Managing Rights in Information Products on the Mobile Internet

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LICENTIATE THESIS

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ABSTRACT OF LICENTIATE THESIS

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The thesis is describing the interdisciplinary field of rights management on the Internet. I am highlighting mobility and the rights in information products.

In the introduction chapter, I briefly discuss the current problems and policy issues related to rights management. Next, I define some key concepts that often look ambiguous. The subject of the thesis is not within one well-defined field of science, but merely requires research methods from many sciences. The futures research methods, especially a modified scenario method, are utilized largely.

The management of rights in information products touches many legal areas. In the thesis, I am not able to cover them all, but describe in particular intellectual property rights (IPR), especially copyright, database sui generis right, and patents, as well as contracts. Next, I introduce some economic viewpoints and discuss their importance in relation to rights management. Technological topics presented in the thesis include, for example, mobility, open, semi-open and closed networks, application service provider and peer-to-peer models, superdistribution, and identifications. Societal factors that affect rights management are also briefly discussed.

I give examples of several information products: electronic books and newspapers, and music are covered more in detail.

The legal challenges are analyzed on the basis of sample scenarios. The scenarios have been created in a systematic way and they form a plausible picture of the future in which the rights are to be managed.

In the end of the thesis a draft rights management framework is presented.

Keywords
Rights management, information product, Mobile Internet, copyright, database sui generis right, patent, scenario method

TEKNILLINEN KORKEAKOULU **LISENSIAATINTUTKIMUKSEN**
Tietotekniikan osasto **TIIVISTELMÄ**

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Työn ohjaaja Dosentti Jukka Kemppinen	

Lisensiaatintyö kuvaa oikeuksienhallinnan monitieteistä aluetta Internetissä. Käsittelen erityisesti mobiilisuuteen ja tietotuotteiden oikeuksiin liittyviä kysymyksiä.

Työn johdanto-osuudessa esittelen lyhyesti oikeuksien hallintaan liittyviä nykyisiä ongelmia sekä yhteiskunnallisia näkökulmia. Seuraavaksi määrittelen joitain keskeisiä käsitteitä, jotka usein vaikuttavat epäselviltä. Työni aihe ei asetu kauniisti yhdelle hyvin määritellylle tieteenalalle, vaan tutkimukseni on edellyttänyt eri alojen tutkimusmenetelmien soveltamista. Olen käyttänyt paljon tulevaisuudentutkimuksen menetelmiä, erityisesti sovellettua skenaariomenetelmää.

Tietotuotteiden oikeuksien hallinta sivuaa monia oikeudenaloja. Lisensiaatintyössäni pystyn kuvailemaan niistä vain aineettomia oikeuksia, erityisesti tekijänoikeutta, tietokantasuojaa ja patentteja sekä sopimusoikeutta. Esittelen joitain taloudellisia näkökulmia ja pohdin niiden merkitystä oikeuksien hallinnassa. Teknologisia aiheita, joita työssä käyn läpi, ovat muun muassa mobiilisuus, avoimet, puoliavoimet ja suljetut tietoverkot, vertaisverkot, superdistribuutio ja tunnisteet.
Käsittelen myös lyhyesti yhteiskunnallisia tekijöitä, jotka vaikuttavat oikeuksien hallintaan.

Annan työssäni useita esimerkkejä tietotuotteista. Sähköisiä kirjoja ja sanomalehtiä sekä musiikkia esittelen yksityiskohtaisemmin.

Oikeudelliset haasteet on analysoitu skenaarioiden pohjalta. Skenaariot on luotu järjestelmällisellä tavalla ja ne muodostavat uskottavan kuvan tulevaisuudesta, jossa oikeuksia on tarkoitus hallita.

Työn lopussa esitellään luonnos oikeuksien hallinnan viitekehikoksi.

Avainsanat

oikeuksien hallinta, tietotuote, mobiili Internet, tekijänoikeus, tietokantasuoja, patentti, skenaariomenetelmä

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FOREWORD

I began to write this thesis during a project on intellectual property rights (IPR) related to content products and the Mobile Internet. Especially copyright was emphasized because of its significance for content production on the Internet. The project took place in California from October 1999 till August 2000. During that time, I was employed by Helsinki University of Technology and I was a visiting scholar at University of California, Berkeley. The project was funded by Nokia Research Center and accomplished in cooperation with Nokia's personnel.

The work is continued in the follow-up project called *MobileIPR* at Helsinki Institute for Information Technology HIIT. Tekes (the Finnish National Technology Agency), Elisa Communications, Nokia, Sonera, L M Ericsson, Yleisradio (the Finnish Broadcasting Company), and a group of law firms have generously funded the project.

I have been privileged to work simultaneously under the supervision of several distinguished scholars. Dr. Jukka Kemppinen is the responsible leader of MobileIPR project, he has been the instructor of this thesis, and he has contributed a lot to the actual research work. Dr. Martti Mäntylä is the research director of Helsinki Institute for Information Technology HIIT. Our project has been lucky enough to receive some of his valuable time and we have gained a lot especially on his expertise on wireless technologies. Professor Reijo Sulonen has been the supervisor of my thesis and given numerous important comments.

Mr. Mikko Välimäki has been my co-researcher in MobileIPR for years and he also worked with me several months at Berkeley. Currently, Mr. Ville Oksanen and Mr. Tommo Reti are also working on MobileIPR project. The opinions and comments of this project team have certainly affected a lot this thesis; their companionship has been valuable and they have given me many important ideas.

Researchers in other HIIT projects as well have had their influence on my work. Especially discussions with Ms. Aura Soininen have been most valuable. I am emphasizing also the contributions of Mr. Perttu Virtanen, Mr. Risto Sarvas, Mr. Herkko Hietanen, Mr. Yki Kortesniemi, and Ms. Raija Tervo-Pellikka. The opinions and profound views of my other HIIT colleagues, like Dr. Pekka Nikander, Mr. Samuli Simojoki, Mr. Matti Kalliokoski, Dr. Pekka Himanen, and Dr. Ken Rimey, have affected my work as well.

I have learned many important issues on the topics of this thesis in discussions with Mr. Kimmo Djupsjöbacka, Mr. Hartti Suomela, Mr. Julian Durand, Mr. Heikki Saikkonen, Mr. Petteri Saarinen, Mr. Pekka Koponen, Mr. Harry Santamäki, Mr. Ilkka Rahnasto, Mr. Pekka Ollikainen, Mr. Nouri Allahwerdi, Ms. Zheng Yan, Mr. Timo Ruikka of Nokia, Dr. Veikko Hara, Mr. Martin Mäklin, Mr. Juha Aaltonen, Dr. Marko Silventoinen, Mr. Janne Yli-Äyhö, Mr. Jussi Hattula, and Mr. Ville Hyppönen of Sonera, Ms. Annakaisa Häyrynen and Mr. Aimo Maanavilja of Elisa, Mr. Juha Vesaoja, Ms. Minna Eskola, and Mr. Antti Järvinen of Yleisradio, Mr. Seppo Kemppinen of Borenius & Kemppinen, Dr. Sami Jokela of Accenture, Mr. Matti Valtonen, Ms. Sari Kela, and Mr. Teemu Soininen of Opplex Attorneys at Law, Professor Jyrki Kontio and Mr. Marko Hakonen of Helsinki University of Technology, Professor Juha Pöyhönen of University of Lapland, Mr. Petteri Laaksonen and Ms. Pia Hurmelinna of Telecom Business Research Center, and Mr. Esa Turtiainen of L M Ericsson, just to mention few.

During my stay at University of California, Berkeley, I met a number of intellectual people and I had opportunities to discuss with and attend the lectures of, for example, Professor Hal Varian, Professor Pamela Samuelson, Professor Peter S. Menell, Professor Mark Lemley, Professor Robert P. Merges, and Professor David G. Messerschmitt.

Discussions in the Open eBook Forum (OeBF) have been most instructive. Of many intelligent and competent people in OeBF, I mention especially Mr. Douglas Armati (InterTrust Technologies Corp.), Mr. David Ornstein, (Microsoft Corp.; the former president of OeBF), and Dr. Jonathan Schull (Digital Goods, Inc.).

I am especially grateful to my wife Merja, our sons Lauri and Aarni, and my parents for their understanding, love, and support.

INTRODUCTION

People are vigorously arguing whether strong intellectual property rights and digital rights management (DRM) are good or bad. The content industry, music companies, movie producers, and book publishers among them, claim that proper means to protect intellectual property are essential to the cultural development. Intellectual property law is to allow individuals and businesses to benefit from the value of the information they produce. It gives them an incentive to produce still more. Rights are vital to create revenues for authors. Without reasonable compensation writers, composers, artists, and other creative people will not produce as many works for others to benefit as they could.

On the other hand, the active movement emphasizing the freedom of information has a negative attitude towards legal rights that restrict the use of information. One of the most noticeable characters of the movement is professor *Lawrence Lessig*. He declares that it is not question about whether the authors get paid, but who controls the revenue flows. The authors would get their compensations even if there did not exist any intellectual property rights. Instead the laws protect media companies that are not flexible enough to survive otherwise in the new digital environment.

It makes the situation more controversial that in many fields of the content industry ownership is highly concentrated. The large corporations own the majority of the publishers and rights holders of the industry. In general, the concentration of control of rights and revenue flows can be dangerous.

The fundamental function of a legal system is to enable adequate protection for the entities within its jurisdiction. Should, however, a legal system protect existing companies and create artificial entry-barriers for new-comers, or should it let the markets decide who the winner is? Should it especially support for example those who create content, those who make it available, or those who use it? The big question is how to find the right balance.

Intellectual property rights have been developed in a quite different world than the digital environment that is rapidly emerging. Many rights protect something that was valuable yesterday, but does not have that much significance any more. For example, according to *Schull*, copy protection does not make sense any longer, because copying and distributing copies are essential to business in the digital content industry. Instead, legal systems should promote new business models based on inventions like superdistribution: people should be encouraged to copy and further distribute information products. The question is how to make sure that the content creators and providers get adequate compensation or other incentives to produce new valuable information products.

Digital rights management systems can also extend intellectual property rights far beyond what is provided by the legal system. For example, exceptions that restrict intellectual property rights because of – for example – private use, fair use, criticism, comment, news reporting, or teaching are generally believed to be useful. However, using powerful rights management systems, rights-holders can pre-empt those exceptions and significantly enlarge their rights. Also, it is widely accepted that no-one should have exclusive rights in certain information, especially in facts. Nobody can own the laws of nature, for example. Rights management systems enable nonetheless control over facts also. Lawmakers are currently extending the legal protection of the technical protection tools so that circumventing technical means becomes widely illegal. Although facts are still not directly protected by laws, they get strong indirect protection if they are stored in a system that is legally protected. This development is most concerning.

From technological point of view, there is an important question to make. It is hardly possible to develop a fully tamper-proof rights management system. For that reason, does it make any sense to use rights management systems at all? It is not possible to make a fully burglar-proof house either, but people are still using locks in their doors. Oftentimes, it does make sense to employ reasonable means of protection although they are not perfect. Even a technical protection system that has evident limitations may be sufficient to prevent most unwanted usages. For a rational, capable, potential infringer, the question is that of cost/benefit: does the cost to circumvent the protection overcome the benefit of getting the information? For a less rational potential infringer, it is often the question of ability and bother: one is not capable or does not want to take the trouble to bypass the protection. Moral and psychological issues should not be ignored either. For many of us, the fact that something is protected means that it is not allowed to be accessed and that as such is a reason not to circumvent the protection but to respect the right holder's will whether legally grounded or not.

The best known example of problems related to digital rights management has been Napster. Millions of users shared music files without paying anything to music companies. As of now, the music industry seems to have succeeded in killing Napster. The unauthorized copying of music files did not however stop. Napster was replaced by a number of new services that are more distributed, more de-centralized, and more difficult to control. By destroying Napster, the music industry may have lost a "good enemy" that could have been controlled unlike its follow-ups.

In this thesis, I will present some facts and opinions about the usefulness of digital rights management, but the underlying assumption however is that it depends on the situation and on the entities whether DRM is needed or not and what kind of DRM should be used. I do not endorse strong legal rights and their strict enforcement nor do I claim that no legal rights should ever be applied to information products. Also, I do not claim that technological solutions alone could solve all the problems that information technology has caused. Nor do I believe in the omnipotence of any legal constructs.

DEFINITIONS

Many terms and concepts in this field are quite ambiguous and vague. Numerous buzzwords without proper definition occur frequently even in scientific papers. It seems that today almost everything has an e-, m-, or u- prefix or an attribute *digital* without explanation. The prefix "e-", for example, should mean *electronic,* but it does not necessarily mean that the issue in question has anything to do with electricity. Digital on the other hand should refer to digits, but often digits are not essential properties of those "digital" matters under discussion.

> A good example of the rhetoric in this field is the name of the controversial U.S. copyright statute "Digital Millennium Copyright Act", DMCA [97, § 101 notes amended 1998 Pub. L. 105-304]. According to Random House Webster's Unabridged Dictionary, *millennium* may refer to "a period of general righteousness and happiness, esp. in the indefinite future". [64] Obviously, it is digitalization that brings forth this happiness and DMCA is to protect it from evil pirates and infringers.

Of course, words can have several correct meanings, different disciplines may well use them in other senses, and often the level of abstraction we are discussing also have an effect on what we mean by words. However, careless and extensive use of hype-words makes it often difficult to understand the essential message. A careful reader will find these peculiarities in this thesis also. However, I have tried to use words in a consistent way and give an explanation when needed. Below are some of the important terms that occur regularly throughout the thesis.

An *entity*, in this context, is a person, a company, or any organization that may own rights.

Digital Rights Management (DRM) is the set of actions, procedures, policies, product properties, and tools that an entity uses to manage its rights in information in digital form. Quite often DRM is used in a narrower sense meaning only technical tools that are used to protect intellectual property rights. In this thesis, however, digital rights management refers to the broader concept that includes also the issues listed above. It is neither restricted to intellectual property rights, but as discussed later, *rights* refer here to other rights related to information products as well. In addition, if someone chooses to have a policy – for example – not to protect information products technically, in my opinion, that decision is within digital rights management also. I would like to point out that the term "*digital rights management*" is somewhat misleading. Rights are not digital. In general, they do not have much to do with digits, but they are rather analog. The word "digital" refers supposedly to the subject matter, to information in digital form, not to rights in that information. It is also possible to think that the word "digital" refers to the fact that digital information technology is often used to manage the rights, "the digital management of rights" instead of "the management of digital rights". Yet, DRM does not refer to computer-aided rights management in general. For example, an investor can have a computer-based system to manage real estates, securities, contracts, etc., but this system is not called DRM. A more descriptive but rarer term is for instance *Intellectual Property Management and Protection* (IPMP) [58], but as of now, DRM is widely known and therefore used also in this thesis.

A computer *program* is a specific set of ordered instructions or statements that is intended to be used in a computer to make the computer to perform certain actions or to bring about certain results. [97, 143] This kind of definition seems to refer to the machine-readable and executable program version, to the set of zeros and ones that is loaded into the memory of the computer and that the processor executes instruction by instruction. The fact is that only the executable set of instructions or statements actually makes a computer to do something. Nevertheless, it is not a big mistake to make the definition a little broader: a program can refer also to source

code, bytecode and so on from which the executable program version is automatically compiled or which is executed by an interpreter, a virtual machine or alike. Although a processor is hardly ever capable of executing source code directly, the relation between source code and executable code is such straightforward that it is reasonable to include source code into the definition. Most programs include errors that make at least some of the actions and results unattainable. Therefore I emphasize that in this definition the intention is significant, not the results. However, a set of instructions or statements that includes so many errors that it is not capable of performing anything intended is hardly a program, although it is very hard to draw the line between programs and non-programs that way.

Software refers to all the information that is produced during a *software process*, i.e. during the process that is intended to produce a certain computer program. [5, 25, 63, 77] Software includes not only the program but also its documentation, database definitions, and so on. It should be noted that there are also many other kinds of definitions for software. For example, software may refer to the variable or the intangible part of a computer system while hardware refers to the invariable or the material part. [143] In this thesis, nevertheless, I prefer the first definition.

