an easy to use calculator. But the most important and useful application is without a doubt the Internet Explorer (IE), which lets you access the World Wide Web - the largest part of Internet.

The Internet is a standard and a global network of connected computers that connects all the users. The Internet consists of a great deal of resources and services; the most well known to the average user is the World Wide Web (WWW) and the support of electronic mail. The WWW is a system which consists of a set of interlinked documents, pictures and other resources. These are again linked by hyperlinks and URLs. All this forms what we know as “Internet sites” which we connect to everyday. These are written in a common computer language called HTML (Wikipedia). Then browsers like IE lets you connect or access the resources of the web, and from there you can navigate your way around web pages. (Wikipedia)

Microsoft has from the beginning given away its browser for free, and has over the years increasingly integrated it in the Windows operative system. Whether IE is a separate product or a part of the Windows operating system, now raises issues in recent European antitrust cases.

7.2. Tying

7.2.1. Efficiency benefits from tying

The reason why companies would use tying as a strategy is because it provides them with economic efficiencies which ultimately give benefit to consumers. Tying leads to efficiency gains for both, to seller by distribution and production efficiency, as for the customer they now don't need to buy the two products separately. For example: Cars and tires or operating systems and browsers.

7.2.2. Risks and inefficiency from tying

Tying is making the sale of one product conditional on the purchase of another one. For example, a company that produces a good in a competitive market can tie this product to another product which is protected by an IPR. In economic theory this is usually referred to as "leveraging". The theory suggests that a firm which has monopoly in one market can monopolize the second market, by using its dominance in the first market.

Critique of the theory by Posner: It's profitable for a monopolist to tie products for the sake of price discrimination, not for exclusionary purposes. According to the critique the firm never has an incentive to engage in tying for the sake of monopolizing the tied-good market (Posner, 1976).

Tying is also said to reduce the incentives to invest. Choi and Stefandis (2000) states that entry takes place through innovation. Further, they show that bundling or tying reduces potential competitor's incentives to invest and therefore an entry barrier occurs.

Tying is usually seen upon as harmful for competition by the competition authorities, and has created a per se illegality approach. But on the other hand it's important that this view does not hinder firms in executing tying practices in the future. It's important to keep in mind that tying is not illegal and is still looked upon as a strategy that can benefit all parts. For this reason economic theory suggest that firms with strong market power should be investigated (Motta, 2004, p.468). It also suggests that if competition authorities too strictly intervene with a tying practice it can create negative effects which can reduce incentives to invest in innovation (Motta, 2004, p. 468).

7.3. Browser Wars II

With the development of new technology and online services, web browsers have become an important instrument for businesses and consumers. The hindrance of consumer choice in this market would weaken innovation.

Microsoft is in a difficult position, and the sooner they realise that people, users and corporate customers, have other options and choices the shorter the fall will be.

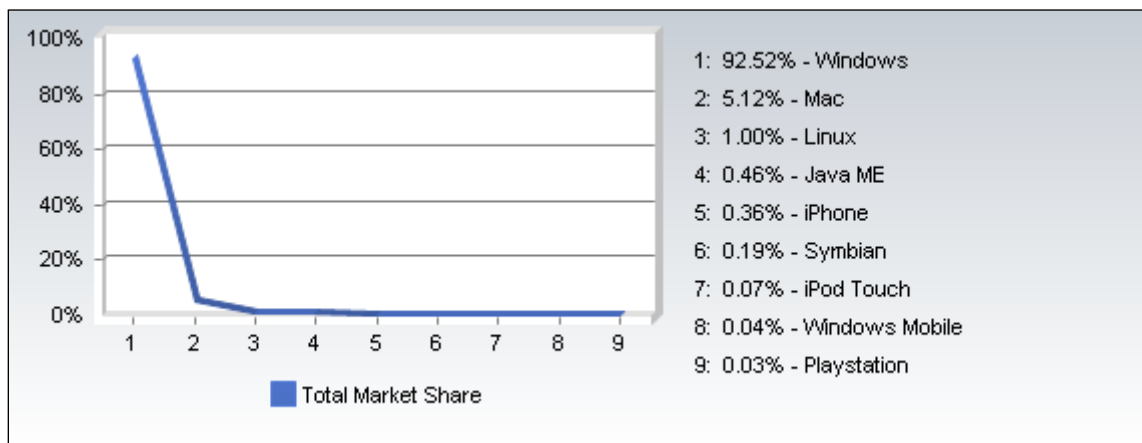
There are at least three reasons for the situation Microsoft faces:

- The development of more effective anti-trust regulation, which more and more recognises the importance of interoperability and knowledge share.
- The second is the competition in the market for browsers. For example, Mozilla Firefox has shown that by following web standards and open source development they can effectively compete against IE.
- The third is because browsing is becoming so widely important, not only in computers but also phones. And users want the web to work the same on every device, as it does on their desktop PC. The problem is that the companies who has followed and built their Web applications and sites for IE will now face problems. For example, there are organizations that have chosen to remain standardized on IE 5 because the alternative, updating all their Web applications to IE 7, would have been years of work.

7.3.1. Microsoft's Internet Explorer

Internet Explorer has come pre-installed as default browser in Microsoft's operating system Windows since the middle of the 90s. Because of the enormous amount of computers sold worldwide with Windows, Microsoft has a massive channel to distribute its browser (see chart below). Competitors claim that tying IE with Windows represents monopolistic behaviour. A formal complaint was made by Opera, a Norwegian browser developer.

The complaint describes Microsoft's abuse of its dominant position and hindering interoperability by not following accepted Web standards. They asked the Commission to take necessary actions.



On January 15, 2009, the European Commission sent out Statements of Objections to Microsoft. This statement of objections outlines the Commission's view that the tying of Microsoft's IE to its operating system Windows infringes Article 82 and further "distorts competition on the merits between competing web browsers" (MEMO/09/15. 2009). This statement comes at an important time where it is urgent to address Microsoft's practices that affect competition, consumer choice and the openness of the internet. The complaint is based on legal and economic principles established in the judgment of the Court of First Instance of 17 September 2007 (Case T-201/04).

The main concern of the Commission is that the tying of IE to Windows hinders the pace of innovation and that it would create artificial incentives for software developers to produce products or web sites mainly for IE (this was also expressed in section 6.1.2.).

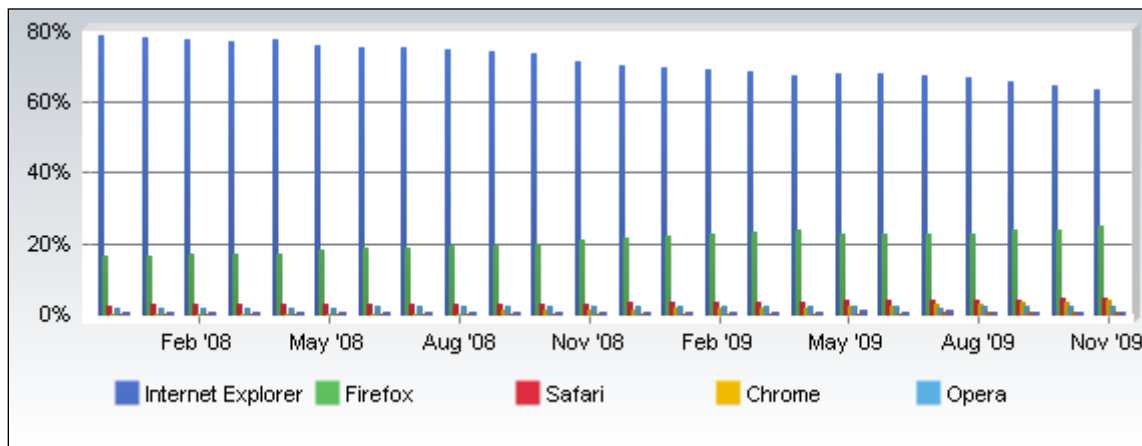
Microsoft did not agree with the Commission's preliminary assessment. Even so, in July 2009, Microsoft made a proposal to the competition concerns stated by the Commission. The proposal included a consumer 'ballot screen', where the consumers are given a screen upon installation of Windows. The screen has the options to install competing web browsers and disable IE if they wish (Microsoft Proposal Commitment, 2009). In this way they ensure effectiveness in terms of genuine consumer choice.

Will this block new inventions and hinder new companies to enter the market? Who will decide the list of web browsers? Who will be responsible for the compatibility of the browser with the operating system? All interesting questions which the Commission needs to consider.

7.3.2. Is Microsoft paying the price for being a market leader?

The timing of the Commission and Opera comes at a time where competition actually is at its best regarding browsers. Over the last few years statistics show that IE market shares has declined.

Browser share trend - December, 2007 to November, 2009 Source: Market share by Net Applications



This shows that competition in the browser market is healthy, but Microsoft still enjoys a high market share compared to the rest. Did it need to be regulated? Economic motivations can seem a bit unclear from the Commission's side. It is most unlikely that Microsoft's strategy is predatory, because raising the price of IE now is highly unrealistic, which means that recoupment is impossible. Microsoft would actually gain from this competition. More developers mean more browsers which again mean increased quality of the product and computers. This has clearly a positive effect for Microsoft because the demand for Windows will increase. Most users today download and try different browsers themselves before choosing the right one, looks like competition and consumer choice.

7.4. Interoperability and Web standards

While the browser question is important, it is far less important than the interoperability issue. The key benefit which consumers gains from the browser case is the option to choose their favourite browser when they start their new computer, instead of using some minutes on the Internet to download the browser themselves. Interoperability goes much deeper than this as explained above. If interoperability is not provided there is no way that you can make a program work the way you want it with another program unless you have the proprietary information, and if the two have different standards then it's almost out of the question.

By making IE behave differently from truly standard-based browsers; people are forced to make web applications that do not correspond to the right standards. The World Wide Web Consortium (W3C) is the main international standards organisation for the WWW. They work together with members in the development of standards. It is not difficult to see that if Microsoft doesn't follow these standards they will ultimately hinder interoperability, and force others to create for them only. So why develop for Microsoft in the first place? The situation is special because Microsoft is such a large and popular company which has great influence on people's development choices because of its superior operating system.