A software or program *component* is a reusable building block that can be combined with other components in the same or other computers in a distributed network to form an application. [143] Components can be delivered independently to reuse the services they offer. According to *Thomason*, independence does not necessarily mean that a component has no dependencies on other components, although such a characteristic is often desirable, merely that those dependencies are generic enough for several different providers to satisfy. [51, 83]

Data are numbers, characters, images, or other method of recording, in a form which can be assessed by a human or especially input into a computer, stored and processed there, or transmitted on some digital channel. Computers nearly always represent data in binary. Data on its own has no meaning, only when interpreted by some kind of data processing system does it take on meaning and become information. People or computers can find patterns in data to perceive information,

and information can be used to enhance knowledge. The Free On-line Dictionary of Computing gives us an illustrating example: "1234567.89 is data. 'Your bank balance has jumped 8087% to $1234567.89' is information. 'Nobody owes me that much money' is knowledge. 'I'd better talk to the bank before I spend it, because of what has happened to other people' is wisdom." [123] Another way to illustrate how data differs from physical medium and information is to imagine text in a piece of paper. If the text is looked close enough – using a microscope or a magnifying class for example – one can see the details of the surface of the paper and ink on it. That is physical medium. When the viewer grows away from the paper, single characters or letters can be seen. That is data. When the distance increases further, one can see words, sentences, and paragraphs and starts to understand what the text says. That is information. By processing this information in the brains, the reader gets knowledge and maybe ultimately some wisdom.

Information is stimuli that have meaning in some context for its receiver. Information can be converted into data and passed on to another receiver. Relative to the computer, we can say that: Information is made into data, put into the computer where it is stored and processed as data, and then put out as data in some form that can be perceived as information. [144]

An *information product* consists of valuable information, which is technically stored in a form that can be controlled and transferred between entities. It may include contents, metadata, and computer programs or program components. [58]

Content is the part of an information product without which the product has no value. The other parts, like metadata or programs, however, may add value to the content. It is not possible to precisely define the concept of content. As there can be tremendously many kinds of information products, also content can differ a lot. It can be nevertheless described as the actual payload of the information product. For example, a computer program as such can be an information product. On the other hand, as a part of a multimedia product, it does not necessarily need to be something without which the product has no value, but is merely a value-adding auxiliary part. Therefore a program may or may not be content.

A *legal product* is the combination of the parts of a certain information product that are protected by legal rights in a certain jurisdiction at a certain time. Those parts that are protected by legal rights are called *legal components*. A legal component itself can be a legal product or an *atomic subject matter*. [58] These concepts could be visualized as if "legal light" illuminates an information product, those parts that are not protected by any legal right are transparent and cannot be seen. From the legal point of view, they do not exist. Legally, only the protected parts exist, or they are "visible in the legal light". If we further imagine a "shade", a certain jurisdiction at a certain time behind the information product, the "shadow" of the information product in the "legal light" on the "shade" is the legal projection of the information product or the instance of legal product in that jurisdiction at that time.

Metadata is information about information. In information products, metadata is the part of the product that describes the content but is not a program. Keeping in mind, how information and data have been defined above, it would be more appropriate to call it metainformation. However, metadata is such a well-known term that I use it in this thesis also. [34, 36]

METHODS

This thesis covers many areas. I am discussing on technological, legal, economical, as well as other societal issues. Therefore, the thesis is necessarily somewhat interdisciplinary and I have needed to use several methods to accomplish this work. In many areas I have heavily relied on literature and large parts of the thesis are thus concluded from other scholars' publications. Nevertheless, the main contributions of the thesis are the analysis of *legal challenges related to the future Mobile Internet* and the *digital rights management framework*. I have created both of them with the help of people mentioned in *Foreword*, principally Mikko Välimäki. In *Legal Background,* in addition to the literature survey, I introduce some analyses of my own. I have accomplished them using jurisprudential methods; discussions with my colleagues, especially Jukka Kemppinen, Aura Soininen, Perttu Virtanen, and Mikko Välimäki, have been most valuable. Particularly about patents, I have learned a lot from Aura Soininen.

It requires some discussion especially, how I came up with the list of the future legal challenges and analyzed them. At first sight, it seems that legal challenges should be analyzed using the methods of legal science. However, the question is about forthcoming issues while legal science mostly uses court cases, statutes, and their preparatory works as its sources and derives theories by analyzing them. Thus it is hardly possible to tell almost anything about the future using conventional jurisprudential methods.

Instead, futures research provides us with more suitable methods. Especially scenarios are useful when I want to describe how the world will be like and what kinds of legal challenges may occur. Scenarios used in other fields of science are typically quite broad. In this thesis, scenarios are relatively narrow: they merely describe a possible service or a use-case that is grounded on literature, existing services, and discussions with operators and vendors.

I do not claim that any of those scenarios would actually come true. Neither is their actual probability of being realized in the focus of this thesis. Instead, they are to form a picture of possibilities and concerns that may exist in the future. Scientifically I am facing serious concerns since I am speculating without immediate possibility to refutation. [16] I believe, however, that it is possible to test the validity of the scenarios later with true use cases or prototypes further derived from the scenarios.

Thus, the major problem I faced was how to create scenarios that cover possible situations adequately. If I had created them randomly, I would not have been able to claim that they embody important issues sufficiently. To avoid such biasing, I had to be able to create the scenarios in some systematic way. Also, using a systematic method helped me to diminish the effect of my own values and beliefs. Certainly, the scenarios reflect my personal views, but the approach I used reduces that bias.

My approach is based on factors and their attributes. I need to understand the main factors that have effects on legal challenges. To see how the factors will develop in the future, I studied their attributes. I used the following method shown schematically in Figure 1.

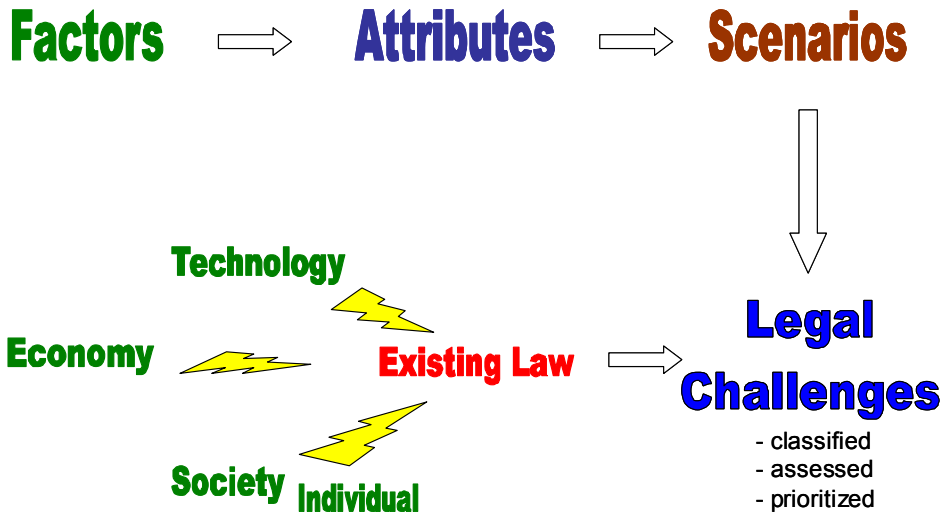

Figure 1. Factors, attributes, and scenarios help to find legal challenges.

I think that specific factors and their attributes can be identified that by interacting with the existing law imply the legal challenges. The factors are *technology*, *economy*, and *society and individuals*. When the existing law is applied to them, the legal challenges will arise. By legal challenges I mean difficulties in legal reasoning or somehow unsatisfying outcome of the legal process. I summarize from literature, which attributes of each factor mostly seem to relate to the Mobile Internet. Then I create scenarios so that each of those attributes occurs at least in one scenario. Next, I identify legal challenges involved in scenarios. I also check the attribute list to identify legal challenges directly from them. The legal challenges are then classified by legal areas, assessed and prioritized. In conclusion I am able to form a list of legal areas that will hold significant challenges on the Mobile Internet.

It should be noted that what I am calling attributes includes also phenomena that in futures research are called for example weak signals and trends. From the perspective of the thesis, however, it is not necessary to make distinction between those concepts. It is sufficient to mention that they are all issues that have effects on the dynamics of the factors. What the factors are in the future depend very much on them.

The method has some noteworthy threats to validity:

- First, I may have made mistakes in the definition of the factors that mostly affect legal challenges.
- Second, I may choose wrong attributes to characterize the dynamics of factors.
- Third, even if the factors and attributes are correct, I may have created scenarios that do not represent adequately the future situations. I may even make erroneous conclusions based on otherwise well defined scenarios because I am not able to test and verify them.
- Fourth, I may identify legal challenges incorrectly or insufficiently.
- Fifth, I may assess and therefore prioritize the issues erroneously.

Based on the careful design of the study, however, I am quite confident that these threats to validity are limited. Moreover, I have been able to check that the scenarios are reasonable by discussing them with our industrial partners and other experts.

LEGAL BACKGROUND

INTRODUCTION

This chapter is intended to give an overview of legal issues involved in information products on the Mobile Internet. The emphasis is on the US and the Finnish legal systems – the latter presenting the harmonizing European regime. The legal rights related to this area are numerous. It is not possible to cover them all in detail. I will only describe the most important of them – and even them only from the perspective of this work. Should somebody want to learn more about intellectual property rights, I can only refer to the excellent works of – for example – *Goldstein* [e.g. 22]*, Lemley, Menell, Merges,* and *Samuelson* [e.g. 43, 49] in America; *Bainbridge* [4, 5], *Hugenholtz* [e.g. 31, 32, 33], and *Koktvedgaard* [e.g. 39] in Europe; or *Haarmann* [24] and *Kemppinen* [37] especially in Finland. For example privacy and data protection would also be a subject worth to discuss, but I have to leave it out to keep my thesis focused.

INTELLECTUAL PROPERTY RIGHTS ON THE WHOLE

Intellectual property rights (IPR) protect intangible valuables. It is possible to own physical objects, but one cannot own nor have title to intangible objects like software, multimedia, or inventions. Those are objects of intellectual property rights: copyright, patent, trademark, etc. They can be used to prevent some unauthorized gaining of intangible objects, that is, to exclude free-riders. [20]

According to *Goldstein*, "the principal object of intellectual property law in the United States is to ensure consumers a wide variety of information products at the lowest possible price. Intellectual property law seeks to achieve this end through the grant of private property rights enabling individuals and businesses to appropriate themselves the value of the information they produce, thus giving them an incentive to produce still more." [22] The same principles of intellectual property rights can be found outside the USA also, although the emphasis may be slightly different. In some countries, the non-economical aspects of intellectual property rights are highlighted more.

According to *Lessig*, the term *intellectual property* is a recent creation. "Before the late nineteenth century in America, the concept did not exist. Before then, copyright was a kind of monopoly. It was a state granted right to control how someone used a particular form of text. But by the late nineteenth century, so familiar was this monopoly that it was common, and unremarkable, to call it property." [45] Indeed, the roots of copyright are in prerogatives, privileges, and monopolies. There are hardly historical reasons to call the subject matter of copyright *property*. The question is whether the situation has changed. The western society has moved towards individualism. Service industry has a remarkable role in its economy. Information in all forms has become most important. Arguably, some of the most valuable objects today are intangible. Shouldn't it be possible to have property rights in them?

Property rights supply the legal framework for allocating resources and distributing wealth. [14] From that point of view it does make sense to have property rights in information. Actually, that is what the intellectual property rights are used nowadays. They do allocate information resources. Yet, it remains a policy issue, how this allocation should happen and how strong those rights need to be.

Technical development tends to introduce new legal problems. Sometimes they can be solved using old methods just by applying them in a new fashion. Sometimes the new legal problems need new kinds of solutions. Sometimes it is difficult to tell which kind of problem it is. Some people are inclined to believe that most problems that come up with new technology are totally new and that they need all new solutions although it would be possible to apply old rules to them. But some people also try to apply old rules to all the new problems refusing to see that some of the problems really need new solutions.

Recent rapid development in information technology has exposed both kinds of problems. For instance, a machine is nowadays capable to perform some activities that previously were possible for human beings only. Therefore now it might be a question about human-machine relationship where it used to be a human-human-relationship. Because of our very basic needs and beliefs, we want to rule human beings and machines differently. That is why those new relationships, to which machines are related instead of humans, may need different laws. The new technology also creates totally new phenomena. For example, hypertext or computer networks did not exist a few decades ago.

The system of intellectual property rights was developed in quite a different world from the one we live in. Although human creativity and inventiveness have probably not changed a lot, new technologies and business possibilities have remarkably changed the environment in which the intellectual property rights operate.

A number of legal areas are related to information products. They differ from country to country; they are developing and thus changed often; and their interpretation is frequently unclear. Therefore it is quite difficult to be sure what one's rights and duties are. In this complex situation, companies have many possibilities to select their strategies in respect with rights in their information products. Of course, there are as many strategies as there are companies and none of them is superior in all cases. However, it is possible to describe the strategies by classifying them illustratively.

One extreme is what I call a *castle strategy*: a company uses its rights to build heavy protection around its businesses. It fights furiously if someone seems to infringe the company's rights. These castles seek for large patent portfolios; they backup their positions with strong contracts; and they try to get all the rights in all their products. A castle is prepared for many kinds of threats. It is typical that a castle has a number of in-house-lawyers. Castles can usually be found in well-established industries, where older companies tend to defend their positions. The largest companies in new and dynamic industries are also attempted to apply a castle strategy to protect their market shares.

I call the other extreme a *pioneer strategy*. Those companies are very dynamic; they try to move fast and progress actively. They use their resources only to repel real and most dangerous attacks. Instead of hiring many lawyers they invest in product development, marketing, and other business-oriented activities. Pioneers are typical in emerging industries or they can be challengers in older industries.

In the following I will first describe copyright, which is the most important legal means to protect information products, especially works of literature and arts. I will also briefly describe patents and database protection, because their importance within the scope of this thesis is significantly increasing. On the other hand, I will almost entirely pass over trademarks and other intellectual property rights that seem to have less weight with respect to digital rights management.

COPYRIGHT

The history of copyright is not very long. Although people have created original literal and artistic works already tens of thousands, even hundreds of thousands of years ago, copyright did not emerge until the art of printing was invented. Previously, books were copied one-by-one. Printing was the first means to mass-reproduce intellectual property. The new technology, for the first time, introduced the risk that somebody could easily make large amounts of copies of the work that someone else has produced. To prevent this risk, sovereigns could grant printing houses and publishers – but usually not the authors – exclusive *prerogatives* or *privileges* to print and distribute books in certain territories. Gradually, author's permission to publish a book became a precondition for such a privilege. According to *Haarmann*, [24] this was a step towards modern copyright. Later, it became customary to pay royalties to authors, the subject matter of privileges was changed to books instead of territories, and occasionally authors themselves get the privileges. [24, 37]

The privilege system spread step by step everywhere in Europe. In England, privileges developed gradually into copyright. The Statute of Queen Anne, the first copyright law in the world, was issued in 1710 [88]. The statute established privilege or monopoly that excludes others from utilizing author's work for limited term. The copyright system in England was nevertheless aimed to provide publishers with adequate rights, not to highlight author's right. Also, in the USA, the Federal Copyright Law was based on the same principles adopted earlier in England. [24, 28, 31, 32, 34, 37]

Nowadays, creative works are protected by copyright. National laws, EU directives, and international treaties govern it. Anything that is original, expressed, and creative is protected by copyright. The work does not need to be registered or copyright noticed (e.g. © mark). It does not need to be artistic either. The emphasis, however, is on slightly different aspects in different countries.

The Anglo-American system has been stressing economic rights, promoting culture and science, and focusing on rights-owners instead of original authors. To be copyrightable, a work must be original. In Anglo-American copyright system, originality nonetheless means basically that the work is not copied. The extremely relaxed common law tradition in the UK and Ireland means that a work is already protected by copyright if there is 'skill, labor or investment' involved in an object. Creativity has traditionally played a minor role. [24, 32, 34, 37]

In France, on the other hand, copyright acts in 1790's gave significantly more emphasis to authors' rights. Since then French *droit d'auteur* has accentuated author's personality and creativity while protecting not only the economic but also the moral rights of the author. Here the requirement also consists of originality, but different from the common law concept. In France, it means a personal creative expression of the author. According to *Hugenholtz*, continental European countries Belgium, the Netherlands, Luxemburg, Spain, Portugal, and Italy, as well as countries in Latin America and Western Africa have similar copyright systems like France. Germany, Austria, and Switzerland have systems that also highlight authors' rights but their statutes furthermore strictly regulate what may be assigned and agreed. The German system is the least relaxed in Europe. It does not only operate with the notion of personal creative expression, but at least for certain categories of works, like designs and computer software further qualitative or aesthetic tests used to be applied before copyright protection was granted. [24, 32, 34, 37]

In Germany, different kinds of works need different levels of creativity to achieve copyright protection. For example, useful articles like the works of industrial art require a high level of creativity to be copyrighted while literal works, like novels, do not need to be particularly creative. [24]

Note that for example in the USA, the design of a useful article is copyrightable only if the design incorporates features that can be identified separately and may exist independently of the utilitarian aspects of the article. [6, 97] This is a good example of the typical situation where the theoretical background of the legal norm is quite different, but the actual outcome is quite similar. That is, useful articles are hardly copyrightable in either continent though the legal rules are different.

Finland and other Nordic countries have cooperated a lot when they have been developing their copyright laws. Their systems are now influenced by both German strict rules, French *droit d'auteur*, and Anglo-American copyright laws. [24, 32, 37]

European Union has strived for harmonizing the copyright system in Europe. The Commission has had to choose between the different systems in force in Europe. According to *Jehoram,* the Commission has chosen the middle road, the general continental one. The UK and Ireland as well as Germany on the other hand have had to change their laws and practices on the very basic points of copyright. [34]

In the USA, *Feist v. Rural* case changed the American interpretation on what is original. Previously US courts had held that skill and labor is enough – creativity was not required. [22, 32, 49, 104] In *Feist v. Rural* the court decided that a minimal degree of creativity is needed:

> "The sine qua non of copyright is originality. To qualify for copyright protection, a work must be original to the author. Original, as the term is used in copyright, means only that the work was independently created by the author (as opposed to copied from other works), and that it possesses at least some minimal degree of creativity. To be sure, the requisite level of creativity is extremely low; even a slight amount will suffice. The vast majority of works make the grade quite easily, as they possess some creative spark, "no matter how crude, humble or obvious" it might be. Originality does not signify novelty; a work may be original even though it closely resembles other works, so long as the similarity is fortuitous, not the result of copying. To illustrate, assume that two poets, each ignorant of the other, compose identical poems. Neither work is

novel, yet both are original and, hence, copyrightable." [104]

The one who has created the work is called an author. Normally the author owns copyright originally. In legal systems that emphasize authors' rights, *droit d'auteur*, typically only a human is considered to be creative. Organizations, computers, and others cannot create copyright protected works. However, the copyright is in some cases automatically assigned to the employer, if the creative work is a part of the employment. In the countries, like the USA, that emphasize publishers rights, a company may be the author of the work. Thus the employer may be considered the original author of the work created by an employee.

If a work has several authors, copyright in each separate contribution to a *collective work* is distinct from copyright in the collective work as a whole, and vests initially in the author of the contribution. Collections of literary or artistic works such as encyclopaedias and anthologies, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, shall be protected as such, without prejudice to the copyright in each of the works forming part of such collections. On the other hand, the authors of a *joint work* are co-owners of copyright in the work. [97] A typical example of a collective work is a newspaper in which all the journalists normally have original right in their articles although they have assigned at least some of their rights to the publisher of the paper. A newspaper is thus a collection of copyrighted works that usually have different authors. A reader is typically able to distinguish between the works and the authors. However, the newspaper as a whole may also be a copyrighted work as might be, for instance, a collection of newspapers as long as the composition work has been performed in a creative way. In a joint work, reader is not able to distinguish between the authors. A single newspaper article may be written by a couple of journalists together so that their work is indistinguishable.

Copyright gives some exclusive rights to the author. There are some differences between the countries which rights copyright brings. The international treaties, like Berne Convention, provide the rights-holder with exclusive right to gain from the creative work, e.g. to copy, to modify, to sell, and to display the work. Those are called the *economical rights*. In many countries the author has also something called the *moral rights*. Depending on the country, they may include, for example, right to proclaim or disclaim authorship, and right to object any modification that would be injurious to the author's reputation. The moral rights cannot be assigned in general.

One of the very fundamental principles behind copyright is that copyright protection extends only to expressions and not to ideas, procedures, methods of operation or mathematical concepts as such.

As mentioned, to qualify for copyright protection, a work must be original to the author. As the court in *Feist v. Rural* stated, originality is a fundamental requirement. Especially, no one may claim originality as to facts. This is because facts do not owe their origin to an act of authorship. The distinction is one between creation and discovery: the first person to find and report a particular fact has not created the fact, but merely discovered its existence. Factual compilations, on the other hand, may possess the requisite originality. The compilation author typically chooses which facts to include, in what order to place them, and how to arrange the collected data so that readers may use them effectively. These choices as to selection and arrangement, so long as they are made independently by the compiler and entail creativity, are sufficiently original that such compilations may be protected through the copyright laws. The mere fact that a work is copyrighted does not, however, mean that every element of the work may be protected. No matter how original the format the facts themselves do not become original through association. Copyright protects only the original compilation, not the compiled facts. Like the Supreme Court of the United States noted, "this means that the copyright in a factual compilation is quite thin." [104]

In general, an idea is not copyrightable, but on certain conditions it can be patentable or it may be possible for example to claim it as a trade secret. (See Figure 2 and Figure 3.) The expression of an idea may be copyrighted. On the other hand, if the same idea is expressed in different, independent ways, each of those expressions can be a copyrighted work of its own and they do not infringe each other. The physical embodiments or the copies of copyrighted expressions can be for instance sold without assigning copyright. [24, 37, 49]

Object	**Examples**	**Means of protection**
Information	Abstract ideas, facts, knowledge, wisdom	No legal rights
	Ideas reduced to practice	Possibly patents, trade secrets, etc.
	Expression of ideas, creativity, etc.	Possibly copyright, trademarks, trade secrets, etc.
Data	Representation e.g. in binary form	No legal rights, but possibly technical protection, e.g. encryption
Physical medium	Embodiment	Possibly property rights, technical protection

Figure 2. Levels of abstraction related to intangible objects and their protection

It is important to note that technical protection measures cover data, but not information, and legal rights respectively do not apply to data. In principle, an entity could technically protect any data that is in its possession. On the other hand, legal rights cover only information that lawmakers have considered worth protecting. However, legal protection does not necessarily require physical possess of the information. That is, although technical and legal protection measures often cover same intangible objects, in principle, their coverage is quite distinct.

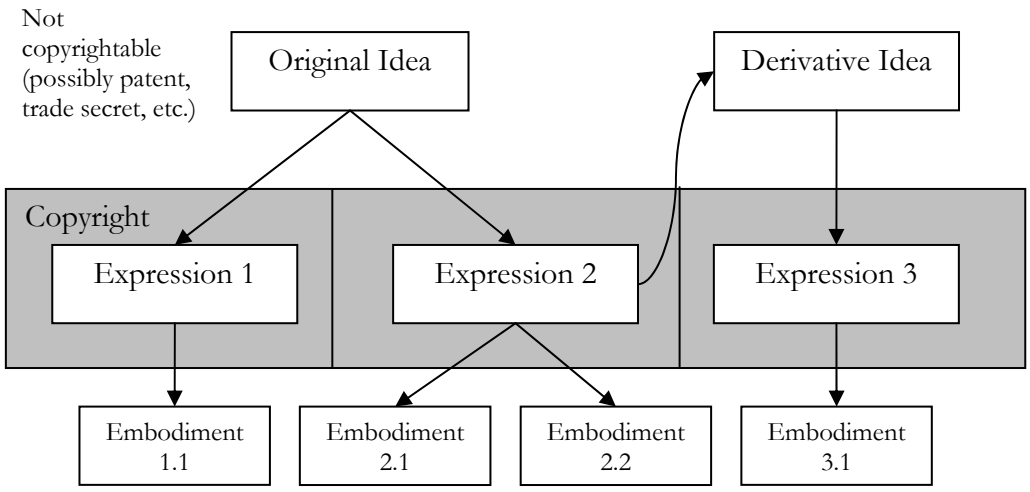

Figure 3. Intellectual property on the different levels of abstraction.

DATABASE PROTECTION

Databases are related to information products in many ways. More and more information is stored as data in databases. An information product can be, include, be a part of, or use a database. As a result, databases form a crucial tool in the development of the information products' market. Therefore it becomes vital important to understand what kind of rights can entities have in databases. It is widely accepted that a database can include copyrighted works and even a database as a whole can be copyrighted if it is original enough. However, most databases are not copyrightable and their content is not copyrighted either. Yet, the making of databases requires the investment of considerable human, technical and financial resources while such databases can be copied or accessed at minimal cost. Therefore some kind of protection for databases is needed. According to Article 10 in TRIPS agreement, "Compilations of data or other material, whether in machine readable or other form, which by reason of the selection or arrangement of their contents constitute intellectual creations shall be protected as such. Such protection, which shall not extend to the data or material itself, shall be without prejudice to any copyright subsisting in the data or material itself." [95] WIPO Copyright Treaty includes a similar article. [99] European Union has adopted a directive concerning the legal protection of databases. It recognizes the possibility of copyrighting a database but also defines a neighboring right, a specific *sui generis* right. [93] Several other countries are considering similar statutes. In the USA, a number of bills have been introduced in relation to database protection, but no statutes have been passed so far. [33, 37, 60, 93]

Contents / **The Whole**	not original	original
no substantial investments	No legal protection	The whole is not legally protected, but copyrighted contents
a substantial investment	Database *Sui Generis* Right	*Sui Generis* Right + copyrighted contents
Original	Copyrighted as a whole	Copyrighted both as a whole and contents

Figure 4. Copyright and the Sui Generis Right in a database.

It should be noted that the word *database* is ambiguous. Especially, a 'database' in information technology and a 'database' in legal context are not necessarily the same. According to the database directive, the term 'database' means a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means. Databases should be understood to include literary, artistic, musical or other collections of works or collections of other material such as texts, sound, images, numbers, facts, and data. This means that a recording or an audiovisual, cinematographic, literary or musical work as such is not a database. On the other hand, not all the databases that fulfill this definition gain database protection. It is namely further required that in order to get the *sui generis* right in a database, it must show that there has been qualitatively and/or quantitatively a substantial investment in either the obtaining, verification or presentation of the contents. [60, 93]

In addition, "works, data or other material" in the definition of database are quite trouble-some. Obviously the directive is trying to state that databases can include many kinds of information, copyrighted works as well as other sets of information. The wording, however, is quite unsuccessful. 'Data' here do not refer to methods of recording as defined above, but rather to information. 'Material' on the other hand probably refers to *im*material items. Therefore this part of the definition does not help us very much. [60]

All the EU member countries need to have implemented the directive. However, they have had the liberty to implement it in their own ways. Therefore the database legislation differs slightly within the European Union. For example, in the United Kingdom, the legislator has chosen to include the definition of a database in the statute quite directly from the EU directive: "'database' means a collection of independent works, data or other materials which (a) are arranged in a systematic or methodical way, and (b) are individually accessible by electronic or other means" and a "property right ('database right') subsists […] in a database if there has been a substantial investment in obtaining, verifying or presenting the contents of the database." [92] In Finland, on the other hand, the legislator has chosen not to specifically define *database* in the statute, but to declare only that the sui generis right requires a substantial investment in obtaining, verifying or presenting the contents of the database. [96]

So, what is a database? From the technical point of view, a database system in a computer consists of several components. There is a collection of data and a collection of programs to access the data. According to *Korth and Silberschatz,* a major purpose of a database system is to provide users with an abstract view of the data. That is, the system hides certain details of how the data is stored and maintained. [41]

This is accomplished by defining three levels of abstraction at which the database may be viewed: the physical level, the conceptual or logical level, and the view level. Physical level describes how a record is stored. Logical level describes data stored in database, and the relationships among the data. On view level, application programs hide details of data types. Views can hide information for security purposes. There can be different views for each user based on for example users' needs, rights, and security requirements. [41]

It seems that many database systems perform this task in such an excellent way that most users cannot make distinction between the three levels of abstraction. Instead they think that the view they see is the actual database. Unfortunately, the legislators do not seem be able to avoid that confusion. This makes the legal analysis quite difficult. What is the subject matter of the database protection? Is it the view a user sees or the actual data stored on the physical level or something in between?

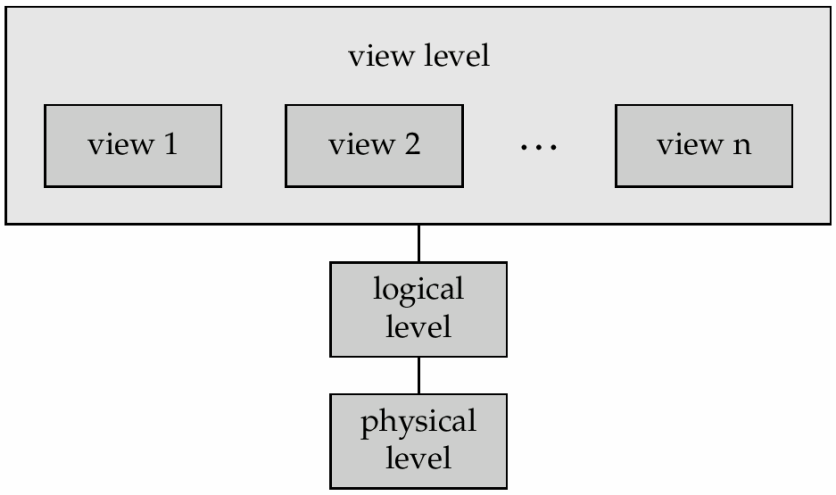

Figure 5. The three levels of a database system. [41]

Let us get back to the legal definition of 'database' in the directive: a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means. I am mostly concerned about the requirement of systematic or methodical arrangement. Let us consider an example. Suppose a group of biologists makes a detailed catalog of natural resources of wildlife and game in a particular area. It takes months to collect, store, and verify the data. The outcome is valuable as the inventory can be used in many studies. However, I find it hard to describe such a list of natural resources "arranged in a systematic or methodical way". To be valuable, the list does not need to be even in alphabetical order. It can be just the Latin names of species in a random order but a user can still analyze the information with a computer. Is that a systematic or methodical way? Hardly. If the sui generis right requires more than trivial arrangement of data then valuable lists – even if they have needed substantial investments – do not gain the right.

In a computer-based system, databases are typically arranged by attaching an index to them. For example, data items can be stored into a database in whatever order they arrive, but a constantly updated index is used to keep the data items in order. This can be done fully automatically so that a user does not see indices and the indexing process at all. The actual data can be completely unarranged. Yet, a user can make queries and the database system software shows results arranged as the user wants. This representation does not necessarily have anything to do with the actual arrangement or unarrangement of data in the database. An index is meant to increase the performance of a database system so that frequent queries can be completed rapidly.

However, indices are usually not mandatory. A database system can be fully functional, only somewhat slower, without indices. The same queries can be carried out by the system with or without indices. Usually, there is no use to optimize infrequent queries using indices, but it is still possible to carry them out. If there are no indices or no index is useful for a certain query, the system must at worst go through each data item to decide whether it matches the query. This takes computing power and time, but it does not affect the results.

> For example, it could be possible to display all the Latin names of the species in an inventory that include letter 'u' and sort them in the alphabetical order. The outcome would look like the data in the database were in order or at least properly indexed, but in fact it does not tell anything about the arrangement. A similar outcome can be displayed even if the database is completely unarranged using only computer's brute force to complete the query.

What is valuable in databases? What need to be protected? Certainly individual data items can be valuable, but as discussed earlier, they should not be protected as such in general. Instead, it can make a lot of sense to protect large investments that are needed to obtain, to verify, and to present the contents of the database. The sui generis right should be seen as a legal protection of certain large investments. From this point of view, the arrangement of a database is not essential; it does not necessarily need to be included in the definition of 'database', although a significant investment in arranging data can help to achieve the sui generis right.

The requirement that the data items are individually accessible is also problematic. It seems to refer to that the items in the database are distinct in a way that they can be found and accessed independent from others. However, there is a difference what in principle would be possible for a computer program to find and access on the database system level and what in practice is possible for a user based on the decisions that the database designer has made.

From the legal point of view, it would make sense to emphasize the user view point, but then the sui generis right would depend quite randomly on – for example – usability or security requirements. Typically it is neither possible nor reasonable to give users access to all individual data items.