Therefore, in addition to the tying, the EC is also investigating Microsoft's hindering of interoperability by not following accepted Web standards. This was very clear in the complaint that the Norwegian software company Opera filed to the Commission. The CEO of Opera, Jon von Tetzchner, commented on their complaint:

"We are filing this complaint on behalf of all consumers who are tired of having a monopolist make choices for them" (Opera, press release).

Furthermore he made it clear how important the choice of consumers and open Web standards are:

"In addition to promoting the free choice of individual consumers, we are a champion of open Web standards and cross-platform innovation. We cannot rest until we've brought fair and equitable options to consumers worldwide" (Opera, press release).

7.4.1. Promises of interoperability

Most recently, due to the statements of objections, Microsoft has now promised to support these open standards. In its guidelines the principles they have put forward reads as follows: (Microsoft Interoperability proposal, 2009)

- "Microsoft shall ensure that third-party software products can interoperate with Microsoft's Relevant Software Products using the same Interoperability Information on an equal footing as other Microsoft Software Products."
- "This Undertaking shall be interpreted in the light of these Guiding Principles."
- "Microsoft shall not circumvent or attempt to circumvent the commitments in this Undertaking, including the Guiding Principles."

The interoperability promises look good on paper, but will they implement it in practice?

The truth is that Microsoft has promised such things before without making a great effort to fulfil them. For example during a recent interoperability announcement by Microsoft, the Commission put forward a statement claiming that the promise by Microsoft followed "at least four similar statements by Microsoft in the past on the importance of interoperability" (MEMO/08/106). It took Microsoft over 3 years to release the amount of interoperability which the CFI has ordered them to do (MEMO/08/125).

7.4.2. Commission's view

As mentioned above, Microsoft has responded with proposals to meet the demands of the Commission. The Commission has indicated that it has welcomed Microsoft's proposals on IE and the interoperability promotion (MEMO/09/352).

After having long criticised and penalised Microsoft for its anti-competitive practices, the European Union seems now, to be at the point of trying to close up the battle with the company after Microsoft has made a new offer to give its customers access to a wider range of web browsers through its Windows operating system and to share information with its competitors. They have also begun to market test Microsoft's proposals: (MEMO/09/439)

On the 16th of December 2009 the Commission sent out a press release stating that they have accepted Microsoft's commitments to give users browser choice (IP/09/1941). The Commission will still continue to monitor interoperability issues, with Microsoft posting a new and 'improved' set of documents about interoperability (Microsoft statement on EC decision, 2009). This is indeed a victory for the future of the web and its users.

7.4.2.1. How will this effect Microsoft?

At first it would look like that all this trouble against Microsoft would have a negative impact which will lead to reduction in Microsoft's incentives to invest. But Microsoft, unlike its rivals, will still enjoy profits from its strong position in the market. A firm can always deal with and escape competition through innovation, which will increase Microsoft's investments incentives. Regarding quality, Microsoft will no longer have the incentives to block innovations that raise quality but have high interoperability with non Microsoft platforms which ultimately saves a lot of time and money.

The outcome of this is not easy to predict, especially in Microsoft's case. But most likely it will have a general positive effect on innovation.

7.5. Summary and concluding remarks

In the case of Microsoft we can see that a network technology has been established in the market, and as a result of this the competitive pressure for innovations in the standard is lower than it would have been in usual markets, which further causes dynamic inefficiency. This is because the consumers are locked-in to Microsoft's technology. It's important to understand that Microsoft's one sided control over the standards in some markets creates a de facto standard. This makes it more expensive for others to support and more difficult to sustain which means that the product in the end become technologically inferior. Therefore it is an important case, for maybe smaller developers, to ensure that browsers in the future can compete on the merits, and that consumers are provided with a genuine choice.

This is exactly what the Commission is trying to achieve in this case. Although the market share for the IE browser has declined, it seems like the Commission is going after the big picture – to secure knowledge share and interoperability through standards. And if Microsoft is serious about making IE less proprietary and more standard it will benefit the consumers greatly and expose Microsoft to real competition from other browsers.

From an economic point of view, making Microsoft disclose information would give benefits to other companies and consumers. It would result in cost savings for other software firms because they now could interact with Microsoft, in turn this would make the competitors products more valuable to the consumer and increase the sales. This should also have a positive impact on innovation; the increase in sales should eventually increase the incentives to innovate.

8. MARKET STRUCTURE AND THE INCENTIVE TO INVEST

With the above said and Microsoft's monopoly leveraging having been taken care of, the thesis will now explore the market structures; monopoly and competition and how these affect incentives to invest in R&D.

8.1. Introduction

A lot of evidence points out that there is a positive effect of innovative activity on firm profits, productivity, economic growth and total welfare. It's clear that R&D plays an

important role in our society. Because of these positive effects R&D has on the economy in general, it is important to understand what drives R&D activity of the firms. Therefore the thesis points out and asks the incentive to invest question.

The market structures which are discussed under this topic are monopoly and (perfect) competition. It is important to keep in mind that the aim of the European competition policy is to promote efficient allocation of resources in the market, hence the goal to achieve effective competition. Therefore it is no surprise that the aim of competition policy is usually to avoid monopoly situations. “A monopolist in economic theory is the sole producer of a good or service for which there are no close substitutes” (Utton, 2003, p. 3). Why are the effects of monopoly so unwanted? The topic is discussed widely and is highly relevant, and to fully get the understanding of it, it would probably require a thesis on its own. For this reason the thesis will touch upon market effects of these two structures, regarding incentives to invest in R&D. The starting point of the monopoly in question will be that it is legally granted by for example IPRs, or the firm is a market leader i.e. a dominant position. (Under EU competition law, it is not illegal to be successful or to hold a dominant position in the common market.)

A question of thought: Are incentives to innovate stronger under competition or is it stronger in a monopoly setting?

8.1.2. Market definition

The definition of market dominance, in light of European competition law, can be explained “...as a situation where a firm has a large degree of market power, which allows it to charge prices which are ‘close enough’ to those that a monopolist would charge” (Massimo, 2004, p. 41) What this principle tells us, is that the lowest price a company can charge is the price which equals to marginal cost of production. This means that the higher a price a company can charge, the higher market power it will have as it is not dependent on competitors. In that situation customers have no possibility to find substitutes if they find the price is too high.

8.2. Economic theory

The question of which market structure provides the strongest incentives to invest is far from new. Two of the most common debated people regarding this matter are without a doubt, Schumpeter and Arrow. While Schumpeter favored that innovation required a significant measure of monopoly, Arrow demonstrated the opposite - that monopolists have less incentives to innovate. Schumpeter thinks of an economy as a process where products and

processes are rapidly renewed and replaced by new technology, commonly known as "creative destruction". This means that a firm will invest in innovation if it gets the possibility to grasp monopoly power for a certain time but it will still continue to research on innovation in fear of losing its position. It is then said that perfect competition in this case would reduce incentives to innovate because of imitation. Arrow, in his defense, states that "the incentive to invent is less under monopolistic than under competitive conditions, but even in the latter case it will be less than is socially desirable" (Arrow, 1962, p. 619).

Newer theory, by Professor Federico Etro (2004), suggests that monopoly power can be good for innovation. He claims that market leaders' investment in R&D can be beneficial to society, because they expand the technological border and open new efficient ways of growth. In other words, while fighting to maintain its monopoly, it acts more competitively than other firms in markets where there is no clear dominant player (Etro, 2004). This is also further expressed in Etro (2007).

8.2.1. Arguments in favor of Monopoly

The general knowledge of this situation is that monopoly is the bad and perfect competition is the preferred, but is a monopoly necessarily less efficient than perfect competition? Theory shows arguments in both directions. Arguments for a monopoly show that firms in concentrated industries will earn supernormal profits which again can be invested in more R&D. On the other side, firms in highly competitive industries will only get a normal profit, hence less resources to invest. The lack of competitive pressure in the monopoly market creates an environment of security, which often has the result that the firm will take more risks in investing in something where the outcome is more uncertain. If successful, the monopoly will provide a good protection of free riding, and at the same time, if the firm fails there will be no competitor present to take advantage of this. In conclusion, the lack of competitive pressure gives the firm time to develop and grow (Lipczynski, Goddard & Wilson 2005, p. 498).

Is Microsoft inefficient because it is a monopoly, or is it a monopoly because it is innovative and efficient? If we go back to the example of Microsoft, they have had a long period of no competitive pressure at all regarding their operative system. Since software is such a rapidly changing technology, whenever there is a discovery in the marketplace that something needs to be done to make the product better, the market expects this correction to take place immediately. But Microsoft lacked that competitive pressure; hence they could take their time

and reap profits on each new product. Microsoft had a unique position where it could control the output into the market, making sure they made as much money as possible for each level of output. As discussed above, this will indeed provide Microsoft with abnormal profits, but will it serve the interest of the market?

8.2.2. Arguments in favor of competition

Suspicion against monopoly exists both by economists and consumers, history has made that evident. Just look at Microsoft, an ongoing debate about their dominant position which results in monopoly lock-in effect. In traditional textbooks, economic analysis of monopoly is measured by the dead weight loss triangle. This is a measure of loss due to monopoly restriction of output. Recent economic analysis discusses "X-inefficiency", (Leibenstein, 1966) this occurs when firms don't manage to produce at the lowest possible average and marginal cost curves. The situation is most likely to occur in areas where the lack of competition is a fact, like a monopoly. Furthermore, the theory suggests, since there is no competition, a firm will be more "slack" which results in poor resource exploitation and increased costs. As shown in section 6.1.4.1. we could argue that Microsoft got lazy when they conquered the market. Consequently, is it true that if no competition exists, innovation will be slower and retarded with a monopoly?

Another argument in favor of competition, states that if a new technology in the market replaces a monopoly firm's existing technology, the monopolist's incentive to innovate is run by the net effect on its profits. If the market has a more competitive structure, it will be the gross return from innovation which drives the incentives to invest. In view of that, incentives to invest may be less under monopoly than competition (Leibenstein, 1966, This argument is also developed more properly by Arrow (1962), in a theoretical addition to the debate around the connection between market structure and the rapid change of technology).

8.3. Competition for the software market

When it comes to competition it is important to look at the software market in a dynamic sense. It can sometimes be the case, according to the Arrow effect, that incumbent monopolists have a lower incentive to innovate without a competitive environment (Arrow, 1962). This is because, by innovating, they only acquire the difference between the value of the next innovation and that of their current innovation, while competitors acquire the full value replacing the incumbents (Etro, 2008, p. 17). But on the other side, theory of market

leaders developed in Etro (2007) shows that market leaders actually invest more money than any other competitor if they are threatened with replacement of their current leadership.