> Nordic countries, Finland, Denmark, Iceland, Norway, and Sweden, have also another neighboring right called *catalogue right*. According to Finnish Copyright Act, a catalog, table or program, or any other production in which a large quantity of data are compiled, shall not be reproduced without the consent of the producer. A program in this context does not mean a computer program, but more like a schedule of activities. The catalogue right does not require that data are arranged in a certain way or that data items are individually accessible. The only requirement is that the quantity of compiled data is large. This approach seems to avoid many problems described above, but – as mentioned – the catalogue right is available only in a few countries. Also, the catalogue right does not require investment. Therefore, it is arguably sometimes too easy to get the catalogue right. A better solution might be a kind of combination of database sui generis right and catalogue right, that is, a sui generis right that requires investment, but does not define database too strictly. [24, 37, 96]

To conclude, the definition of 'database' in the directive is questionable. It is hard to tell on which level of abstraction both arrangement and individual access refer to. Therefore they should not be given noteworthy meaning. Instead, the requirement of significant investment is very important. Parallel to originality, novelty and non-obviousness, distinctiveness, and so on, it adds a vital new area of subject matter into the field of intellectual properties. [60]

In Figure 2 above, I have illustrated how the levels of abstraction related to intangible objects affects legal protection. The question arises, does database protection fit into the picture and on which level it would be. Obviously, the database sui generis right has a significant extra dimension – investment – that is not shown in the Figure 2. Therefore the sui generis right may protect databases on the several levels of abstraction. However, we can still exclude some of the levels.

The database sui generis right does not protect physical medium. If an appliance that is used to store a database is stolen, the thief does not infringe the database right, but violates the ownership.

How about data? Does the database right protect the bits or the representation in a binary form? No, it does not. Suppose one has a protected database in an IBM mainframe system. If the database is transferred into a UNIX or an MS Windows system, it is possible that the binary representation needs to be changed. For example, letter *x* in IBM's EBCDIC code is represented as the binary string *10100111* while in ASCII code, *x* is *01111000*. The indices are probably regenerated. It is possible that most bits are changed while transferring a database from one system to another. Yet, the database right remains untouched – both the original database and the transferred version are protected alike, or from the database right view point, the two databases are the same. Therefore, the database right is not related to data either.

Instead, it is related to information. That is, the contents of a protected database need to have some meaning. On the other hand, the database right does not protect the information or the meaning itself but – as described earlier – the large investments that are needed to obtain, to verify, and to present the information.

The sui generis right provides the maker of a database with the right to prevent extraction and/or re-utilization of the whole or of a substantial part, evaluated qualitatively and/or quantitatively, of the contents of that database. [93] Although individual data items in a database are not protected by the sui generis right, not only the database as a whole is protected but also a substantial part thereof.

What is a substantial part? As suggested above, the most important qualification for the sui generis right is significant investment. Therefore, to judge what is substantial, the amount of investment should again be considered. If the investment needed to make a part of a database is significant, that is, if the part alone could be considered to gain the sui generis protection in case it were a separate database, then the part is a substantial part and its extraction and re-utilization without consent is prohibited.

So, the sui generis database right requires substantial investment. The investment must be in obtaining, verifying or presenting the contents of the database. If the investment is aimed at something else, it does not constitute the database right. This is illustrated by *spin-off* doctrine that is especially popular in some courts in the Netherlands. For example, a television program listing, a real-estate listing, and a headlines listing were not databases according to Dutch courts, but merely spin-off products of other activities. On the other hand, Dutch courts have several times held that telephone catalogues and subscriber data are databases. [33] The logic here is not quite clear: it seems that telephone catalogues and subscriber data do require investments, but they are mainly outcome of other activities, namely marketing, customer recruitment, customer service, and the necessary information collection. How large a part of the investment is accomplished just for the catalogues? Probably usually quite small although it is obviously possible to develop a database on subscriber information that needs a lot of investments. As suggested above, the database sui generis right should protect specifically investments in databases. Therefore, it does not make sense to count investments in other activities. Therefore the spin-off doctrine in general is acceptable, but maybe not quite mature enough yet.

PATENTS

A patent gives an exclusive right to exploit an invention commercially. In principle, patents are granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application. An invention can be a product or a process that provides a new way of doing something, or offers a new technical solution to a problem. The invention cannot be commercially made, used, distributed or sold without the patent owner's consent. Patent is limited to a specific period of time – usually for a maximum of around 17 to 20 years – and to a certain territory – usually to a country.

International treaties have harmonized national patent laws worldwide, although some differences still exist. Most of the dissimilarities, however, are only formal and do not affect patenting in practice. For example, in the USA a patentable invention must be novel, useful, and nonobvious while in Europe an invention should be new, involve an inventive step and be susceptible of industrial application. [43, 49, 50, 73, 76, 90, 98] Nevertheless, sometimes disparities in development may lead to incompatibilities between jurisdictions.

Patent protects information on a higher level of abstraction than for example copyright (see Figure 2 above). In general, a patent protects an idea reduced to practice. That is, it does not protect totally abstract ideas nor only new implementations or expressions of ideas. It does not protect mere data or investments either.

Patents do not appear automatically; they have to be applied for. It is actually quite a laborious and expensive process to get a patent. A patent application normally contains the title of the invention and an indication of the technical field. It also includes the background and a description of the invention, in such a clear and detailed way that others could use or reproduce the invention. Drawings and other visualizations often help to describe the invention. The application also contains various claims that determine the extent of protection granted by the patent.

The patent rights can be enforced in a court, which holds the authority to stop patent infringement and award damages to the patent owner. On the other hand, a court can also declare a patent invalid if a third party has successfully challenged it. A patent infringement suit in a court can be very expensive. Therefore the threat of trial is often enough to force the parties to negotiate and cases are frequently settled outside the courts.

As mentioned above, to be patentable, the invention must be novel. In other words, there needs to be some new characteristic which is not known in the body of existing knowledge in its technical field. This body of existing knowledge is called *prior art*. The invention must also show an inventive step. Finally, the subject matter must be patentable under law. In many countries, discoveries, scientific theories, mathematical methods, aesthetic creations, plant or animal varieties, discoveries of natural substances, schemes, rules, methods for performing mental acts, playing games or doing business, and methods for medical treatment are not patentable.

The patent system is supposed to promote inventions and industrial advances. Arguably, patents provide incentives to individuals by offering them recognition and material reward for their inventions. These incentives should encourage innovation. It is however questionable, how well the patent system actually achieves that goal. Currently, it is valuable for especially large companies to have an extensive patent portfolio that can be traded with other companies. On the other hand, smaller companies are often required to apply for patents because many venture capitalists and potential acquisitiors believe that patents as such add value to a company. Patents are also often used as a marketing and brand-building tool to give a high-tech impression of a company. Do any of these motivations to apply for a patent really require the patent to be issued? Actually, for many companies, it is enough to file an application. A pending patent already brings all the benefits the company is seeking. It seems that the lawmakers' idea of issued patents protecting certain useful technological inventions is giving way to a number of other ways to benefit from the patent system.

For years, there has been a lively discussion about the patentability of computer programs. Previously, programs were likened to mathematical methods, mental acts or games, and thus not patentable. However, case by case, these limitations have crumbled away. The United States has led the development, but the rest of the world is following. The United States Supreme Court had decided in 1972 that programs are not patentable [105]. However, often cited as a US landmark case, *In re Alappat* [106] effectively brought programs into the field of patentable subject matter. In 1998 the Federal Circuit unambiguously permitted patents on "pure" software. [40] Moreover, U.S. Patent and Trademark Office (USPTO) has recently begun to issue Internet business method patents [e.g. 101, 102, 103]. In my opinion, it was not that much of a policy change, but the realization of the fact that none of the artificial boundaries that were supposed to prevent patenting programs were actually justified. It was realized that computer programs are not that different from machines and other patentable subject matter. The logical conclusion was that programs must be patentable with the same prerequisites as other inventions. The development went even further: in *State Street Bank* [110] court found that business methods are also patentable. This caused a huge boom of patenting business methods related to electronic commerce. The European Union has followed the USA. Although the European Patents Convention (EPC) still states that programs *as such* are not patentable inventions, in practice computer programs are largely patentable in Europe and discussion about patenting business methods is lively. Similar development is ongoing around the world. [24, 31, 37, 43, 49, 50, 73, 76]

To me, this is not the end. The current boundaries of patentable subject matter will also be found artificial and the area will extend and extend. It seems that any natural borders cannot be found. Of course, lawmakers can build statutory limits and declare that nothing outside this area is patentable.

This however is not satisfying if the boundaries are in more or less arbitrary positions. On the other hand, if the development may continue, the patent system will eventually collapse. To avoid these problems, whole the patent system should be revised. The new technologies have introduced new kind of inventions. It is an important policy issue to go through the fundamentals of the patent system and see if more than a century old primaries should be reconsidered.

INTELLECTUAL PROPERTY RIGHTS IN SOFTWARE

Most information products nowadays are produced and used with help of computer programs. Many of them – especially multimedia products and games – even include programs. Therefore I am briefly discussing about intellectual property rights in computer programs.

Copyright has been the most important legal tool to protect computer software, although until the 1980s, it was largely unclear if copyright protected computer programs. Many organizations were lobbying on behalf of *sui generis* protection. That is, they wanted to develop a special legal protection that would take care of the special characteristics of the computer programs. In the 1980s however, many legislators acknowledged that copyright should be the way to legally protect computer programs. In the U.S., the Copyright Act was amended to specify that computer programs are within copyrightable subject matter. In European Union, the Council adopted a directive according to which the member states protect computer programs by copyright, as literary works within the meaning of the Berne Convention. [40, 49, 88, 91, 97]

In the last few years, many software companies especially in the USA have begun extensive patenting to gain a better strategic position among competitors. They are now using patents as the primary means for legally protecting their software. As described above, in the 1980s and 1990s US courts and USPTO gradually changed the rule. Therefore more and more inventions related to, for example, multimedia or Internet applications are within patentable subject matter.

This development has also been widely criticized. It seems that sometimes patents are issued too easily without proper examination. Also it is not clear in general that patents are the best way to promote inventions and industrial development. [e.g. 2, 49, 50, 68] In Europe, copyright has still kept its dominant position in contents and software industries, but also there, a lively discussion on software and Internet patents is going on. Despite the shortcomings, it seems obvious that patents are becoming increasingly important.

Most people probably agree that the valuable parts of computer programs should get adequate legal protection. The proper means to protect programs depend on what we believe is valuable in them, which is a very difficult question to answer.

In their highly respected Manifesto [71] *Samuelson*, *Davis*, *Kapor*, and *Reichman* discuss about intellectual property rights related to computer software. Although it was written several years ago, the Manifesto is still very timely and addresses clearly the problems that are topical. They try to perceive among other things what makes a computer program valuable. Their arguments are very strong and profound. However, a couple of questions presented in the Manifesto need some consideration.

Samuelson et al are trying to reach the inner nature of computer programs by saying that "programs behave" and what is valuable in a program is not its textual representation but its behavior. The computer is a very complex system. When we try to understand how the computer works, we need to simplify it somehow. It is often helpful, if we are able to kind of visualize it in mind in some way or another. However, there is a great danger that we oversimplify complex issues or that we left out something important from our picture. That may lead us to wrong results.

'Software' and 'program' are very difficult and ambiguous concepts. For example, when we say that "we are using word processor program" we do not mean that we use the set of instructions or statements that form a program. We are not speaking of the computer system as a whole either, because we can run many programs in a computer at the same time. Instead we refer to an abstract machine, in this case to a kind of imaginary typewriter. For example, word processors usually implement a kind of paper metaphor: a white rectangle or "a sheet of paper" is displayed on the screen and black letters are "printed" on it. This creates an illusion that the user is actually writing on paper.

As *Soininen* points out, an observer without source code or other documentation experiences a program mainly through a user-interface or through the functions that the program carries out. [76] For such an observer, it is quite natural to say that a program itself behaves. To define a program as an imaginary machine in this way is quite acceptable. However, it should be noted that this definition is different from the one above (see *Definitions* page 13). An imaginary machine is not a set of instructions or statements, but system behavior that a user experiences. A common mistake is to mix up these definitions and base an analysis on a wrong definition. If programs are sets of instructions or statements, they should be analyzed as such. On the other hand, if we referred to users' experiences and imaginary machines, it would be satisfactory to analyze their behavior, but the legal analysis of such concepts would make little sense.

The way a computer system normally works is that a processor reads program code, i.e. instructions one by one, and acts according to them. A program is usually quite a static set of instructions or statements. Albeit there are so-called self-modifying programs, the instructions do not usually change during the execution of the code. Instead, processing a program makes hardware act in a certain way, which in turn may change data in one way or another. Therefore, we should say "a program is a set of instructions or statements that make a system as a whole behave in a certain way" instead of saying that a program itself behaves. Thus programs are in fact merely text.

However, I do agree that behavior is valuable, not the text. Or, like *Messerschmitt and Szyperski* put it, "software informs a computer (rather than a person) by giving it instructions that determine its behavior. Whereas information embodies no behavior, the primary value of software is derived from the behavior it invokes; that is what it causes a computer to *do* on behalf of a user, and various aspects of how well it does those things." [51] Software is not valuable as such but as a part of a system. It could be compared to a steering wheel, which is not very valuable without a car, but which has a lot of value as a part of a vehicle.

Samuelson et al also compare programs to machines. I agree that software and machines have a lot in common. Especially, the complexity, the requirements of interoperability as well as building programs by assembling functional elements make software and machines similar. Nevertheless, it is hard to think that text is a medium of creation while in books, for example, text is the artifact created. To me, it is more logical to say that text is always an artifact that is created in a medium, whether the medium is paper, a disk, or electronic signals. The artifact, i.e. the text, then may cause something else to behave somehow. For instance, a book may cause me to laugh, a contract may cause me to fulfill my obligations, and a computer program may cause a computer system to process its input in a certain way.

As mentioned previously, useful articles are only seldom copyrightable. Computer programs are usually meant to be useful. Therefore one could expect that computer programs need to be especially creative in order to be copyrighted. However, this is not the case. In many countries, the level of creativity needed to copyright a computer program is especially low. [23] To me, this is only illustrating the fact that there is something fundamentally wrong in the legal protection of computer programs and that the current solutions – copyright, patent, and so on – do not easily fit to programs but they need to be compelled to give protection.

The main shape of legal protection for information technology is nowadays fairly clear. Copyright is protecting software and contents. Most entities do not think it is acceptable in general to make copies of programs and other works without permission. Patents protect hardware as well as innovative processes and structures in programs. [40]

Open source software development is gaining more popularity. It challenges traditional ideas on how strong intellectual property rights promote development. The supporters of open software movement do not want to restrict the copying and modifying their programs. They are still willing to develop software although anybody can copy, change and use it freely. Even if one does not believe that the open source model will dominate in the future, it certainly shows that strong intellectual property rights are not the only way to solve the legal questions about software.

I conclude that copyright is actually a reasonable way to protect the textual parts of a computer system, i.e. programs. Then again, the real value of a system is not in the text but in the behavior that is not protected by copyright. This in turn leads us to think if – for example – patents would be a better means to protect the real valuable parts of computer systems.

Having said that, I am not endorsing the current practice of patenting everything. Instead, I suggest that ideally a better system should be developed considering what is actually valuable and worth protecting. Maybe software legal protection could benefit from a similar sui generis right that is now protecting databases in Europe. After all, most computer programs probably do not include such novel and non-obvious ideas that they would earn patent protection. And even if a part of a program is patentable, the rest of the program remains unprotected. Instead, it is often very laborious to build a useful program and therefore legal protection for investments - like the database sui generis right – might be the best way to protect what is actually valuable. I do understand that developing a new international legal protection system is not an easy or a quick job. However, the current system has so many flaws that sooner or later it should be fixed.

INTELLECTUAL PROPERTY RIGHTS IN METADATA

In general, intellectual property rights protect the content of an information product and related computer programs. On the other hand, the metadata of an information product is usually not protected. By and large, metadata consists of facts, definitions, identifiers, and so on. If it is organized in an original way, metadata might be copyrightable as a whole, but usually information items within metadata are not copyrightable expressions of creative work. Typically, but not without exceptions, there have not been such substantial investments in metadata that would entitle to the database right. Especially methods of processing metadata can be patentable, but not metadata itself.

In some cases, however, parts of metadata can be legally protected. For example, based on Article 12 of the WIPO Copyright Treaty [148], many countries have changed their copyright laws so that it is now illegal "to remove or alter any electronic rights management information without authority". Trademarks can also protect parts of metadata and, arguably, some metadata could be claimed as trade secrets.

CONTRACTS

Contracts are the primary legal means to manage rights in information products within bilateral relationships. If two entities know each other and are willing to commit to certain terms and conditions, according to contracting freedom, they are free to agree on issues extensively. On the other hand, however, contracts do not bind outsiders: contracting parties cannot in general give obligations to third parties. Also, especially on the Mobile Internet, it may sometimes be difficult to identify the contracting parties and be sure what the terms and conditions are. The mandatory laws can limit the contracting freedom furthermore. Therefore, the contracts do not always bind the contracting parties either. Instead, laws are required to define the legal framework to control issues that are not governed by contracts.

In many cases, contracts can extend legal rights. For example, copyright law provides right's owner with certain statutory rights. However, in a contractual relation, the parties can agree that they have more rights than defined by the law. Say, according to a contract, an author might have a right to proclaim authorship or a publisher could restrict redistribution even if the legal system did not ensure it.

Hugenholtz claims that "prima facie, contract law has all the makings of a perfect alternative to copyright protection. The structure of the Internet facilitates the establishment of a multitude of contractual relationships between information producers and end users, either directly or through intermediaries. The Internet (or more precisely, the World Wide Web) is uniquely suited for this purpose. Both its 'textual' environment and its interactive nature are ideal conditions for a contractual culture to grow and flourish. Contract law, thus, may become the instrument par excellence to fill the legal vacuum of the Internet. Information producers, intermediaries and end users are free to create their own rules, without government intervention, and to experiment at will with novel legal approaches. Ideally, new legal norms may emerge from this self-regulatory laboratory; norms far better tailored to the new environment of the Internet." [31]

Hugenholtz lists a number of doubts about Internet contracts. He is afraid that weaker parties risk being subjugated and fundamental freedoms may be jeopardised if most relations are governed by contracts, not laws. He also raises question about validity of so called 'click-through', 'mouse-click' or 'click-wrap' contracts. [31]

Further, *Hugenholtz* asks whether the terms of user licenses can override the statutory limitations of copyright. [31] Actually, it may be difficult to get round mandatory laws using contracts, but many rules are not mandatory and there are many potential claims and relations that laws do not say anything. It seems quite clear that it is largely possible to extend intellectual property rights in contract terms. For instance, in a license agreement, a licensor and a licensee can agree that the licensor has rights that are not stated in the law. That kind of an agreement is normally binding and enforceable between the contracting parties. It seems that these agreed intellectual property rights are becoming quite common and significant.

ECONOMIC VIEWPOINTS

INTRODUCTION

Intellectual property rights are intended to protect what is valuable in intangible objects. In general, the intangible objects consist of information. Some of them, especially works of art, might have essential elements that are hard to be described just as information. For instance, invaluable emotions and experiences that are shared with others with the aid of aesthetic objects, the works of art can hardly be called information. Yet the emotions and experiences are shared using information. Thus, with these limitations in mind, I am concentrating on the legal protection of information. In this chapter I am trying to elucidate what is valuable in information products from the economic point of view and how rights management can affect it.

SCARCE INFORMATION

What makes information valuable? First of all, to be economically valuable the information must be somehow *scarce*. The concept of scarceness includes that a commodity is both limited and needed. Exclusive rights in information no one wants are worth little. Information can be limited for several reasons: it might be due to the costs of production, reproduction, or transaction. Figure 6 elucidates how different factors affect scarcity.

The production of information, that is bringing certain information into existence, can be costly for many reasons. For example, information may be about a new idea that is hard to invent. Or it can be difficult to express the idea in a way that it fulfills the demand of the potential users. Or, it can be laborious to build a new collection of existing information: in terms of the database sui generis right, the obtaining, verification or presentation of the information may require substantial investments.

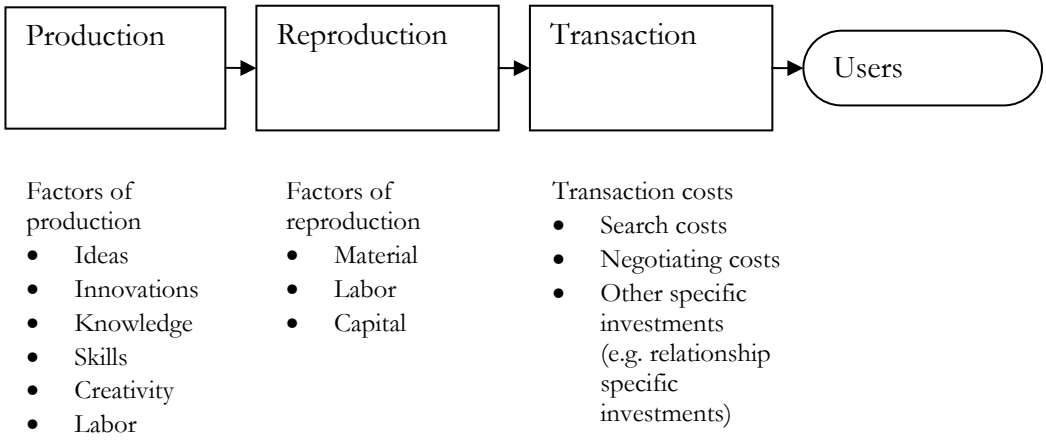

Figure 6. Sources of scarcity related to information products.

As examples, let us consider a couple of different information products that can be valuable. First, after a hard research work that also demands a lot of knowledge an engineer comes up with a new idea about a better way to manufacture a certain appliance. Information about that innovation is demanded, because companies that produce those appliances can save money and improve the quality of their products by using the innovation. At the first place, only the inventor, the engineer, knows about the invention, which makes the information very scarce for the others. The information is therefore valuable.

The second example is a textbook about a method to manufacture a certain appliance. The writer has not invented that method. In fact the method is already fully described in a scientific article that is publicly available, but the article is quite theoretical and hard to understand. The writer of the textbook explains the method clearly and carefully. After reading the book, a professional can easily use the method. In this case, some information about the method is freely available, but the free information does not fulfill the demand. Instead the better expression of the same ideas is more demanded. If the textbook is not freely available, it is a scarce resource of information and thus valuable.

The third example is a collection of descriptions of known methods to manufacture a certain appliance. If there is a large number of those methods, collecting their descriptions may be difficult even though nothing new is invented or expressed. The large amount of work needed to obtain the information, to verify it is correct, and to present it properly makes the information scarce.

The modern information technology has made the reproduction or copying of information goods very inexpensive. Especially, information in digital form can be copied with very low costs. Usually only a little material, labor, and capital is needed to reproduce information. However, from customers' viewpoint, reproduction can be costly if it is restricted by technical or legal protection. For example, to make an unauthorized copy of an information product that is protected by a technical protection system may require a lot of work and expensive apparatus. On the other hand, making an illegal copy of an information product that is legally protected poses the risk of severe reimbursement. Therefore unauthorized reproduction is not necessarily as inexpensive as it may seem and the means of protection can be used to manage the scarcity and the value of information.

The other way to analyze the value of information is to examine the demand side. Several factors have effect on the demand. *Shapiro and Varian* [75] as well as *Messerschmitt and Szyperski* [51] have published excellent dissections.

One of the most important factors on the demand side is *network effect*. The more users an information product has, the more appealing it is for new users. The other important factor is *lock-in effect*. After somebody has started to use an information product it can be very expensive to replace that product with another. [51, 75]

Transaction costs include search costs, negotiating costs, and other specific investments. They may have significant effect on the total costs of acquiring an information product. Rights management can affect transaction costs. Rights management technical tools can, for example, enable a permanent connection between a service provider and a user. This can make it easier to find information products from the same provider and automate the negotiating process thus decreasing the search and negotiating costs. On the other hand, the same tools can also be used to increase transaction costs if a user is willing to procure services from another service provider: rights management tools can strengthen the lock-in effect.

GENERAL VALUE CHAIN

According to *Timmers,* a business model is an architecture for product, service, and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for various business actors; and a description of the sources revenues. Also, according to Timmers, a systematic approach to identifying architectures for business models can be based on value-chain deconstruction and reconstruction – that is, identifying value chain elements – and identifying possible ways of integrating information along the value chain. [84]

To add value and to deliver information products to end-users, entities need working business models and value chains. However, the suitable business models may be quite different for various information products. For instance, the music industry and the publishing industry have traditionally used quite different models.

In figure 7, a sample general value chain is illustrated. Note that infrastructure providers are not shown. For example, operators that merely provide access to communication networks, seem to be sinking into the infrastructure. Their income will probably be more and more based on fixed fees – e.g. monthly service fees – and they are not able to charge for each information product they transmit. Their business models are based on effective production and economies of scale while an actor in a key position along the value chain may charge a remarkable share of the price of each product.

The figure shows a number of actors. In general it is hard to build that long a value chain that is also profitable. At least, transaction costs rise too much. Instead, an actual business model is usually based on few actors. Computer networks and electronic delivery can be used to reduce links in the chain. Each of the actors in a chain includes several links. For example, a publisher can also be an editor, an aggregator, and a filterer. It is important for an actor to understand its business model and position in a value chain.

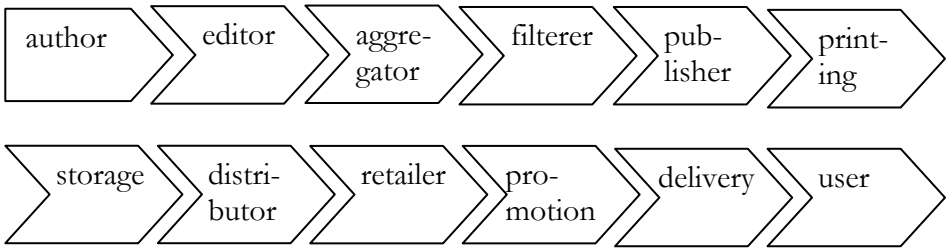

Figure 7. A sample value chain related to digital information product.

FUTURE TRENDS

The fast pace of technological progress makes people often forget that the laws of economics do not change easily. [75] Yet, economic attributes do not alone determine the future, but they have a crucial role in the reality where financial and other organizational decisions are made to selectively support different technologies. Therefore, I try to map the key economic attributes. The first three of them describe entities and the rest three describe their economic environment. [61]

The *dynamic capabilities* of the entity become more important. In firms, this means strong change culture through specialized scope and focus on innovative niche products and markets. Second, the *resources* become more *intangible*. Rights in them are limited and fuzzy and therefore call into attention new methods for intellectual asset management. Intangibles may be turned into value not only through traditional income from licensing and sales but also from strategic positioning. Entities use more efficient licensing strategies based on detailed product differentiation. Third, organizational entities and internal processes become more integrated with *low hierarchy*. This change can be described as a shift from vertical bureaucracies to flexible horizontal entities. The lifetime of a low hierarchy may be very short as new kinds of ad-hoc hierarchies emerge for specific purposes. [61, 75]

On the environment level, mainly on the markets, *network economics* and network effects are perhaps the most determinant attributes. Firms tie alliances, partnerships and joint ventures for strong external relations. Products and services that rely on demand side economies of scale turn out to be the winning ones.

Second, *lock-in* has become a key term in describing information economy. Most profitable products are those that can be turned into long-term services. Lock-in situations are self-feeding since as the other party knows more of the other, the information exchange can be further tailored according to the needs of the parties.

Third, the networked economy strengthens the importance of *branding*. For many new products and services it is crucial to get public attention and recognition among users. Holder of a strong brand may also franchise or license it to enable growth in new markets. Brands break ground in the society at large; brand marketing is getting closer to culture and culture to marketing. Sports, music and movies are already commodified into brands. On the other hand, existing brands do not automatically guarantee success on the digital environment. [61]

TECHNOLOGICAL ADVANCES

INTRODUCTION

This thesis is about rights management on the future networks. To find out what will those future networks look like, it is necessary to try to draw a picture on the future. There, technologies have an important role as enablers. However, it should be noted that technologies do not determine the future; they just enable many kinds of different futures. Completely other factors determine which one of those possible futures will actually come true. On the other hand, those other factors, like economy and society at large, also affect technological development. Like *Rosenberg* has shown, technological change does not occur inside a black box, but in close interaction with the other fields of society [67].

It should be also noted that technological development is not so much about significant, separate inventions, but continuous evolution. Although it is typical in public to pay attention to certain heroic individuals or remarkable technical inventions that seem to have had significant impact on a certain technology, it would usually be more adequate to see them as a part of on-going evolution [7]. Therefore, though I am presenting in the following some specific technologies or even inventions, they are just to represent the technological development. I am not trying to describe any technology in detail. Merely, I am attempting to give an overview picture on what kind of technologies affect this area.

LAYER MODELS

It is often useful to illustrate computer communication using layer models. For example, OSI reference model is divided into seven layers, and the Internet TCP/IP model is also layered. On the bottom of those models, below the first layer, is the physical medium, like cable. Above the layers are applications that send and receive messages. Each layer takes care of some important part of communication. Figure 8 below summarizes the two common models. It is not necessary to go into details of these models. From this theses point of view, however, layered models are helpful to clarify that the Internet is very different on different layers or viewpoints. The layers hide their technical details from each other. For example, in principle, higher layers do not need to know what the physical medium is, because the lowermost layer hides it from the others. Therefore upper layers do not need to change their behavior even if the physical medium is changed. On the other hand, the lower layers do not need to care what applications are using the network connection, because the upper layers hide that information.

Let us consider an example. If a user wants to browse certain web pages, the browser software sends a request to the web server in HTTP protocol. This protocol is on the higher layer of TCP/IP model as shown in the figure. The protocols on the lower layers take care of the actual data transfer. Therefore neither the browser nor the web server needs to care about the physical medium. The fact that the user may have an Ethernet or a modem connection through the wired network to the server or a mobile terminal device that accesses the Internet using GSM network is hidden from HTTP protocol, the web server, and the browser. Mobility, in this case, does not require any changes on the higher levels of the model. As a matter of fact, it seems that in most cases, the mobility can be hidden on the lower layers and it does not need to affect services.

On the other hand, some services themselves change their behavior depending on the mobility of users. For example, an office application, like a word processor or a calendar, might provide an end-user with different kind of services depending on whether the user is sitting behind a desk and using a powerful computer with broadband network access or whether the user is hiking on a mountain carrying only a small mobile device and having only a slow wireless network access. A weather service application could behave differently depending on user's location and the weather data available on that area. Also, the mobility may have, for example, legal implications that force service developers build their services so that they are legal also when users are moving. For example, if a user moves from one country to another, the service should keep track that it complies with territorial laws and agreements all the time.

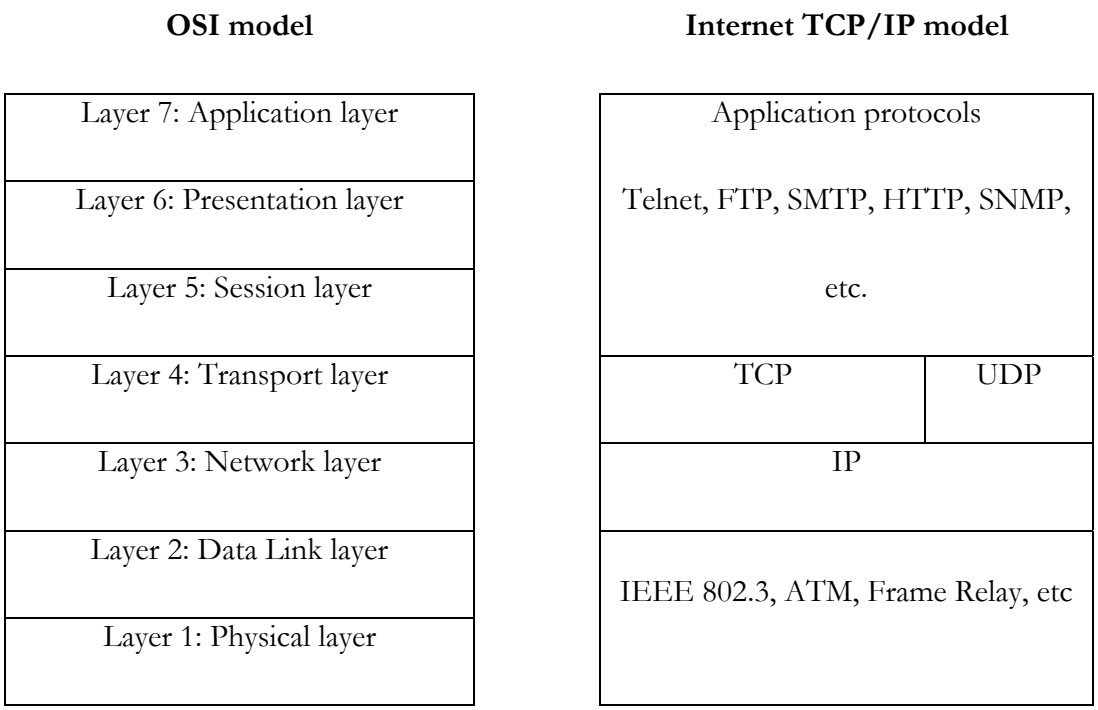

Figure 8. OSI model and Internet TCP/IP model compared according to Karila *[129]*

MOBILE NETWORK

The Mobile Internet is the future computer network to which the end-users connect largely using mobile, wireless appliances. It should be emphasized that the concept is not well defined. Both the terms *mobile* and the *Internet* are ambiguous. Therefore I do not try to draw strict borders around the Mobile Internet, but I merely describe essential characteristics of the concept to name the research domain.