In the software market, let's take a look at Microsoft's incentives to invest. If we illustrate the above thesis and take the example of Windows Vista, the expected net value of replacing Windows XP will only be a small percentage of the overall expected high value of Windows. This also becomes clear if we take into account that most likely the price of the OS will not change and the introduction of Vista is only gradual, which means that it is mostly associated to change of hardware to most costumers (Etro, 2008, p. 17). At the same time if a competitor of Microsoft had managed to create a successful operating system, the value of this would be much higher (Etro, 2008, p. 17). If the entry in the OS market would not be further possible, the Arrow effect would now propose that Microsoft would have a lower incentive to innovate than other firms. If the entry is endogenous the market leader theory suggests that this is not the case. As a result of this, we can see that it supports the idea that if Microsoft were to invest money on a whole new rewrite of an OS like Vista, there would have to be a certain amount of pressure in the market in the form of competition (Etro, 2008, p. 17). The competition in the market that causes this pressure comes largely from new comers in the software market, the open source community and commercial companies that actively support these communities. The reason why these kinds of fast growing communities invest so much money on innovation in the first place, is because they want or imagine the opportunity to replace Microsoft's leadership (Etro, 2008, p. 18). This is why the software market is looked upon as a very dynamic market, where strong competition and creative destruction along with a market leader that acts as a source and cause of innovation, characterizes it. This is quite the contrary to the usual way it is sometimes illustrated (Etro, 2008, p. 18).

In sum, antitrust law seeks not only to promote static competition but at the same time to induce innovations by keeping up the innovative pressure in a market, the pressure depends on the market mechanisms.

However, it is important to remember that a single operating firm will always be a monopoly by definition, and a monopoly is known as absence of competition. There is no need to overstate the economic benefits of market leadership by claiming that a single firm may as well be perfectly competitive, and produce at lowest cost. Declining long run costs can originate from quite a few reasons: economics of scale and scope, long run learning effects, experience, induced consumer consumption because of tendency of innovation, etc. If the

market leaders' effect and economies continues to be monopoly-enhancing rather than reducing they will continue to have trouble with anti-trust authorities.

8.4. A necessary evil? - Implications of monopoly on innovation

In this part, the consequences of the market structure monopoly will be discussed. A critical view of monopoly will be presented, where the result of the discussion will contribute to answer the overall problem statement.

A monopoly is in theory, a good thing to have, after all it provides a reward for innovating, namely a monopoly. This again should provide enough incentive to continue and increase the innovation process. And everyone agrees it is important that the creators should be compensated for an idea. An economic factor for monopoly is that the creation of the idea is costly, and therefore innovators need to be compensated. The economic theory then suggests that without it, there will be no incentive to innovate.

“If one wants to induce firms to undertake R&D one must accept the creation of monopolies as a necessary evil” (Schumpeter, 1943).

But then again this is just logically correct, and doesn't mean that it will be the case in any market situation. In order for a monopoly to create wealth for themselves, they must transfer this away from the society to themselves, by preventing entry. The fastest way of doing this is to hinder and retard innovation, which has a negative effect on overall growth and efficiency. A competitive market would allocate to consumers (Lande, 1982, p. 74-75 – See also Lande & Kirkwood, 2008). This is of course a difficult thing to measure because it's not 'visible' - until we look back at history and make assumptions. But to put things in perspective, look at Microsoft again, and all the anti-trust cases they have been through. It would be hard to imagine how much innovation and effective productivity growth society could have benefited from if Microsoft had not been successful in hindering dynamic efficiency. These situations are often caused by the power patents and copyright give.

Schumpeter argues, regarding monopolists, that in the competitive market the process of "creative destruction" exists. His view of the process is highly supported today, for example Aghion & Howitt (1992) produced a formal model based on his ideas. They pointed out that the competition is not in the market but for the market; in the short run they argue that competition may be good because it fosters static efficiency, but on the other hand monopoly is better in the long run, because it spurs dynamic efficiency. The monopolist will then reap

the market for a while, but the constant threat of creative destruction will force dominant firms to continue innovating, thus making the market efficient (Boldrin & Levine, 2008, p 189). The idea behind the system is that market leaders will replace themselves because of the high innovation cycle in the market. Only monopolists that are capable of innovating faster than their competitors will survive, which is the basic theory of how the market can generate a high level of innovation (Boldrin & Levine, 2008, p. 190).

An example describing the above situation is provided by Evans & Schmalensee (2001): They have explored four cases of this situation. 1) The 1990 leader in Word processing, WordPerfect, overtaken by Microsoft Word in 1997; 2) The 1988 leader of spreadsheets Lotus 1-2-3 overtaken by Microsoft Excel by 1997; 3) the 1989 leader in personal finance, Managing your money, overtaken by Quicken by 1996; and 4) the 1990 leader in desktop publishing, Adobe PageMaker, overtaken by QuarkXPress by 1997.

But there are some factors here which are highly worth mentioning (Boldrin & Levine, 2008, p. 190):

- Two of the leaders were overtaken by the big software company Microsoft, and since then there has been no further take over. And it's important to keep in mind that when the current leaders are overtaken, they are far from being monopolists, de facto or de jure.
- As we can see from the years gone by - it takes almost 7 years before a change takes place, and yet there have been no further replacements of these.
- Another interesting factor about the examples presented above, is that they are in an early stage of a new industry, when IPRs are low and competition and imitation are high.

A question we could ask ourselves is, if Spreadsheet had been patented, would lotus 1-2-3 have been overtaken by Excel?

History shows us that monopolies that have been granted IPRs have tendencies to last for a long time (since the change), which, we can argue, has a rather negative effect on output to society. If we take a step over to the telecommunication industry, and the well known case of AT&T, how long would we have waited for someone to take over the industry, if its monopoly had not ended by anti-trust action (Boldrin & Levine, 2008, p. 190)? In fact there haven't been many cases along the road where innovators frequently replace each other and their monopoly position.

The Schumpeterian view on this is apparent to the fact that once monopolies are up and running, they will appoint in rent-seeking behavior and use their size and influence to get government protection, instead of being taken over by competition and losing market position. (Boldrin & Levine 2008, p. 190-191)

8.4.1. More competition = more productivity

To support evidence that competition provides more efficiency for the society, this section will show some examples where competition indeed was more efficient than a monopoly setting.

Over the past eight years, economists have developed a significant body of research establishing empirical links between increased competition and higher productivity.

Jim Schmitz, with Tom Holmes and other colleagues, has been behind several of these studies. In 2001, Holmes and Schmitz found that the U.S. shipping industry, characterized by substantial monopoly power among water transport firms during the 19th and 20th centuries, became much more efficient when railroads, and later trucks, provided competition. In 2002 and 2005, Schmitz, with José Galdon-Sanchez, established that increased competition in the iron ore industry led firms to adopt new technologies (a change in work rules) that resulted in a productivity surge. In 2008, Schmitz, with Timothy Dunne and Shawn Klimek, found that when the U.S. cement industry faced increasing competition from foreign producers, it adopted new work rules and increased productivity.

Other researchers have made similar connections. In 2004, economist Daniel Trefler found that labor productivity rose significantly when the Canada–United States Free Trade Agreement eliminated trade tariffs between the nations and thereby increased competition among manufacturers on both sides of the border. Chad Syverson’s 2004 research on the U.S. ready-mixed concrete industry found that firms in geographic areas with many competitors were more productive than those with little competition. In 2007, looking at the electric power industry in the United States, Kira Fabrizio, Nancy Rose and Catherine Wolfram showed that replacing regulated monopolies with a more market-based structure resulted in modest efficiency benefits. And in 2008, when George Symeonidis examined the impact of anti-cartel laws introduced in the United Kingdom in the late 1950s, he discovered that cartels had had a significant negative impact on labor productivity.

Source: Douglas Clement, 2008

9. INNOVATION IN THE SOFTWARE INDUSTRY

9.1. Innovation

Innovation is the key source of power in the software industry and plays in general an important role in our modern society; therefore it should not in any way be hindered by law or regulation. We need to see that the law plays a different part in the future. Anti-trust authorities need to better understand the relationship between market structure and innovation, which means they need to recognize possible competition arising from innovation. It is also necessary to state though, that this is a very difficult task in practice. Katz & Shelanski (2005) stated more generally, that traditional goals of competition policy, low prices and high output, are conflicting with the aim of more efficient innovation. Furthermore they stress the importance of developing a structure which captures suitable tradeoffs between static and dynamic efficiency (Katz & Shelanski, 2005). We are currently moving in a new direction or even a new “era” regarding software innovation. IPRs is now working more as a market asset, and we are witnessing a collaboration where people are asking themselves – what can we produce together?

Software companies that meet customer demands and can create innovative technologies which correspond with these needs will prosper; companies that can't keep up with the race will ultimately be replaced with firms who can. This innovative importance in the software industry is far from new and the characteristic dynamic market will continue to thrive, now, tomorrow and in the future. However, the things that are new and have changed are the strategies and business models that are used to give output to the market which meets customer demands, and the ways to secure financial return on investments.

9.2. Collaborative innovation – Do we protect it or do we share it?

Not long ago, firms were executing R&D almost entirely internally, which was looked upon as a strategic move that could give companies overwhelming competitive advantage. This is why IP was protected so hard and not shared. The result of this was under-exploitation of the idea or innovation, if the idea was not considered as beneficial for the company that discovered it.

On the other hand, our society today can witness innovation moving beyond centralization and includes even the smallest companies and self-sufficient inventors. The reason for this is the great heterogeneity of our new innovation “era”; few companies own all the pieces of an

innovation themselves, even though it's their own product technology. This new pattern, which is changing the software industry, is usually referred to as "open innovation". (Open innovation has appropriately been illustrated by Berkley Professor Henry Chesbrough in his book from 2003) Companies realize that they must collaborate to survive and grow in this ever increasingly diverse technology setting.

"Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology" (Chesbrough, 2003, p. 24)

The technology that contributes most to collaborative innovation is open standards. This makes sense since both are reaching their objectives by benefiting the society. "Know how" is a good approach to innovation, firms can leverage this knowledge and help others to include innovation in their offerings. To help firms in this process, a suitable set of technology and resources are needed, vital to this attempt is open standards. Luckily a number of firms, through history, have created the path for the success of open standards. An Example of this is the Apache server project, first open collaboration of an HTTP web server. Linux is also a good example; their technology is all based on open standards. At the same time, a natural factor for allowing firms to innovate using open standards is IP. This is considered to be the center of innovation and how it is managed plays an important role when clients build innovation into their products to gain a competitive advantage. How do organizations balance the IP equation in terms of what is opened and retained? In a collaborative innovation business model, it is a combination of both.

Online and collaborative innovation prospers not only software, examples of results from open innovation can be found everywhere, and we all probably know the internet encyclopedia Wikipedia. This is an excellent result from the inspiration of open innovation, it's free, collaborative, broad, and the quality is very good. Furthermore it is important to understand that Wikipedia is not a means to an end. Some software companies that are contributing to open innovation are Intel, IBM and Microsoft. Intel for example, do a great deal of internal R&D but in addition they leverage and complement that internal R&D with an extensive set of programs to identify, recognize and then transfer external ideas from technologies, from university's and start up's. They also build platforms for others to build upon and take advantage of their technology, so they are trying to build an ecosystem around their technologies. Microsoft is also committed; they spend a lot of resources on open

innovation relationships with other firms. In 2007, an IDC study found that Microsoft related activities are responsible for 42% of the global IT workforce (IDC, 2007). It was also predicted that the company's involved in this system would earn more than \$400 billion in revenues and invest more than \$100 billion in local economies on R&D. Furthermore the study found that for every \$1 Microsoft earned in 2007, companies working with them earned \$7.79 (IDC, 2007).

9.3. Allocative efficiency

Technological innovation progress in products improves allocative efficiency by giving society a more mixed variety of products. Regarding markets, demand for a new product will rise, and demand for an old product will fall. Profit which is accumulated by the new product will attract resources away from the less valued product to the new one. This continues until the price equals its marginal cost. But there is a warning sign here. Monopoly power can be created by innovation, either through patents or other advantages of being first. The basic idea here is that society may lose some efficiency gains which that innovation would have provided it with. The reason for this, as explained in the monopoly section, is restriction of output, which again allows the monopoly to reap profits above marginal cost. An example of this is Microsoft's Windows which has given them dominance in the market for operating systems for personal computers. The position allows Microsoft to charge prices that are above marginal cost (Campbell & Brue, 2004, p. 254).

9.4. Imitation and R&D incentives

Analysis of innovation explains that technological progress has a positive effect on firm's profits. At the same time it also shows that there is a risk of potential imitation. Competitors may be able to imitate products – reducing profits of the original inventor's R&D effort. An example of this is reverse engineering, this has helped firms incorporate innovative features in to their own products. This type of imitation is perfectly legal. Reverse engineering is a process of examination only, and the software which is to be inspected is not modified. Two kinds of reverse engineering can be seen. 1) The source code is already known for the software, but higher level aspects of the program like documentation are poorly done or not valid. 2) There is no source code available for the software; efforts towards discovering this code are seen as reverse engineering. Reverse engineering of the software can make use of the so called 'clean room design' (copying a design by reverse engineering and then recreate it without infringing any of the copyrights) technique to avoid copyright infringement.

Then we can ask ourselves: what incentives are there for any firm to bear the expenses and risks of innovation if competitors can imitate its new improved product? (Campbell & Brue 2004, p. 249)

That is why we have patents. Once patented, others cannot legally imitate for a certain time. Patents work as a way of reducing imitation and its negative effect on the incentive to invest in R&D. Patents need a public disclosure of an invention and therefore patented items do not necessarily have to be reverse engineered to be studied. It's more important to determine whether a competitor's product contains patent infringements. Regarding the clean room design technique, since independent invention is not a defense against patents, they cannot be used to avoid patent restrictions. The main advantage of patents is that they protect the functionality of the software, which means that the patent also protects against competitors who try to sell software that has different coding, but offers the same functionality. On the other hand patents can be time consuming and usually involves a lot of money.

10. PATENTS

10.1. Introduction

In Europe, software falls under a copyright regime, so why talk about patents? Originally, software was viewed as pure mathematical algorithms and, as such, not eligible for patent protection. That view has changed. Today there is an ongoing debate about patents and the ability to patent software. Arguably, copyright is not optimal to protect software, since it protects it as a kind of "work of art" or "literary work", which (mentioned above) offers a poor protection against reverse engineering. In terms of software this would mean to extract the underlying algorithm from the source code and then reprogram it into another separate work.

Software working on computers or any kind of gadget has become one of the most prominent intangible instruments not only in industry but also in our daily life. Since software industry has been continuously developing computer programs to perform complicated tasks in business, the number of computer based inventions attempting to obtain patent has been rising steadily. As a result, software-based patent applications have the highest growth rate in all patent categories presented to the European Patent Office (EPO) over the past few years. According to a press release by the Commission in 2002, there has been issued over 30.000 software related patents since 1978 (MEMO/02/32).

In the area of software patenting the development has turned out quite different in the U.S. and Europe. This section will mainly focus on a critical view of the patent system in the European software sector, but there will also be some comparison to the American system, as well as the interesting and important, economic ‘developing’ country China. There is currently an open source fight against software patents, the thesis will point out issues relating to this and comment on the question: are present software IPRs, especially patents, an overprotective regime?

10.2. Patenting of software in Europe

While an invention in America has to be new and useful, there has to be a documented technical effect in Europe. This strict European demand makes an essential difference between the U.S. and Europe, particularly in the software market. As with all inventions, computer-implemented inventions are patentable only if they have *technical character*, are *new* and involve an inventive *technical contribution to the prior art*. EPO does not allow patenting for computer programs that fail to fulfil these demands. The reason for this strict view on patenting is to identify true technical innovations from variations on existing methods. Similarly, China will also not issue a patent for software unless it is combined with a computer or is part of a process intended to provide a technical solution to a problem (See rule 18 on China’s patent implementation regulations, SIPO 2002).

The patentability of *software*, *computer programs* and *Computer-Implemented Inventions* (CII) under the European Patent Convention (EPC) is the extent to which subject matter in these fields is patentable under the Convention on the Grant of European Patents of October 5, 1973. The subject also raises the question of whether European patents granted by EPO in the fields of ‘software patents’ (a term for all the above) are looked upon as valid by national courts. Programs for computers are not regarded as inventions for the purpose of granting patents under the virtue of Art. 52(2) (c) EPC. But the exclusion only applies “*to the extent to which a European patent relates to such subject-matter or activities as such*” (Article 52(3) EPC). The words ‘as such’ are far from clear and have created a great deal of difficulty.

An interpretation of ‘as such’ is that a computer program may be granted patentability under Article 52 if, when running on a computer, “*it causes a further technical effect going beyond the "normal" physical interaction between the program (software) and the computer (hardware). An example of a further technical effect is where the program serves to control a technical process or governs the operation of a technical device. The internal functioning of*

the computer itself under the influence of the program could also bring about such an effect” (EPO 1. 2009, see also T 1173/97 and T469/03, Reasons 5.1 to 5.3). It has also been explained and followed by the Boards of Appeal of the EPO, that an invention is patentable if it provides a new and non-obvious technical solution to a technical problem (EPO 2. 2009, See also T 641/00).

CII’s which only solve a business problem using a computer, rather than a technical problem, are considered as not patentable because of the lack of an inventive step (see T 258/03). However, the fact that an invention is useful in business does not mean it is not patentable if it also solves a technical problem.

An overview to distinguish between technical or non technical inventions:

Technical	Not Technical
Control of a brake in car	Calculation of pension
Faster communication between mobile phones	New rules of auction
Secure data transmission	Selling and booking sailing cruise packages
Resource allocation in an operating system	Aesthetic effects of music or a video

Source: Nildo Ciarelli 2007.

The European treatment of business methods and software patents has given room for conflicts and controversy, but there is no doubt that the technical effect requirement contributes to delimit certain areas, like for example business methods, from the scope of protection under the European patent law.

10.3. Area of conflict

Today there is a concentrated debate on whether software patents should be approved. Some issues regarding this are:

- Clarifying the boundary between patentable and non-patentable software;
- Whether the inventive step and non-obviousness requirement is applied too loosely to software; and
- If software patents hinders innovation, rather than promoting it.

Due to the limits of space and relevancy of this thesis, only the last issue will be discussed. Although there are several arguments in defence of software patents, the next sections will focus on *some* of the negative effects that software patents can have on the market.

Arguments and critique of the current European patent system has mainly been focused on economic consequences, the proposed software patent directive has also been discussed within the debate but was rejected in 2005.

Regarding SMEs, software patents are controversial because they provide stronger protection than copyrights, and because they are often used by larger firms but not often by SMEs. Some advocates of strengthened IPRs suggest that more protection provides SMEs with a good defence against imitation by larger firms. On the other hand, there have been fears expressed that claim software patents have potentially large anti-competitive effects in the development of the software sector due to the easy generation of ‘essential patents’ which create a lock-in effect, an essential patent is a patent which discloses and claims one or more inventions that are required to practice a given industry standard, and because of likely predatory behaviour of large firms hold back dynamic development of SMEs, due to the high costs of litigation.

10.4. Intellectual Monopoly

‘Intellectual Monopoly’ is a term for patents, copyright and restrictive licensing agreements (Boldrin & Levine, 2008, p. 17). The term expresses that these are unnecessary and creation happens under competition. Furthermore, Boldrin & Levine (2008) state that “Intellectual monopoly is not a cause of innovation, but rather an unwelcome consequence of it.” What they mean by this is that, for example, patents are used to protect companies from new competitors and new ideas, by protecting their old ways of doing business (Boldrin & Levine, 2008, p. 19).

In the software industry there is potentially a great risk of a technological lock-in effect, which results in certain technologies becoming standards. As mentioned in section 6.1.4., this can have serious negative effects on competition in the relevant market and can damage both consumers and the furtherance of innovation. If, in the market, the costs of strong protection have increased, the innovators will be given net benefits of the monopoly on an individual level, but on a social level this will not be the case. The example implies that a legal monopoly will create barriers to entry. The software industry is recognized by rapid change;

hence entry is important for the fostering of innovation. An overprotective regime hinders just this (Harison 2008, p. 73).