The meaning of mobility depends on whether we see the Internet through a service level or an underlying protocol level. On the protocol level, a significant property of mobility is that the access point is not fixed. The point in which a terminal logically accesses the Internet varies. Therefore packet routing to a mobile terminal on the protocol level needs to be dynamic and it may change during the communication. Obviously, challenges to protocols, routing mechanisms, and naming conventions are remarkable. This viewpoint does not necessarily imply that the terminal should be wireless or portable.

On the service level, however, the word mobile refers to users' ability to move around while using the Internet. The term *nomadic*, on the other hand, sometimes refers to users' ability to connect to the Internet in different places, but not necessarily move while they use the Internet. For example, a laptop computer that is connected to the Internet using a modem, a cord, and a telephone line is a nomadic device. A nomadic device does not need to be wireless. Instead, mobile end-user terminal devices in practice must be wireless and portable. The focus in this thesis, digital rights management on the Mobile Internet, is mainly related to the service level. Therefore, I emphasize the wireless and portable properties of terminal devices. Some of the issues however will refer also to the protocol levels.

The network itself and many end-user devices will remain wired. In the foreseeable future, wireless bandwidth will not achieve the orders of magnitude that are already available with wired connections. Therefore, the backbone network as well as all those connections that need very large capacities will not be wireless. Instead, wireless connections will be common where the very large bandwidth is not essential and where end-users benefit from the ability to carry network devices with them while they move.

The *Internet* is a computer network system that combines many smaller networks. It is the global network of networks. It is based on a common addressing system and communications protocol called TCP/IP (Transmission Control Protocol/Internet Protocol). The Internet is very large connecting hundreds of millions of computers and users around the world. There are many ways to define what the Internet is. Some technical definitions provide an unambiguous and clear description, which nonetheless are not suitable for our purposes. For example, I cannot leave some networks, appliances, and services out of this study just because they are based on, say, some exceptional communications protocol. From the rights management point of view, it is necessary to concentrate on how users, service providers, and other high-level actors realize the Internet, and pay less attention to the technical details.

From this thesis' point of view, there are some important attributes that describe the Internet.

First, there are several widely used services on the Internet. Especially, the World Wide Web (WWW), electronic mail, and file transfer and sharing mechanisms seem to be very popular today. It is hard to call for example a computer an Internet device, if one cannot access most of the public WWW pages, e-mail system, and at least some file transfer possibilities using that computer. Therefore I consider an access to those services an essential part of the Internet.

Second, the Internet services are usually more or less interactive. In order for something to be called the Internet, it needs to be possible for the user to be able to interact with the services. Also, the Internet is a computer network, which means that the computers communicate with each other online. They are usually simultaneously connected to the Internet. It is however quite typical that, for example due to some technical error, a terminal device is temporarily unconnected. Many computers are nowadays connected to the Internet using modems that are not always on. On the Mobile Internet for a long time there will be geographical areas that are not covered by wireless networks. If a user travels through such an area, the terminal device will not be connected to the Internet there. Therefore, even if a terminal device is switched on and the user wants to access some service on the Internet, the connection is not always possible. I still want to call that sort of device an Internet terminal device. A continuous online access is not a criterion for the Internet. Yet an Internet device should have online access to the Internet services often enough and preferably it should have some features to support offline usage of the Internet services, like drafting e-mail messages without connection.

On the Mobile Internet, the user switches between access points and is often even disconnected. However, the illusion of continuous service should be maintained. This requires new infrastructural properties on the network. When the user is online, these properties should help to deliver the best possible quality of service adapted in accordance with the user's profile and the physical context. The network would try to predict which services the user is going to request next. While the user is offline, these properties would manage the user-information and make it available for the proper services and for them only. If we for example travel from San Jose, California to Helsinki, Finland, the network would prepare for the evident data replication at Helsinki airport by pushing the user-information into a nearby server in Helsinki.

Third, the Internet is quite an *open* network. Open means that the Internet specifications and standards are publicly available so that anyone can build new hardware, software, and services to be used on the Internet. Also, it means that the Internet is publicly available. Not everybody has possibilities to buy the necessary devices and an access to the Internet, and some countries or jurisdictions have severe restrictions to the usage of the Internet. Still, in general, the Internet is largely available, and it is not required to be for example a member of a certain organization to get the access.

OPEN, SEMI-OPEN AND CLOSED NETWORKS

It is an essential property of the Internet that the network is open. As discussed above, both the standards and specifications of an open network as well as the network itself are publicly available. A *closed* network in this context, for the sake of comparison, is a network that does not allow its users to connect services outside the network. For instance, a company's local area network (LAN) that is not connected to the Internet at all is closed. It merely provides connections to the other machines and services in the same network.

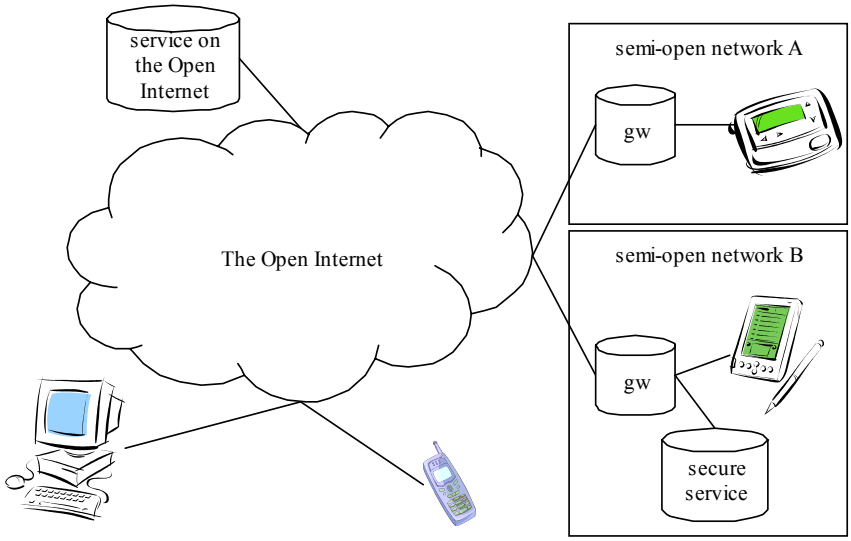

Figure 9. The structure of the open and semi-open Mobile Internet.

Interestingly, there are lots of networks that fall between these two extremes. They are not completely open or closed. Instead, they do provide an access to the services on the Internet, but this access is more or less limited. For example, a user may access only certain services on the Internet. Figure 9 illustrates the overall structure of the Mobile Internet. Often these kinds of semi-open networks are connected to the Internet using some kind of a gateway (*gw*) that allows certain traffic but prevents the other. For example the world's leading Internet access provider America Online, Inc. (AOL) used to be quite closed a network. Yet, it has been opened gradually and today it would be difficult to claim that AOL is not a part of the Internet. [114] In the Mobile Internet, appliances like Palm VII hand-held devices [138], WAP phones [145], and I-mode phones [123] offer a limited access to the Internet based on the access providers' policies. Therefore Palm, WAP, and I-mode networks are typically semi-open networks and in our opinion they provide mobile Internet access. I consider a network a part of the Internet if it is open enough to provide users an access to essential services on the Internet, like e-mail and most of the public WWW pages.

On the other hand, a truly open network is also accessible from outside. A semi-open network, even if it allows its users to freely access the other networks, typically restricts other users' access to its services from outside.

Although open networks are usually desirable, a closed or a semi-open network can offer important advantages. It does not need to use all the standard protocols and tools that often lack important properties like security. Instead, a proprietary protocol, for example, can provide a much higher-level confidentiality, data integrity, and authentication. Closed networks can also offer more sophisticated methods for traffic accounting and invoicing as an example. There will probably exist lots of closed and semi-open networks on the edge of the Internet in the future also.

It should be mentioned that terms open, semi-open, and closed could have different meanings in other contexts. For example depending on the viewpoint, the same network can appear as an open, semi-open, or even closed network. A terminal manufacturer, a network operator, and an end-user may have quite different opinions on whether the network is open or not. In this thesis, I once again emphasize end-users' point of view because the digital rights management questions seem to be most likely to appear on that level.

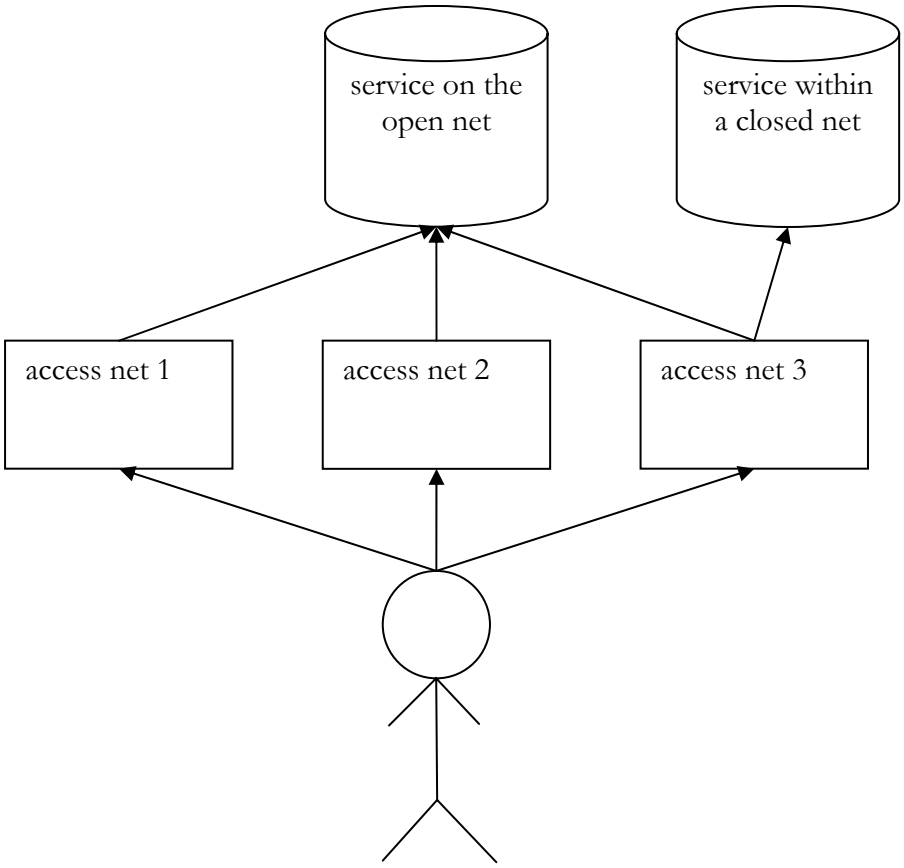

Figure 10. Services through different access devices and networks

Figure 10 illustrates how some services on the open Internet are accessible through many kinds of open and closed networks and using many kinds of terminal devices. On the other hand, some services are available only on a certain closed network that provides for example adequate security and accounting capabilities.

SAMPLE TECHNOLOGIES

It does not make sense to describe all the technologies that are related to the Mobile Internet. Instead, the following is a brief introduction to some of the interesting technologies that have significant impact on rights management on the Mobile Internet.

APPLICATION SERVICE PROVIDER AND PEER-TO-PEER MODELS

At the early phases of information technology, computers were big mainframes. Users accessed them using terminals, which did not have any processing capabilities. All the processing was conducted in central mainframes. Because all the data was stored and processed in a central computer, management issues were typically not very serious. For example, documents were stored in a central archive, they were easy to find, and there were hardly any confusion about versions and access permissions. Programs were easier to develop, because they were generally to work in one environment only. Also, it was rather simple to change or upgrade programs, because the changes were needed to make in only one place. The problems started to emerge after the invention of personal computers. They enabled data processing on every desktop. The programs and data were spread everywhere. After that the management of data integrity, program and document versions, access rights and so on became a nightmare. Each personal computer formed somewhat different computing environment from all the other computers, which make software development as well as maintenance more difficult. Without central management it was hard to find data, keep track of versions, and so on.

The development of the *client/server* model attempted to combine the best parts of centralized and decentralized data processing. Users access data flexibly using their client workstations, but the data is actually stored and managed in a central server. Clients and servers are typically located in different computers that communicate through networks. Software is divided in two parts: client programs that are executed in workstations and server programs executed in servers. Client programs typically offer user interfaces and some processing capabilities while server programs are invisible to users and they carry out most of the processing and provide storage services. The decision what a client should do and what is left to a server is basically a matter of performance. The network between the server and the clients introduces some delays and its capacity may be quite limited. It often makes sense to accomplish those operations in a client that need to response rapidly to users actions. On the other hand, client programs are normally not easier to develop and maintain than personal computer programs in general.

A natural evolution from the client/server model is the *application service provider* (ASP) model. While networks become more efficient it is possible to move more and more on the server side without compromising system's performance. In the ASP model everything but the basic user interface is initially located in a server. For example, normal office applications such as calendars, e-mail, and word processing, can be provided as services. Users do not need to install any applications. They only need a computer with adequate network capabilities and a browser program. If some specific programs are needed in the client computer, they are loaded dynamically from the server while the service is used. This is much less demanding for a computer. Therefore more inexpensive hardware could be used as client machines. ASP services are expected to become an important alternative, not only for smaller companies with low budgets for information technology, but also for larger companies as a form of outsourcing and for many services for individuals as well [143]. Ultimately, however, ASP companies could largely replace the shrink-wrap software product industry.

Peer-to-peer or *P2P* is a type of transient Internet network that allows a group of computer users with the same networking program to connect with each other and directly access data and resources in one another's computers. Users can for example share files or spare computer cycles, which makes network a huge distributed computer. P2P technologies include peer group collaboration, distributed content sharing, peer group file sharing, peer resource discovery, and peer access and control. [12, 38, 143] According to *Kilmer*, "P2P applications can be one-to-one (1to1), where the client owner accesses client information or capability from a distance (wired or wireless); one-to-many (1toM), where some specific group can access a service available within a client; or many-to-many (MtoM), where anyone can access the client. The most common P2P application, content sharing falls into the MtoM category, and will not translate well to wireless until third-generation networks can provide sufficient bandwidth." [38] In its pure form, P2P networks do not have servers and clients, but the user terminals or the edge devices act as more or less equal peers.

ASP model will probably be quite important on the Mobile Internet. Mobile devices will not have storage capacity and computing power to run locally all the software and services that the users will need. Therefore it will be important to divide applications so that only the minimal part of it is in a terminal device and the rest is kept in servers on the network. On the other hand, P2P model is gaining increasing popularity. As suggested below, we will probably see combinations of these two models: basic information and resources will be shared in a P2P fashion, but some value added services will be provided in accordance with ASP model.

SUPERDISTRIBUTION

Packaging information in secure containers enables a concept called *superdistribution*. It is one special form of peer-to-peer distribution: others can make copies and even repackage information products and further distribute them, possibly profiting from the repackaging, while respecting the rights of the owners of the original content. A user can for example give copies of an information product to friends telling them that it is a good product and recommending the acquaintances to use it also. A user can even package several products in a secure container with user's own set of rules for access. Importantly, those rules depend on the rules specified by each of the individual information products that remain enclosed in their own containers. That is, the user cannot give others more rights than the rights holder of an individual product has permitted. The user then recommends the information products to acquaintances and sends copies of the package to them. [81, 141]

Many of the acquaintances are willing to buy the package because someone they trust recommends it. The one who buys the package must obtain all the necessary rights, including the rights to the collection, and the rights to any of the individual information products. Superdistribution therefore makes distribution more effective and enables a chain of value-adding activities, while respecting the rights and restrictions imposed by all the content owners. [81]

According to *Schull*, information products can be copyright-protected, so that while for-pay content may be formatted in such a way that it is not easily pirated, freely browseable preview content can remain accessible and inviting to its recipient. Superdistribution works, and it proves that the sale and marketing of digital goods is fundamentally different from that of e.g. conventional print products. Content producers should not focus on preventing copying. They should encourage redistribution. [141]

IDENTIFICATIONS

To solve most of the questions risen up in this thesis, it is viable to be able to identify objects. That is, entities, persons, devices, and information products should have unique identifiers.

Digital Object Identifier System is in progress to standardize identifiers for digital information. A digital object identifier or DOI is a means of persistently identifying a piece of intellectual property on a digital network. The DOI has two components, known as the prefix and the suffix. These are separated by a forward slash. The two components together form the DOI. For example, *10.100X/123456* would be a valid DOI, where *10.100X* is the prefix and *123456* is the suffix. The prefix is a number or a string that is assigned to an organization that wishes to register DOIs. An organization then again may register any number of prefixes. For example, a publisher may have only one prefix or it could have a different prefix for each publication series. Each suffix, on the other hand, is unique to a given prefix and it identifies the digital object, like an information product. The suffix can be any alphanumeric string. This can simply be a sequential number, or it can make use of an existing identifier, like an ISBN code. For example, ISBN-90-411-9785-0 would be a valid suffix. The combination of a prefix for an organization and a unique suffix provided by the organization itself avoids any necessity for the centralized allocation of DOIs.

In principle, a DOI can apply to any form of intellectual property in any digital environment. It seems that this will largely solve the identification problem with respect to information products. However, some difficult semantic questions remain unsolved.

For instance, if an information product is adapted or it has a number of versions, each of them should be identifiable, but DOI does not give any specific support to versioning. A DOI can be assigned to products with numerous versions, but it is up to the publishers to determine to what level of granularity and to which versions DOIs will be assigned to a work. The semantics of versioning is left to the entities that use DOIs. Moreover, usually only the publisher controls the semantics and thus, if other entities use different semantics, it can be very difficult to apply DOIs in certain situation. If entities, say, have different notions of versioning and DOIs are based on one notion; other entities have troubles in applying the DOIs to their versioning scheme.

> For example, an organization might identify its documents in accordance with the following form: *doc.language.version.revision.subdoc.representation*. A valid identification could be *30072.fi.A.1.main1.ps* meaning that the document *30072* has a Finnish version *A*, revision *1*, and it has a subdocument *main1* that is represented in the postscript form. For the organization, this kind of identification includes a lot of information. However, another organization might use syntactically similar identifications, like for instance *10028.xy.C.2.report.doc*, but different semantics. Therefore those identification systems are not interoperable although they both comply with the DOI standard.

For devices, unique identifiers are even more difficult to define since there are so many different technologies available. Some of them already include identifiers. For example, GSM mobile phones have identifiers on several levels: each phone has an identifier, smart cards or SIM cards that store for instance user information have identifiers, and there are identifiers for user accounts, like account number and telephone number. However, none of those identifiers is universal. That is, other technologies, like PDAs or PC computers use different identifiers.

The identification of human individuals seems to be the most difficult one. It is difficult to reliably relate any physical identification to a human being. However, that is a small problem compared to legal and ethical issues related to privacy, anonymity, and identity. In general, everybody should be able to remain anonymous and to keep privacy. On the other hand, a human being may act in a large number of roles. A person at work, at home, at leisure activities, and so on has many roles that should be distinguished. For example, usage rights like private use or fair use are often different depending on the role and a license may only cover certain role-based usages. Therefore it is hardly possible to build solutions that in general rely on human beings direct identifications. Instead, most systems need to depend on indirect user identification based on for example device identification. [e.g. 54]

There are also many other objects that should be identifiable. For example it would be very useful to be able to identify some context factors, like the country where the user is currently located. At the moment, it is often possible to identify some of those factors, but not unfailingly and precisely in all the cases.

OTHER FUTURE TECHNOLOGY ATTRIBUTES

Many other interesting and important fields of technology related to computer networks are also developing rapidly. A number of them are still hidden in the laboratories of universities and R&D departments of companies. Yet, some of the major trends are visible and can be observed at least superficially.

They include, for example, the technologies that make use of location information. When either user-devices or a network service can find out where the user is physically located, it is possible to provide services that take advantage of location. While computer networks in general have significantly released people from the boundaries of the physical world, the Mobile Internet can in turn make use of physical locations.

Another trend is the progress of technologies to support information adaptation. It will be necessary to manipulate content information based on several reasons. They will include for instance, device features, user profiles, context information, and content's own characteristics as well as service properties.

Also, the technologies that enable ubiquitous computing are becoming very important. They extend the reach of computation and information beyond the traditional framework of a computer application running on a fixed set of machines. The extension may be physical, breaking the ties of the desktop, wired computer. Alternatively, the extension may be in scope, providing information services to the public in a form that does not require technical expertise. [13]

SOCIETAL FACTORS

> *The industrial age, very much an age of atoms, gave us the concept of mass production, with the economies that come from manufacturing with uniform and repetitious methods in any one given space and time. The information age, the age of computers, showed us the same economies of scale, but with less regard for space and time. The manufacturing of bits could happen anywhere, at any time, and, for example, move among the stock markets of New York, London, and Tokyo as if they were three adjacent machine tools.*
>
> - Nicholas Negroponte [53]

This thesis intends to analyze the legal challenges related to the future Mobile Internet and describe a digital rights management framework. Legal and regulation issues are always related to the society. It is not possible to study them without trying to understand what kind of society they are associated. Therefore I am briefly illustrating the world around the future Mobile Internet.

It is arguable if our society — or any society — should be called an *information society*. Information has always played important role in every society. Some characteristics, however, of the modern society suggest that information is a more essential part of it than it used to be. *Castells,* on the other hand, calls the modern society a *network society* emphasizing how networks change the world. [10, 11] Information is the fundamental part of a network society. According to *Castells*, "the network society is a social structure made of information networks powered by the information technologies characteristic of the information paradigm." [10]

One of the special characteristics of the modern society is the fact that entities are increasingly dependent on information as a central strategic resource in industrial and economic development. It has a significant impact on their competitiveness. All technological changes have depended on information, but now both the input and the output of business processes can be pure information or as *Castells* points out, "what is specific to the informational mode of development is the action of knowledge upon knowledge itself as the main source of productivity." [11] The economy turns towards information extremely rapidly. This trend allows closer links between regional, national and international economies. Also, it breaks down the conventional barriers between financial sectors, as all work, including manufacturing, becomes increasingly a matter of the transmission of information. [143]

The rapid rise of transnational corporations would have been impossible without global information networks. Currently, there are hardly more than a couple of dozen national economies bigger than the economies of the major corporations. The networks facilitate the *globalization* and it depends on them heavily. While networks permit economic decision-making on a world scale in real time the term globalization does not refer simply to improved ease of communication and interaction between nation states, nor is it purely limited to the economic and business spheres. [11, 143]

Globalization refers also to significant cultural changes, including for example greater migration, more international tourism, the development of "world music", greater international co-operation in political, economic and ecological matters. *Castells* also indicates that there is "a trend that we would call 'bureaucratrization' in the Weberian sense, that is the predominance of the rationality of means over the rationality of goals." [11, 143]

At the level of individuals, *the changing concept of work* is affecting daily life. Concepts like *networkers* and *flextimers* [11] or *e-lancers* [48] reflect that change. Flexibility in the working arrangements is bringing about new work-life policies that allow employees to have more control on their jobs and personal life. Also some traditional work environments will change: more virtual offices will emerge, more employees will telecommute, and non-traditional work schedules will be the norm. [11] Described by *Himanen*, a hacker ethic contests what was before the basis of individuals' "protestant" duty to work. In some sense the hacker ethic is a counterforce to the market culture. Hackers enter into information creation and exchange motivated by enthusiasm, joy and passion, not just money. [30]

Information technology may introduce severe *challenges to political* systems. According to *Castells*, the collapse of Soviet Union was largely due to the incapability of assimilating informationalism. [9] *Himanen* illustrates the role of information technology in the Kosovo crisis of 1999. [30] Several countries are currently trying to limit their citizen's access to the Internet for political reasons. Mobile technologies make the future even more challenging for a political system based on people's limited access to information.

As information technology affects people's lives in many ways there can be significant changes in their *minds and behavior*. At worst this can appear as an addiction but there are many other possible phenomena also. It will be seen how people react on increasing telecommuting and virtual working communities. Restructured social identities can affect how people feel about themselves. The ever increasing surveillance and ubiquitous computing change people's notion on privacy. In general, there are lots of important issues on the individual level yet to be researched.

The reduction in the constraints of space is also an important part of the modern society. The actual geographical locations will be largely irrelevant in an economy, which has passed, in *Negroponte*'s terms, from shifting around atoms to shifting around bits. [53, 143] Yet, it is interesting to realize how much the geographical location still means on the personal level. For a human being, the tangible world is nevertheless very important.

EXAMPLES OF INFORMATION PRODUCTS

ELECTRONIC BOOKS AND NEWSPAPERS

As an example of information products, I shall first discuss about print media turning to electronic form. Especially, I will discuss about books and newspapers.

ELECTRONIC BOOKS

Currently, there are lots of efforts to develop electronic books, e-books. The first of them have already been commercially available for a couple of years. In a few years we will plausibly see a rapidly growing market in this area.

E-books as information products include not only the contents but also metadata, i.e. information about the contents, and possibly computer programs that are parceled up. It is possible that some parts of an information product are distributed separately to the end-user. For example, parts of metadata like a key to decrypt the contents may be delivered by a trusted third party while an intermediary distributes the rest of the product. Yet all those parts form a logical whole and they can be called a product.

E-books enable a vast amount of new business possibilities. There are few ways to sell a traditional printed book. In general, it forms a single transaction to sell a book: a seller gives a book to a customer and the customer gives payment to the seller. However, in addition to the traditional single-transaction mechanism, there is an unlimited number of other ways to sell an e-book. For example, an e-book can be given for free for awhile and charged later if the customer wants to keep it. Or a customer can be charged based on the usage: he or she will pay per read page, for instance. This will not only enable better price discrimination but also creates a valuable continuous relationship between an e-book provider and a user. [75]

These new business models, however, rise up questions that are both legal and technical. An e-book publisher should be able to control and enforce its intellectual property rights to get payments. The legal projection of an e-book is a legal product; it may include several legal components. Therefore the publisher should also be able to take care of the rights in components and share the revenues accordingly. [79]

E-books will be distributed through networks that may be wireless. There can be a number of different kinds of intermediaries between authors, publishers, sellers, and customers. For instance, network operators and service providers will have an important role. It is essential to have secure mechanisms to perform the business transactions. The technology will be based on cryptographic methods and trusted third parties. Therefore there will be a number of important actors involved in these transactions. All of them need to be able to communicate with each other using well-defined protocols and languages.

Communication between entities includes e-books, but also commitment notifications, payments, certificates, and so on. The term commitment refers to something that an entity agrees to accomplish in the future. A written contract and an oral agreement are possible ways to manifest commitments. [21, 40] Yet, it is also possible to send another entity a message expressing a commitment, either a conditional commitment, like an offer, or an unconditional commitment like an acceptance notification or a promise.

For example, an e-book distributor can send an end-user a message telling that the end-user is allowed to use the e-book on the condition that the end-user pays a certain price and accepts certain other terms. This message does not constitute an agreement because it does not bind the end-user until the end-user accepts the conditions stated in the message. It is rather an offer. However, if the offer binds the distributor, it expresses distributor's commitments. The distributor is committed to grant the end-user a license to use the e-book on certain conditions. The end-user in turn can send the distributor a message telling that the end-user accepts the terms and will pay the price. This message represents the commitments of the end-user. After the end-user has accepted the distributor's offer, there exists an agreement between the end-user and the distributor even though it is not manifested in a one contract but in two or even in several commitment notifications.

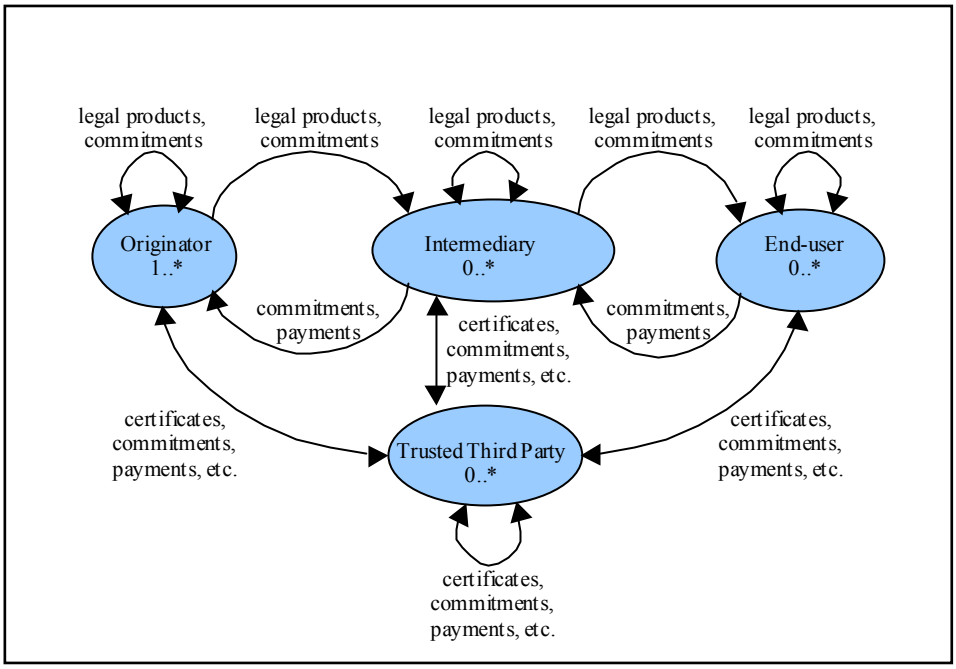

Figure 11. A sample legal process of e-book transactions.

In Figure 11, originators have created, invented, collected, or otherwise brought about contents in legally significant ways. Intermediaries, including agents, publishers, service providers, operators, retailers, etc., add new components, new value and new rights into the legal products and forward the combinations further. End-users of e-books get licenses to use e-books. They send payments to intermediaries that share them with other parties. Transactions are secured using cryptographic methods and trusted third parties. The term commitment in the figure refers to commitment notifications that entities send to each other. The notations 0..* and 1..* refer to cardinalities. In general, there should be one or more originators and any number of intermediaries, end-users, and trusted third parties. If there are no intermediaries, originators transact directly with end-users. In the undesired situation that there are no end-users, the process of course is reduced to meaningless. If the parties trust in each other enough, there do not need to be any trusted third parties. A loop arrow going from an actor to the same actor means that if there are more than one actor of that kind they can communicate with each other.

NEWSPAPERS

As *Enlund* points out, newspaper production actually consists of two very different production processes linked together. First, there is the creative process of putting together the newspaper pages with their mixed contents of editorial matter and advertisements – the manufacturing of an original. Next, a high volume mass production and distribution of copies follows this. These two types of production are fundamentally different. (See Figure 12 below.)[18]

The digital technology will dramatically change especially the latter. If newspapers are delivered in electronic form through networks, no more printing is needed and the distribution of copies can be completely automated. However, the creative process may not change that much. New technology will probably somewhat change the way journalists work, but the same human creativity remains behind the editorial work.

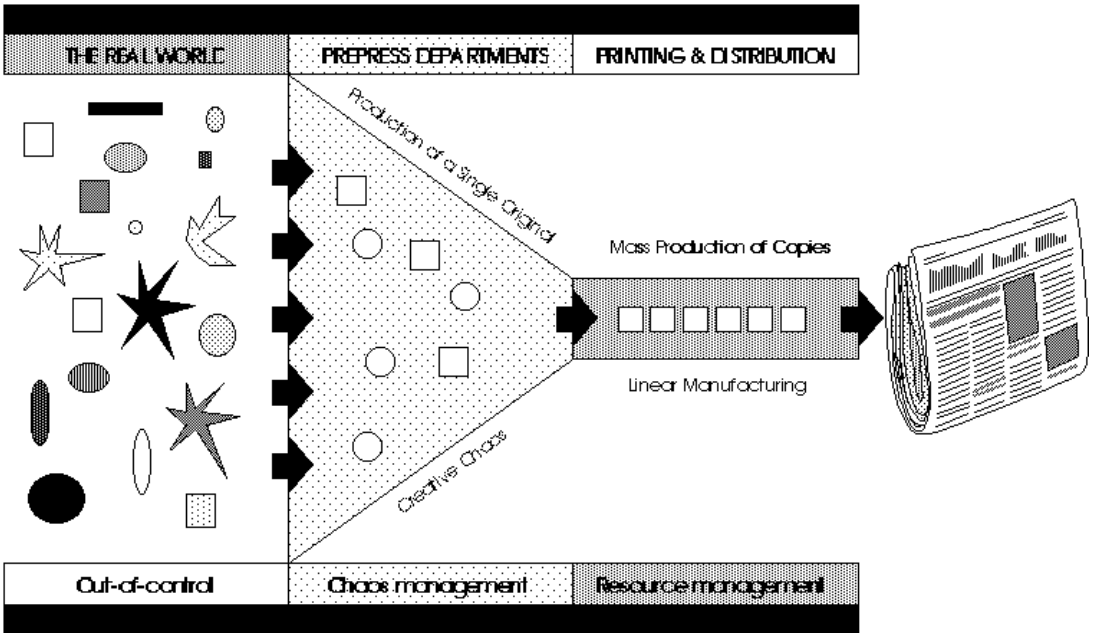

Figure 12. The different processes of newspaper production according to Enlund.