"If people had understood how patents would be granted when most of today's ideas were invented and had taken out patents, the industry would be at a complete standstill today."
(Bill Gates, 1991)

10.4.1. Strategic use of IPR – effects on innovation

One of the most general criticisms towards software patents is the use of them for strategic purposes. Big companies tend to use software patents as weapons against each other in case of violation. There is also a large tendency of firms that have entered into patent pools with each other, agreeing not to sue each other, while the SMEs are paying the price.

A problem relevant for innovation is the term called *patent thickets*. In the software and information technology sector, it is common that a newcomer in the market needs to obtain a lot of licenses from other innovators, before they can start research or production. This issue raises costs and can be a serious entry barrier. The problem is also described as the “tragedy of the anti-commons”, where too many IPR holders can result in under exploitation of information (Heller & Eisenberg, 1998, p. 698-701). Lately, Cockburn & MacGarvie (2007) have provided solid evidence that software patents make innovation harder for start-ups in software. They find that the more patents held in a market, the less likely new firms will enter and the same time they also face financial delays. In contrast, if the entrant holds a patent of his own, this will increase the chance of entry. In other words, defensive patenting improves the odds. *Patent flooding* is also a similar strategic behaviour. Patent flooding takes place when a company files a large amount of patent applications that claim minor variations on a competitor’s existing technology. Theory suggestions on this behaviour states that the company tries to surround the other company with patents, making it very difficult for the targeted company to make use of its technology without violating the patent rights (Sankaran, 2000, p. 393-425). Because the boundaries of software patents are very vague and the numbers of issued patents today are enormous, it is almost impossible to rule out that a new software product may infringe some patent. When a firm tries to take advantage of the above situations and make profits by licensing or selling its patented technology, to a firm that has (unknowingly) infringed its patents, they are *patent trolls*. These ‘trolls’ can do serious damage to innovation by blocking technical standards.

10.4.2. Recent cases

10.4.2.1. Nokia vs. Apple

An interesting case, which is similar to the situations above, is currently being processed in a U.S. District Court Lawsuit, the Finnish mobile-phone giant, Nokia, accuses Apple of patent infringement on Nokia developed 3G and wireless LAN technology (Nokia complaint, 2009).

In a statement, "*Nokia said Apple has refused to pay for use of intellectual property developed by Nokia that lets handsets connect to third-generation, or 3G, wireless networks, as well as to wireless local area networks*" (Ewing & Hesseldahl, 2009).

"*Apple is attempting to get a free ride on the back of Nokia's innovation,*" Ilkka Rahnasto, Nokia vice-president for legal and intellectual property, said in the statement (Ewing & Hesseldahl, 2009).

This statement implies that Apple copied their patented inventions. The Finnish handset giant announced on the 22 of October 2009 that it has filed a suit against Apple, stating that Apple has infringed patents for core technology that allows the iPhone to make calls and connect to the mobile Internet. Nokia has sued rivals in the past, but this came as a surprise and represents an *escalation of increasingly contentious competition* with Apple.

In sum, in order to defend themselves against this 'escalation if increasingly contentious competition' they filed a law suit. Isn't this action a clear example of how patents really are anticompetitive strategies used for protectionism?

We could argue that the behaviour of Nokia is coming from the loss of market share to Apple (See chart below). Apple's smart-phone has literally taken over the market and is extremely popular amongst young people. A natural reaction of Nokia is then to use legal weapons, but how can this foster a dynamic structure which the market seeks for furtherance of innovation? People would also argue against this because Nokia has patent rights and therefore has the law on their side, but it's quite clear that if all is to operate like Nokia it doesn't foster dynamic efficiency for the market.

Company	3Q09 Sales	3Q09 Market Share (%)	3Q08 Sales	3Q08 Market Share (%)
Nokia	16,156.4	39.3	15,472.3	42.3
Research in Motion	8,522.7	20.8	5,800.4	15.9
Apple	7,040.4	17.1	4,720.3	12.9
HTC	2,659.5	6.5	1,656.3	4.5
Samsung	1,320.6	3.2	1,114.8	3.0
Others	5,368.0	13.1	7,793.3	21.3
Total	41,067.6	100.0	36,557.4	100.0

Source: Gartner.com 2009

Nokia says it has contributed its IP to global standards bodies, and Apple, like the rest of mobile-phone makers, highly depends on such standards to make its devices compatible with carrier networks. Nokia wants to be compensated for the use of their patents in products like Apple's iPhone, and "*Apple is expected to follow this principle,*" Nokia's Rahnasto said in the company's statement. The situation is really an 'eye opener', Nokia contributed to a standard which has become a global one so everyone can use it. But when Apple started to use it, they sued them. Is this leveraging of monopoly the state granted them?

As stressed many times before open standards are really important, especially in the software sector, because it contributes to opening up the market for competition and helps to introduce new software solutions.

10.4.2.2. Microsoft vs. TomTom

Regarding the software sector, Microsoft filed a patent infringement lawsuit against TomTom in February 2009 (Microsoft press release, 2009). They stated that in-car navigation company's devices violated eight of its patents – including three that relate to TomTom's implementation of the Linux Kernel. The Linux Kernel is an operating system Kernel used by the Linux family, further it represents one of the most well-known examples of free and open source software. This has shaken the open source community because it's the first time Microsoft has filed a patent suit over Linux, after years of claiming the open source operating system has violated its patents. Is Microsoft threatened by the competition of Linux and the open source software? On the other hand, Microsoft has pointed out, that the open source software is not the focal point; five of the patent violations were related to proprietary software. (Ina Fried, Microsoft, TomTom settle patent dispute 2009)

In July 2009 Microsoft surprised the open source community when it contributed 20,000 lines of code to the Linux kernel. The contribution consisted of Hyper-V drivers. These drivers

have the ability to advance the performance of virtual Linux guest systems in a Microsoft hosted environment. Microsoft licensed its Linux Hyper-V drivers under General public license (GPL) – which is a widely used free software license. To ensure that the software remains in the commons, the license grants every user rights and restrictions. Did Microsoft do this as public stunt, for charity, or to just improve their services by helping Linux? People were later surprised to know that this ‘charity’ actually was a result of a GPL violation. A network driver in Microsoft’s Hyper-V uses open source components licensed under the GPL. These drivers were statically linked to closed-source binaries, which the GPL does not allow. Microsoft handed over the codes simply because they had violated the GPL, not because they wanted to in the first place. It’s interesting to see that Microsoft is so interested in ‘protecting’ their own intellectual property, while they find themselves in hot water with other copyright holders.

Sometimes it is difficult to see how software patents make a positive contribution to innovation, especially when it limits access to necessary knowledge, as may be the case in the software industry where innovation has a cumulative nature and patents protect opening inventions. In this view, a too broad protection on basic inventions can hinder follow-on inventors if the patent holder refuses access (Bessen & Maskin, 2000; Bessen & Hunt, 2003). Large firms such as IBM stock their patent portfolios to monetize innovation and at the same time it works as protection against firms who claim patent infringement. In this way intellectual monopoly occurs which reflects the inefficiency of the patent system.

10.5. The rise of open source

“The best evidence that copyright and patents are not needed and that competition leads to thriving innovation in the software industry, is the fact that there is a thriving and innovative portion of the industry that has voluntarily relinquished its intellectual monopoly - both copyright and patent.” (Boldrin & Levine 2008, p. 19)

The Open source movement, along with open standards, is an example of how high technology markets can develop in the absence of patents. It challenges the current patent system by giving software developers alternative incentive mechanisms such as reputation rather than exclusive rights. Open source development is based on disclosure of the source code. The software programmers remove their protection or owner-rights from their work so that they enable further development of applications. Despite the fact that creative output are

disclosed at a zero price tag, open source projects keep growing and attracting a number of developers.

10.5.1. Impact of OSS

A study from 2006, on the impact of OSS, shows that firms have invested an estimated €1.2 billion in developing OSS. The same study reports the ‘notional value’ of FLOSS investment in Europe at €22 billion. Investment continues in proprietary software as well. Small and large companies often choose to make part of their offerings open source, and part proprietary. The available alternatives enable businesses to choose business models that suit them and their customers (Ghosh, 2006).

The Commission itself has also noticed the great quantity of varied technologies in the software market when DGI in 2005 explained:

“Software has gained so much in importance in almost every sector of society that it has become a strategic societal resource. Moreover, in recent years the software market has shown signs of entering a much more volatile and vigorous period. This re-invigoration of the market is due to the emergence of F/OSS, which has made commercial in-roads in major segments of the software market. This development has led to some unrest with software and service providers and users alike, which may be the natural reaction of a high value market injected with new competitive offers. In terms of the market, F/OSS most likely will increase the competition in the software market from which positive fall-out for the consumer is to be expected. On the provider side, F/OSS creates new opportunities for software and service providers, which may be a new opportunity for the European software industry.”
(CompTIA, 2008)

10.5.2 Challenging IP

It’s important to point out that open source technologies also depend, to some extent, on IP protection. They need this to protect and enable their business and licensing models. The example above with Microsoft’s Hyper-V drivers perfectly illustrates this. Open source companies distribute their works in human-readable ‘source code’ form, and rely on copyright so they can protect their innovations from being exploited and distributed with a more restrictive term by competitors. This term is usually referred to as ‘Copyleft’ and it’s no longer ‘all rights reserved’ it’s ‘all rights reversed’ to show that the regular copyright term is turned upside down. In sum Copyleft is a license policy which states that you cannot, when redistributing, add restrictions to hinder other people’s central freedoms, such as redistributing copy’s (Free software foundation, 2009).

Markets for OSS are usually accelerated by factors such as high quality software, low cost and low barrier to entry, vendor independence and flexibility. According to a survey at the end of 2005 an average of 72 % of European firms claimed that lower 'total cost of ownership' and lower acquisition costs are the key advantages over commercial software (Méndez, 2005). Even if Open source is selected because of its low cost, other benefits can clearly be seen. A key focal point here is the ability to adopt software for local needs. Companies that provide proprietary software are usually global and concentrated in a few parts of the world. This is the nature of the software market, which often results in natural monopolies thanks to network effects and standards. Proprietary vendors tend to ignore local needs, for example the needs of Nynorsk speakers in Norway, who form a relatively small market in a global setting. It is situations like this which truly reflect the negativity of proprietary software, no user or local business is in a position to add language support because of the proprietary. On the other hand, many OSS developers have no interest whatsoever in supporting Nynorsk speakers. However, unlike closed software, OSS developers allow people in the local areas to adapt their software. This means that users and SMEs will be able to provide and adapt software for local needs. Regarding Nynorsk, this has been done by several OSS developers before 2002, while Microsoft refused to add local language support.

Examples of how OSS and open standards can push back the IPR system can be found everywhere in the software market. For example if you try to play a video file in a proprietary format using Windows Media Player, it will first connect to a Windows codec server. It will then transfer the meta data of the video file, get information about the codec and at the same time retrieve a unique code indentifying the machine to a Microsoft codec server. If the codec is recognized and available it will be downloaded so you will be able to play the video file. By some users this is seen upon as a violation of privacy, and a non efficient way of playing a video file. Many users are therefore shifting to alternative players like VLC media player. VLC is a cross-platform open source multimedia framework, player and server. In other words it is a video player which lets you play proprietary video format files. The thing with VLC player is that it has a wide range of codec's; hence there is no need to connect to the Internet.

Another example is the use of documents. Usually computers use standards such as .doc, .xls, .ppt and other proprietary formats. These documents are dependent on proprietary software like Microsoft Office to open and access. When the license of the Microsoft office product expires, the right to open and access your own documents will also expire, which means the

computer can't access your own work. The Open-Office is software based on open source, it's an alternative to Microsoft Office and has designed the Open Document Format (ODF), which allows the users to open and access their own documents without having to acquire or illegally copy proprietary software. This move has forced Microsoft to build its own competing open standard called OOXML (Open Office eXtensible Markup Language) and to support the ODF in Microsoft's own Office.

10.5.3. General public license

The GPL has become a large threat to companies. There are mainly 2 mechanisms which are dealing with IPR. 1) Software licensed under the GPL can never be made proprietary. This basically means that the original source code must be included with the changes made to that source code when distributed. 2) The viral character of the GPL. It's been called a virus since it affects other software. In other words, software containing GPL'ed code must be licensed under the GPL as well. This makes it a very dangerous 'weapon' for the community, because its viral character also takes software that was previously closed source into the commons.

10.6. SMEs in the debate

Although some claim that SMEs support software patents, most people and communities think of this as a myth. UEAPME, an organisation which represents 12 million SMEs with 55 million employees commented on the proposed CII directive which was turned down in 2005: "This directive will threaten the existence of many small businesses if passed in its present format". A press release in June 2005 clearly showed that the organisation takes distance from software patents:

"UEAPME is opposed to the introduction of an EU software patent, which would reinforce monopolisation in the software sector, damage interoperability and act as a barrier to innovation by SMEs. Small firms simply do not have the resources to engage in the costly and time-consuming process of patent application. This would enable dominant large firms in the sector to secure vast numbers of patents and result in crippling litigation costs, which would put small firms out of business." (UEAPME, press release, 2005)

According to a new study by Pottelsberghe (2009) the European patent system is too expensive and uncertain; this is especially true for SMEs, where high litigation costs and differing legal systems mean that legal certainty is far from guaranteed.

OSS presents significant opportunities and benefits for SMEs. By comparing this model to the currently dominant proprietary systems, a lot more SMEs could afford to employ information communications and technology. As mentioned earlier it is important to embrace SMEs because they represent a great amount of work force for the European software market which helps against competition from other geographical areas.

10.7. Open source software and China

China's IT industry has increased remarkably, and has moved forward as planned in their tenth Five-Year Plan (2001-2005). The plan states "Information technology should be used extensively in all circles of society and the use of computers and Internet should be wide spread". According to an IDC study from 2005, China spent over \$30 billion on IT in 2005 and was expected to exceed \$51 billion by 2009. As a part of the five-year plan, software has been recognized as an important strategic sector for growth, which also involves the implementation of Linux. Statistics by the Chinese government's Beijing Software Industry Productivity Center (BSTC) have shown Linux sales increasing more than 40% a year – from \$6.3 million in 2002 to \$38.7 million by 2007. (Amant & Still, 2007, p. 103).

10.7.1. Benefits of using OSS

China has struggled with piracy for a long time. They promised to protect IP when they joined the WTO, but making all software licensed is still a big problem for China. The benefits of OSS, like low costs and freedom to access, offers great opportunities to China's social and economic development. IDC (2006) stated that "China, with one of the fastest growing IT markets in the world, dropped four points between 2004 and 2005" while piracy rates were stable in the rest of the world. IDC (2006) further reported that that was the "second year in a row where there has been a decrease in the PC software piracy rate in China. This is particularly significant, considering the vast PC growth taking place in the Chinese IT market" (IDC, 2006). OSS, like mentioned before, has benefits like flexibility and cost savings. This has for example helped China to build its own operating system and database system. China has also started to export software to other countries, during its tenth five-year period it exported over 7000 sets of the Chinese Linux based product. The flexibility of OSS has also been recognized in China, for example, the China Ministry of Railways has developed Turbolinux operating systems in 15 railway bureaus, 230 railway stations and more than 440 package processing stations, to encourage standardization for package delivery operation and management. This implementation was the first large initiative by the Ministry.

For countries like China, OSS can be leveraged to stimulate growth in the software industry. On a longer term it will help China solve piracy problems and at the same time change the competitive environment of the software industry. Actions to promote OSS can be made to increase the overall social welfare. This can for example be; 1) adopting more OSS in the public sector, 2) more governmental financial support for the software sector regarding R&D efforts in OSS. 3) Implementing OSS in training and education. These factors will help to increase the understanding and the competitiveness of OSS (Amant & Still, 2007, p. 104).

10.8. New Business models and patent initiatives

The competition between the two is not all negative. Several trends can be recognized in the software industry due to the competition. In the next section there will be a presentation of a few more examples of alternative practices to the regular patent system.

It can be seen that traditional ‘commercial’ software providers are suddenly offering OSS, while companies usually offering OSS, now offer commercial software as well. The two are also working together to produce better software. An example is Red Hat, a very popular open source producer, which also ships out commercial software that functions together with its open source platform. Even IBM and Microsoft offer a wide range of software models. Established large firms often use OSS as a diversification and for cost saving.

Licensing is also a common method of doing business. Many businesses cross license their patents, so they can use each other’s inventions without getting sued for patent infringement. This is one of the main reasons for why OSS companies sometimes file for patents, so they can cross license with proprietary software and at the same time maintain their freedom to operate.

This competition between the business models has an overall positive effect on the market. It creates more competition and innovation in the market which ultimately leads to more choice for the consumers. Is the future a mixed business model?

10.8.1. Community patents

Cost relating to translation and filing make patenting an invention much more costly in Europe compared to the US or Japan. This creates a serious barrier for R&D. Having a patent fully translated into *one* language costs around €1,400 – time is also lost because of the significant waiting period for the patent to be translated.

The aim of creating a community patent is to allow individuals and companies to obtain a unitary patent which is legally valid in the whole European Union. In this way the companies can save costs and the effort of having to apply for protection by different national patent regimes. Although this is a highly sought after solution to the problem, an agreement on the community patent has yet not been reached (Community patent proposal, 2009).

But also here, it's needed to stress the importance of SMEs; they should not have to spend more on translation than innovation. They cannot be ignored if they are to continue to make an important contribution to the European Union's prosperity in the future, especially now when European SMEs are facing increased competition from China, India and other emerging economies.

10.8.1.1. Alternative solutions to a community patent

The London agreement – an attempt to handle translation costs. The London agreement of 17 October 2000 is a voluntary group trying to reduce the costs of translation regarding patents in Europe. Under the terms the patent would only have to be translated to one language (English, French or German) to be valid in all countries. The London agreement entered into force on May 1, 2008. Newer study has shown that this agreement has reduced costs somewhat, but the cumulated costs of translation and renewal fees which rises after the patent grant, are still high and still represents a burden for applicants. (Pottelsberghe, 2009)

The European Patent Litigation Agreement (EPLA) – an attempt to reduce litigation costs. This is an EPO initiative, the idea is to set up a European patent court under the authority of EPO. In this way patent holders can avoid costly legal procedures in each individual country in order to handle clashes. It is feared that the EPLA will revive the software patent debate which came to an end in July 2005 when the Commissions software patent directive was rejected. The reason for this is that if the court would be set up it would cover all patents, including software, which is not officially worthy of a patent protection in Europe.

Critiques of the EPLA state that it will lead to an overflow of software patent lawsuits, and that it would give more power to the EPO which will destroy existing national patent litigation administrations. Maybe that's the reason it's only left as a proposal?

10.8.2. Patent commons

All software vendors depend on intellectual property protection. As described earlier, 'free software' and commercial software companies alike depend on intellectual property to protect

and enable their business and licensing models. Indeed, there is increasing cross-over, interaction and common practice among open-source and commercial software and licensing. Another example of this is ‘patent commons’. The initiator behind this project is the Linux Foundation, and the aim of the project is to advance OSS. The project is dedicated to document the boundaries of The Commons. They stress that it is a neutral and safe environment where developers and users of software can innovate, collaborate and access patent resources.

“Some contributors specify the particular patents they agree not to enforce by patent number. Some of these contributors have also identified the patents they pledged by subject matter.”
(<http://www.patentcommons.org/commons/patentsearch.php>.)

Many companies that provide OSS have contributed their patents to this project, but most surprising is the fact that it has also attracted some rather unexpected contributors from the commercial software sector, including Microsoft. They originally developed the ISO-standardised “Office Open XML” file formats. (ECMA International was the standards developing organisation for Office Open XML (OOXML), which “enables use of industry-standard XML technology in managing spreadsheets, documents, and forms.”)

“Microsoft irrevocably covenants that it will not seek to enforce any of its patent claims necessary to conform to the technical specifications for the Microsoft Office 2003 XML Reference Schemas posted at <http://msdn.microsoft.com/office/understanding/xmloffice/default.aspx> against those conforming parts of software products.”
(PatentCommons.org, 2005. Microsoft submitted its ‘covenant not to sue’ before OOXML was accepted by ISO in 2008.)

10.9. Possible lessons for policy makers

It is not easy for the law to maintain neutrality in the conflict between the two spheres, even-handedly encouraging development in both models. To meet at the middle, patentability should continue to be limited to technical solutions, and not include business methods. The costs of patents are too high and the London Agreement is a step in the right direction, but the costs should be further reduced.

Policies must also be neutral with respect to the different software models. If policies are set out to foster specific technologies or software models it can severely damage innovation and

competition. Instead they should focus on a level playing field and create an environment which benefits all market players.

The future will become more open and evolve as a great platform for innovation. Open standards are a key focal point. These standards give everybody the possibility to access and create innovative content. In the software market we have observed an industry which has created a wide range of dynamic standards. It is important to continue to ensure that these standards remain open and transparent and that the players on the market adopt and implement these standards without adding proprietary extensions that create de facto standards. Public authorities should ensure a commitment from software developers to the interoperability of software products based on open standards.

11. A STEP INTO THE FUTURE

"Imagine a world in which every single person on the planet has free access to the sum of all human knowledge." (Jimmy Wales, Founder of Wikipedia)

In 2007 the EPO expressed its thoughts regarding the future of IP in its Scenarios for the future report (EPO, 2007). The most interesting scenario is the Trees of Knowledge – a world where society is the dominant driver. Diminishing societal trust and growing criticism of IP system results in its gradual erosion. The scenarios offer a prospect of what might come to pass; we can sit tight or choose to adapt. The interesting thing with this scenario is that it's actually starting to happen, some of the 'what ifs' are becoming visible, it's not a scenario anymore it's becoming a fact.

This section will take a peek into the future of the software industry. To keep the relevancy level at the highest, the section will build upon existing market trends and provide examples and conclusions based on this to predict a potential outcome.

The software industry, in the beginning was emerging under no patents at all – so why try to fix something that worked? Market forces, rather than patents spurred the development of these products. The first Internet browser, Mosaic, was developed by students in less than three months. On the other hand, a joint venture between IBM and Microsoft failed to create an OS/2 Operating system which cost several billions of dollars in research. By looking at the Internet today we can observe a never ending story where a thousand software projects are under way. A lot of these projects are initiated by amateurs, whether it's Internet browsers,

email clients, file sharing programmes or image editors. Along with these, a lot of companies as mentioned earlier, are releasing software under an open source license. The idea that the thesis has put forward is that there need not be a promise of monopoly to create an incentive to innovate, in fact less generative software, such as stand-alone word processors, have failed while more generative competition has surfaced.

With this said – is it possible to imagine a future software industry with no IPRs? The greatest challenge for the patent system will be convincing the society that patents have a role to play and are in the public interest.

It is difficult to predict what the future brings, especially regarding IPRs. In order to understand the current situation of the IP system with a view to discussing its future one has to also consider its development. Concerns about the future function of the system have been a constant worry regarding IP, as have attempts to limit or remove it. Today we can witness huge tension regarding systems for managing IPRs. People want access to patent or copyright protected goods; patients complain over expensive patented medicines, the software world is witnessing a great push towards open source projects. People are rising up and questioning the governments and political bodies. Is the patent system favouring big corporations?

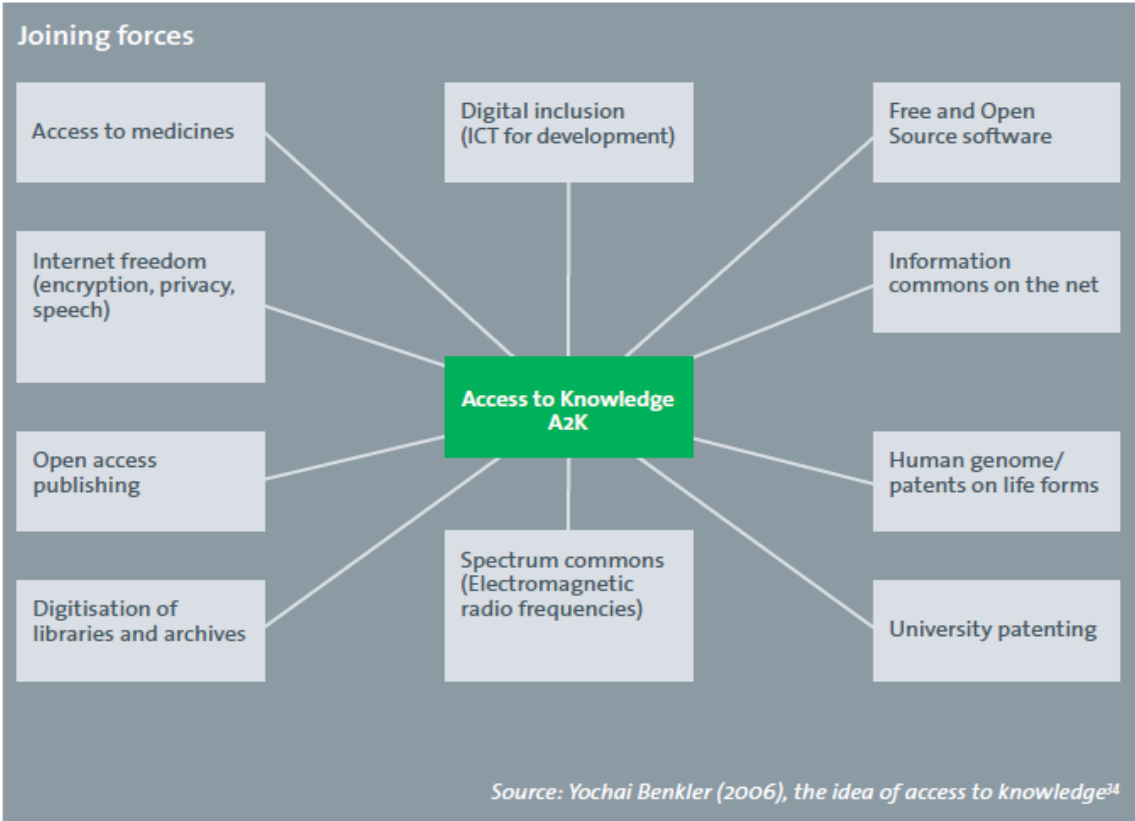
“There is a growing sense that IP is becoming more about private enrichment at the expense of the public good.” (Kenneth Cukier, Technology Correspondent at *The Economist*)

11.1. The reform movement

“The greatest challenge will be to create a 21st century world that brings technological freedom: the freedom to understand, study, tinker with, improve, modify, share, keep and teach others what we know. Having grown up with technology, we know that... it enables society to share knowledge, to share liberty... Information is the root and infrastructure of freedom in the 21st century.” (Professor Eben Moglen, Software Freedom Center)

It is clear that the patent is not the main cause of the problem in itself but it is the balance of benefits. The current uneven balance between society and the market place has resulted in distrust in the patent system which again has led to attack on the system. For instance SMEs team up with hackers to challenge software patents. This movement has become possible almost alone thanks to the Internet – which is a system operating on open standards and shared IP. People use blogs, chat rooms and websites to easily communicate and share information with each other. Here alliances are formed by like-minded groups or individuals,

which are often referred as A2K – Access To Knowledge. The A2K movement builds upon the idea that access to knowledge should be linked to fundamental principles of justice, freedom and economic development. The movement has worked around the system and created open access, open sources and creative commons.



Source: EPO (2007). Scenarios for the Future

This is just the beginning of the end. These groups are getting larger and larger, and have come to realize that the only way to benefit society in the end is by sharing knowledge. This is the future, people find less trust in the public policies which seems to have distortive effects and rely exclusively on IPRs. They represent ‘new’, while IPRs, and especially patents, protects the old against the new. It is no doubt that these communities seek alternative ways to foster greater access to knowledge.

It is also clear that if a society of accessibility should function the best way, restrictions need to meet user’s expectations. There can’t be any gatekeeping, holding knowledge and information back. There needs to be an understanding of how things work. An example of this is the Movie industry. In 2007 they made a copy protection for the new High Definition DVD format which was supposed to be much better than the one for the DVD. Surprise! The

copy protection was eliminated or worked around just as easily as for the DVD. Information about how you could do this instantly spread on the Internet. As long as the software industry is moving towards openness and sharing of knowledge, the ability to put restriction on systems is brutally limited.

When looking at the ‘joining forces’ image above we better understand that our information technology ecosystem functions best with generative technology at its core. Generative technology can be personal computers which can produce user driven change, an example of this can be a code that is written on a computer by a person, which he shares with anyone who wants it. A mainstream dominated by non-generative will hinder innovation, and restrict certain individual freedoms (Zittrain, 2008). The future of the software industry will witness a more generative system. There are five principal factors at work (Zittrain, 2008): 1) how extensively a system or technology leverages a set of possible tasks; 2) how well it can be adapted to a range of tasks; 3) how easily new contributors can master it; 4) how accessible it is to those ready and able to build on it; and 5) how transferable any changes are to others – including non-experts. If the quality of these are maximized, which basically means that none of them are left out, it will be easier to welcome contributions from outsiders as well as insiders (Zittrain, 2008). These principals have a lot in common with the ideal of the free software movement. The main focus of the movement is that software should be shared, understood and modifiable by everyone. This means that the core values here are accessibility and participation, which allows the system to increase output generation (Zittrain, 2008).

11.2. Web 2.0

The term Web 2.0 is associated with web applications which pursue information sharing, interoperability, user-centered design and collaboration. Examples of Web 2.0 are blogs, video sharing, social networking sites and wikis. The fundamental thing behind the Web 2.0 is that it allows users to interact with each other and change website content, in contrast to non interactive websites where this is very limited. In the future we will witness more user driven content such as Wikipedia and Flickr. How is it different from Web 1.0? It represents changes in the ways software developers and end-users use the web.

Web 1.0		Web 2.0
DoubleClick	-->	Google AdSense
Ofoto	-->	Flickr
Akamai	-->	BitTorrent
mp3.com	-->	Napster
Britannica Online	-->	Wikipedia
personal websites	-->	blogging
evite	-->	upcoming.org and EVDB
domain name speculation	-->	search engine optimization
page views	-->	cost per click
screen scraping	-->	web services
publishing	-->	participation
content management systems	-->	wikis
directories (taxonomy)	-->	tagging ("folksonomy")
stickiness	-->	syndication

O'Reilly et al has provided the list above and done some good research on how Web 2.0 differs from Web 1.0. Two subjects will be used as an example, Netscape and the Encyclopaedia Britannica Online (O'Reilly, 2005). Netscape used the web as a platform; they produced a web browser and wanted to dominate the market in order to establish a market for server products. This kind of control over standards would put them in the same position as Microsoft, enjoyable market power. They tried to replace what we know as the 'desktop' with the promotion of 'webtop', and focused more on creating software and updating it on occasion. O'Reilly makes a comparison with Google, a company who focus more on providing a service based on data. The data are the links Web page authors make between sites, which Google fully takes advantage of when offering Web search based on reputation through its "Page Rank" system. This means that the service Google provides is constantly being updated, rather than scheduled like in the case of software.

Another similar case can be seen between Encyclopaedia Britannica Online and Wikipedia. Britannica relies on experts to create articles, while Wikipedia relies on anonymous users to build content. Wikipedia is based on Open source software as mentioned earlier and it produces updates and articles constantly.

It's the society that creates knowledge. Could Wikipedia maintain its support from its contributors if its users used any kind of IP on the content? Open source models seem to foster consumer relationships and give a good chance to gather creativity that's evolving in social creative communities.

Many people now understand the idea of Web 2.0 (collective intelligence) as ‘crowd-sourcing’. O’Reilly & Battelle (2009) explain the concept as a large group of people who “can create a collective work whose value far exceeds that provided by any of the individual participants.”

11.3. Given enough eyeballs, all bugs are shallow

Microsoft has long been claiming that there are hundreds of patent infringements in the Linux Kernel, but has never really pursued it. The reason Microsoft does this is because they feel that it keeps the balance of power in their hands and enables them to use the threat of patents to fight the adoption of Linux.

"Given enough eyeballs, all bugs are shallow". This is an expression known as the 'Linus's Law'. In short terms it means that if there is a problem, and there is a large enough co-developer base, somebody will always find the problem and somebody will understand it and fix it. This expression could be redefined to also apply to other technological barriers. If there is a problem, for example the patent system, people will always find a way around it, and indeed they have.

Commit to memory the TomTom case mentioned in section 10.4.2.2. They refused to meet Microsoft’s royalties’ demand, and by that they infringed some patents that belonged to Microsoft. Recall the ‘Linus’s Law’ - There has now been submitted a patch to the Linux Kernel which bypasses the VFAT patent issue in question. (Kleikamp, 2009)

This patch is really an eye opener into the world of open source software and patents. There are with no doubt many patents which affect free software, but there are also many people out there waiting to work around them. What’s the missing link? Knowing what they are. If people knew all the other patents which Microsoft claims are violated in the Linux kernel, it would not be long before the Linux kernel wouldn’t violate any at all.

How are companies built on proprietary development models competing against it? Linux itself is not a company, so it can’t be bought and the technology destroyed. It’s open source, so the code will never die. Companies like Microsoft have realized that they cannot compete against free and open source software, so they are trying to control it. They are doing this by using software patents and threatening companies which they can then influence.

11.4. Bilski

On the 9th of November 2009, The Supreme Court of the United States heard oral arguments in the case of *Bilski vs. Kappos*, 08-964. The case deals with a patent application for hedging risk in commodities trading. The high court's decision on patentable subject matter is of great importance to the future of software development, including OSS. The ruling could help to clarify the law and reduce the risk of patents hindering innovation. The patent was rejected based on that it was not implemented in specific machinery and was purely nonfigurative in nature, by both the U.S. Patent and Trademark Office and the United States Court of Appeals for the Federal Circuit. In reaching its decision, the Federal Circuit ruled that in order to be entitled for a patent, a process claim must be tied to particular machine or it must transform an article into a different state or thing – this is the so called “machine or transformation” test.

When this decision was reached they over ruled its own “useful, concrete and tangible result” test which was formulated in *State Street Bank & Trust Co. V. Signature Financial group, Inc.*, 143 F.3d (Fed.Cir. 1998). It is said that this decision has been the reason for the boom of business method and software patents in the past decade. The rejection of the useful, concrete and tangible result raiser important and interesting questions about the validity of many existing business methods and software patents. This concern a lot of companies, and many interested parties have followed the case carefully, in sum a total of 44 ‘friends of the court’ briefs have been sent out expressing viewpoints and concerns.

There has not been a ruling yet, but it's clear that it is an important case. Should the Supreme Court find that businesses methods are not patentable subject matter; this may in turn negatively impact the patentability of software patents, which are often related to business methods. An example of this is Amazon.com's one click process. Should the Supreme Court overrule the decision, status quo will be kept.

How will this effect Europe? A lot of software businesses are global and are therefore affected by decision made in the U.S. A good example of this is the TomTom case mention earlier. TomTom is a company from the Netherlands but the litigation is happening in the U.S. because Microsoft filed the complaint there.

It is important for the Supreme Court to keep in mind that litigation is not a good way to determine whether an innovation should be granted a government enforced monopoly. This is

what the OSS communities are trying to put through, they advise the Supreme Court to use the Bilski case to end software patents.

Ed Black, president and CEO of the Computer & Communications Industry Association, expressed an equally view on the situation:

"The unprecedented expansion of the patent system and the ensuing virtual land-rush that it created put lawyers in charge of innovation and enabled opportunism to trump opportunity," Black said. "All of this has produced a crisis of credibility in our intellectual property system. It is time to get back to basics, where our IP law promotes progress, not patenting, and where discovery is what inventors do—instead of what lawyers do."

11.5. Innovation happens without patents

In the long run the current patent system will face a great deal of challenges and possibly decline. The patent system is functioning as a brake rather than encouraging innovation. The future of the software market will evolve in the hands of society itself. Societal pressure has and will in the future shrink the patent system. Society wants transparency and fairness which means collaboration becomes a valued factor. In years to come more success stories featuring OSS will take form. OpenOffice.org and Wikipedia is good examples of this.

The current patent system is too slow to keep up with the rapid evolution of the software industry. Companies cannot be expected to behave in a way which does not correspond to the (broken) rules of the business environment in which they operate. This is a “prisoner’s dilemma”. The majority of players and the society as a whole would benefit if there were no such patents, but individual logic tells to run to the patent office, behold the emergence of patent trolls.

Innovation is an evolution. Everybody takes from everybody else. Clearly a shift to a non patent system or a complete abolishment of the IPR system cannot happen overnight. If there is going to be a change it will have to be gradual, and that is what’s happening right now in different communities.

12. CONCLUSION

The focus of this thesis has been on the stimulation of growth and innovation in the software industry with starting point on the IP system. A central issue has been whether the monopoly power achieved by IPRs is truly necessary to stimulate innovation. The thesis has identified some pressing issues regarding the software industry: namely, network effects, market failures of software patents, interoperability issues and standards. To further address these issues an understanding of the characteristics of the software market were made. Software products in general, have the characteristics of public goods that feature large economics of scale and network effects. The standards created could be made de facto standards and they could be privately owned. This creates a problem, because if the interfaces that allow interoperability with other computer programs are subject to strict IPR, the company controlling them could exclude competitors not only in its own market but also the neighbouring market. When intervening in software markets, policy makers need to take into consideration the fact that there exist trade-offs between encouraging follow-on innovations versus preventing free-riding on existing innovations. Economic literature on the relations between IPRs and competition law shows that these systems are reliable in terms of basic principles. There is no doubt that there exist some tension between the two and it's difficult to balance IPR and competition law in practice. The sources and facts about these tensions are several, but still it is commonly impossible to find a most favourable balance between IPR incentives for innovation and antitrust intervention for competition.

Because of the complex nature of software, the implementation of even the smallest computer programme will most likely be dependent on components from other software. Hence, there is a difficulty to create a programme without having to get acceptance from others. This overlapping of rights creates a good deal of problems because more people are contributing to the software industry and software in itself is only getting more complex by time. The fact that the software industry is recognized by rapid change, and the patent system is far from updated to meet this characteristic feature of the industry, the application of patents in this field will reduce the level of innovation. Software patents will make it more difficult to create software because of high costs and legal processes, which, at least, does not have a positive effect on innovation. In other words, patenting of software means that competition would not take place in the market but in the courts. This effect can have a devastating effect on SME's. The problems caused by this intellectual monopoly, is quite opposite to the result IPRs are supposed to provide, which are to enhance innovation. It is important to remember that,

besides the software creation, there is no significant financial spending in creating software. Like other industries, as for example the biotechnology industry, there is a great deal of up front capital costs. The software industry needs not laboratories to create software. Compared to other industries, the software industry is a low cost industry where patent protection is not needed to give incentives to invest.

The software industry is experiencing a growing agreement in various communities that the current IPR system, software patents mostly, experience several problems which make it inefficient and promote anti competitive actions. In our knowledge society new products and new product features follow one another in rapid progression. In order to remain competitive, creativity and innovation is vital. Society develops constantly through invisible forces by the strong pressure of business in the markets; Adam smith's term for this was the "invisible hand." Software patents works as tools and the pressure of business causes the society to use those tools. The software patent system will continue to grow under the constant pressure of business. If the growth can be controlled and *balanced* there can be great gains for the software industry, on the other side, great harm can be caused if not. As for most industries, the software industry will benefit greatly by *cooperating* to build industry *standards*, which provides *dynamic efficiency*, increased functionality, productivity and economic growth. If this is not pursued, a vital element of innovation, which is *interoperability*, lacks to fulfil its purpose of increasing *competition*, which ultimately leads to more *consumer choice*. The advent of OSS communities has pointed out the important role of *communities* in the innovation process. With its vast developer community and cooperative nature it offers a great alternative and competition to proprietary software – which is important because competition drives innovation in the software industry.

The words in cursive are made for a reason, throughout the thesis these factors have been used to stress important factors which are crucial for healthy competition and innovation in the software industry. Accessibility and participation are the common denominators of these words. Analysis and discussion in the thesis shows that there need not be 'intellectual monopoly', or market domination, to create and stimulate innovation. Although the elimination of the patent system may not yet be here, other approaches can be seen. Open innovation, open standards, cross-licensing and OSS provide good examples of this and supporting these could help stimulating competition in the software industry and increasing the innovation rate, while on the other hand, strategic use of IPRs are evident by theory and data analysis, which can result in negative effects for dynamic efficiency.

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