Hetemäki and *Obersteiner* have forecasted that US newsprint consumption is more likely to decline than increase. Conventional printing and distribution will probably decrease. By 2010 economic incentives and marketing benefits will lead to that many newspapers are published only in digital form. In 2020 most newspapers in the USA and in several other countries are published in workdays exclusively in digital form. It will not pay to print papers any longer. Lately, information technology has increased paper consumption. Information technology and paper products have been complementary companions. In the long run, nevertheless, they will become rivals and information technology will eventually win. [27, 28]

THE CURRENT MAIN PLAYERS

Publishers

In the USA, in 1997, a total number of 2684 book publishers had receipts of $22,648,251,000. There were book publishers in the USA. [87] The publishing industry forms a large and quite conservative field. The following table summarizes the most important publishing companies in the U.S.A. Newspaper publishers, on the other hand, had receipts of $41,601,011. In 1997, there were a total number of 8758 newspaper publishers in the USA. Yet, of those papers only about 1500 were daily newspapers and only some 300 of the daily newspapers were independent, and only 15 of those independents had circulation exceeding 100,000. In addition, there were 6298 periodical publishers, which had total receipts of $29,884,807. [87] What is very important is the amount of contents those companies own. That makes them the real rulers of the information society.

Concentration of the industry

Newspaper industry is highly concentrated. There are about 1500 daily newspapers in the USA. Only about 300 of them are so called independent. Chains own the rest of them – that is about 80 % of daily newspapers. Although direct competition between newspapers within a single city was once the rule, it is now an exception. Less than one percent of the U.S. daily newspapers face direct competition from a newspaper publishing in the same city. [16, 66]

Worldwide, AOL Time Warner is probably the world's biggest media conglomerate. It is a vast empire of broadcasting, music, movies and publishing assets, complemented by AOL's dominant Internet presence, all fed to consumers, ultimately, through Time Warner's cable network. It is globally concentrating the publishing industry also. Similarly, other largest media companies in the world, The Walt Disney Co., Bertelsmann AG, Viacom, News Corporation, and Vivendi Universal have their effect on the concentration of the publishing industry. [132]

The diminishing competition in the newspaper publishing industry has several important aspects. The anti-trust issues from both the economical and the legal point of views are significant, but taken into consideration how central this industry is to the freedom of speech, the diversity of the press is also an end in itself. Thus policymakers have long been concerned about the effects of media structure and ownership on the goals of freedom and diversity of expression. In the USA, this concern has led to lengthy Justice Department deliberations about proposed mergers of newspapers located in the same city, a Federal Communications Commission (FCC) ban on the crossownership of local print and broadcast properties, and congressional hearings on the growth of newspaper chains. Although the importance of media concentration transcends considerations of economic efficiency and performance, the policy debate has frequently focused on the potential production economies associated with larger enterprises and on the degree of competition in the relevant media market. [16]

Dertouzos and Trautman [16] have suggested that the demise of competition might be an inevitable consequence of scale economies in the production of advertising, circulation, and news. Perhaps the monopoly newspapers face competition for advertising and circulation from other newspapers located in contiguous geographic markets. The debate about local media crossownership centers around similar questions regarding the definition of the relevant market. Do newspapers face competition for advertising and circulation from local radio and television stations?

As mentioned, the huge majority of the U.S. daily newspapers belong to chains. *Dertouzos and Trautman* have studied questions like are there production economies associated with chain ownership, are chains able to disseminate features, national news items, or advertising copy to individual firms at lower cost, and can chains acquire inputs, such as newsprint and ink, at discount by purchasing in bulk or by exercising monopoly power. They have specified a five-equation model of newspaper operations and estimated the model with data drawn from a sample of 129 newspaper firms. [16]

On the cost side, they confirmed the well-known fact that there are significant scale economies in the production of circulation and news. However, they did not find any evidence that chain newspapers can produce output more efficiently than independents, all things equal. On the demand side, they found that newspapers located in contiguous geographic markets appear to have an important competitive effect on the demand for circulation. However, they could not reject the hypothesis that broadcast stations do not affect the demand for newspaper advertising and circulation. [16]

Their results have interesting implications for concentration in the newspaper industry. First, the absence of face-to-face competition in all but a few cities is most likely the consequence of scale economies in the production of advertising, circulation, and news. However, multiple newspapers that are differentiated on the basis of location can coexist and appear to compete quite vigorously when their markets overlap. Thus, according to *Dertouzos and Trautman,* the emergence of one-newspaper towns may not be a policy issue of the highest order. Next, the existence of local broadcast media does not appear to influence the operations of newspaper firms. FCC restrictions on crossownership do not appear to have an economic justification, although such a policy may still make sense if one values media diversity. Finally, the growth in chain ownership does not appear to be motivated by consideration of multi-newspaper efficiencies. Instead *Dertouzos and Trautman* suggest that the possibly significant tax advantages associated with investing retained earnings in other newspaper properties may explain the growth of newspaper chains. In the absence of any discernible economic benefit, restrictions on the size of newspaper chains may be warranted. [16]

The most important implications of their results, however, may be those concerning digital media, although *Dertouzos and Trautman* did not seem to notice it themselves. Circulating newspapers through networks reduces circulation costs to almost zero. This changes the outcome of *Dertouzos and Trautman*'s equations significantly even if the costs of advertising and news would remain unchanged. The entry barrier will be lower and the local competition will increase. [16]

Dertouzos and Trautman argue however that primary economic markets for newspapers are local in nature. If that will be true in electronic newspapers also, then even the diminishing circulation costs will not help newspapers to extend their markets geographically. Yet, customized electronic newspapers might look like local newspapers to their readers while giving the advantages of global markets to producers (see e.g. Knight Ridder below). Of course, there are also newspapers like The Wall Street Journal, which already have global markets. They are not competing with local newspapers.

Rank	Company	Revenues (million $)	Profits (million $)	Employees
1	**Gannett**	6,344	831	51,500
2	**R.R. Donnelley & Sons**	5,298	25	33,000
3	**Tribune**	5,253	111	25,600
4	**McGraw-Hill**	4,646	377	17,135
5	**New York Times**	3,043	445	12,050
6	**Knight-Ridder**	2,900	185	18,681
7	**American Greetings**	2,519	-114	25,200
8	**Reader's Digest Assn.**	2,518	132	5,000
9	**Washington Post**	2,417	230	9,494
10	**Mail-Well**	2,259	-136	13,150
11	**Scholastic**	1,962	36	8,450
12	**Dow Jones**	1,773	98	8,077
13	**Primedia**	1,742	-1,112	6,550
14	**Wallace Computer Svcs.**	1,693	53	8,228
15	**E.W. Scripps**	1,459	138	8,000
16	**Banta**	1,458	50	8,000
17	**Belo**	1,365	-3	7,820
18	**Deluxe**	1,278	186	6,840
19	**Standard Register**	1,196	-49	5,692
TOTAL	**--**	**51,123**	**1,484**	**278,467**

Table 1. The largest companies in the U.S. publishing and printing industry [120]

Gannett

Gannett claims to be the USA's largest newspaper group in terms of circulation. The company's 94 daily newspapers have a combined daily paid circulation of more than 7.7 million. They include USA TODAY, the nation's largest-selling daily newspaper, with a circulation of approximately 2.3 million. USA TODAY is available in 60 countries worldwide. [121]

In England, Gannett wholly owns Newsquest plc, which is the largest regional newspaper publisher in England with 15 daily newspapers that have a combined circulation of approximately 600,000. [121]

R.R. Donnelley

R.R. Donnelley & Sons Co. is a very large content manager and printer of books, magazines, catalogs, directories and financial information (see table in page 84). R.R. Donnelley and Microsoft Corp. have announced that they will work together to provide consumers equipped with Microsoft® Reader software with access to a repository of tens of thousands of eBook titles. This union has an enormous potential: R.R. Donelley owns vast amount of contents while Microsoft dominates the software industry. [133, 140]

Knight Ridder

Knight Ridder claims to be the second-largest newspaper publisher in the USA. The company publishes 32 daily newspapers. Knight Ridder also has investments in a variety of Internet and technology companies and two newsprint mills.

KnightRidder.com, through its participation in the Real Cities network, is an important player in Internet. Real Cities (www.realcities.com) is a national network of regional information portals on the World Wide Web. Real Cities consists of regional portals, city-resource sites and a variety of online services in classifieds, entertainment, shopping, news, search and archives. This might be a kind of global newspaper that looks like local to readers as discussed above. [130]

NEW POSSIBILITIES AND SOLUTIONS

> *The thing that's been around for thousands of years and is so powerful is the word. The power of the word is extraordinary, and if the word is embodied as text, that, too, is powerful, regardless of whether the text lives as ink on pulp or signal on flat-panel display. Words aren't going away, and I think the book/no-book argument is dumb once you realize that all we're talking about are variations in display technology. I'm not anti-book or anti-print; it's just that soon we're going to be doing our "printing" in a different medium.*
>
> - Nicholas Negroponte [8]

Open ebook Forum

The Open eBook Forum (OeBF) is an association of over 120 hardware and software companies, publishers, authors and users of electronic books and related organizations. OeBF's goals are to establish common specifications for electronic book systems, applications and products that will benefit creators of content, makers of reading systems and consumers, helping to catalyze the adoption of electronic books; to encourage the broad acceptance of these specifications on a worldwide basis among members of the Forum, related industries and the public; and to increase awareness and acceptance of the emerging electronic publishing industry. [137]

The EBX Working Group was an ad hoc group developing a standard for electronic book exchange. EBX was creating a copyright protection and distribution specification. It was intended to work with various standards for content files, including the Open eBook Publication Structure. The EBX Working Group published a draft specification. They raised some important legal questions. In March 2001 EBX and OeBF joined their efforts and EBX was terminated as an independent entity. Its work is now continued under OeBF. [119]

The Open eBook Publication Structure specifies eBook file format and structure. It aims at ensuring that content can be viewed on any reading system which is OEB-compliant -- as long as the owner of the reading system has the right to read the content on that reading system. It seems to me that the specification is a quite mature format for communications. However, although the legal aspects have been mentioned briefly, the specification does not tell how the rights are enforced. [137]

Adobe

Adobe has many activities in the field of electronic publishing. Adobe Acrobat is widely used software platform to create and view portable files. The Portable Document Format (PDF) is one of the most important e-book file formats today. [112]

Glassbook, Inc. is developing EBX compatible electronic books. The company was acquired by Adobe in August 2000. Glassbook emphasize copyright questions. It has some software products for consumers, publishers, distributors, booksellers, and libraries. They have also developed a reference platform definition, but so far there does not seem to exist any working implementations of the platform. An overall impression is that the company is quite promising. They have not yet completed much, but with the resources of Adobe, they will probably accomplish quite a lot in the near future. [122]

Web Buy is Adobe software that lets users download encrypted files from the Web and unlock them to read on a personal computer or reading device. In combination with Iomega's portable media they have developed a product family called ePaper that is supposed to provide a copy protected distribution format for electronic books. [112]

Cytale

Although many companies in the field of e-books are American there are some interesting exceptions. For example, in France, Cytel has introduced a set of e-book reader devices. [117]

Xerox, ContentGuard and XrML

Xerox *ContentGuard* enables rights management by providing ongoing tracking and protection of digital content. Using ContentGuard, publishers can assign rights to their content and sell permissions to users with the assurance that their content is protected against unauthorized use. Permissions given to the users are enforced and usage tracked during the use of the content. While many rights management systems protect documents only during their delivery and initial "unwrapping", Xerox ContentGuard Self Protecting Documents (*SPD*s) provide ongoing content protection both during distribution and use. [115]

XrML - eXtensible rights Markup Language, formerly known as Digital Property Rights Language (DPRL), is an interesting work towards developing tools for digital right management. The language was first created at Xerox Palo Alto Research Center (PARC). The further development is now carried out by ContentGuard, Inc. XrML can be used to specify rights for digital works. It provides a mechanism in which different terms and conditions related to access, fee, and time can be specified and enforced for the different operations on digital documents such as view, print, and copy.

XrML is especially interesting because there are several excellent scholars, e.g. Marc Stefik, at Xerox PARC, who are well aware of intellectual property right issues and who have contributed to the development of XrML. ContentGuard is trying to get XrML into the position of the industry standard. In August 1999, Adobe and Xerox announced a strategic initiative to integrate Adobe's PDF technology with Xerox ContentGuard rights management solution. [115, 135, 147]

XrML seems to be quite mature and well-defined rights description language. On the other hand, ContentGuard has strict license terms and there are several patents that are claimed to cover not only XrML, but also other rights description languages. Therefore, licensing and other legal issues related to XrML leave serious question.

The example in Figure 13 adapted from XrML Specification 1.3 [147] gives an idea how the usage rights can be described in XrML. It tells that Mr. John Doe is allowed to view a particular book in certain period of time using a specific device.

```
<?xml version="1.0"?>
<!DOCTYPE XrML SYSTEM "xrml.dtd">
<XrML>
    <BODY type = "WORK" version="2.0">
        <WORK>
            <OBJECT type="BOOK-LIT-FORMAT">
                <ID type="ISBN">8374-39384-38472</ID>
                <NAME>A book of James</NAME>
            </OBJECT>
            <OWNER>
                <OBJECT type="Person">
                    <ID type="US-SSN">103-74-8843</ID>
                    <NAME>Mike the man</NAME>
                    <ADDRESS type="email">mike@man.com</ADDRESS>
                </OBJECT>
            </OWNER>
            <PARTS>
                <WORK>
                    <OBJECT type="Chapter">
                        <ID type="relative">0</ID>
                        <NAME>Chapter 1</NAME>
                    </OBJECT>
                </WORK>
            </PARTS>
            <RIGHTSGROUP name="Main Rights">
                <DESCRIPTION>Rights granted to John Doe</DESCRIPTION>
                <BUNDLE>
                    <TIME>
                        <FROM>2000-01-27T15:30</FROM>
                        <UNTIL>2000-01-27T15:30</UNTIL>
                    </TIME>
                    <ACCESS>
```

```
                        <PRINCIPAL>
                            <OBJECT type="Principal-Certificate">
                                <ID type="MS-GUID">7BD394EA … </ID>
                                <NAME>John Doe</NAME>
                            </OBJECT>
                            <ENABLINGBITS type="sealed-des-key">
                                <VALUE encoding="base64" size="512">lnHtn …
                                </VALUE>
                            </ENABLINGBITS>
                        </PRINCIPAL>
                    </ACCESS>
                </BUNDLE>
                <RIGHTSLIST>
                    <VIEW>
                        <ACCESS>
                            <PRINCIPAL>
                                <OBJECT type="MS Ebook Device">
                                    <ID type="INTEL SN">
                                        Intel PII 92840-AA9-39849-00
                                    </ID>
                                    <NAME>Johns Computer</NAME>
                                </OBJECT>
                            </PRINCIPAL>
                        </ACCESS>
                    </VIEW>
                </RIGHTSLIST>
            </RIGHTSGROUP>
        </WORK>
    </BODY>
</XrML>
```

Figure 13. Sample listing in XrML. [147]

IPR Systems and ODRL

The Open Digital Rights Language (ODRL) is said to provide the semantics for a digital rights management expression language and data dictionary pertaining to all forms of digital content. It is developed by IPR Systems Pty from Australia and aimed to become a widely accepted standard. The ODRL is a vocabulary for the expression of terms and conditions over digital content including permissions, constraints, obligations, conditions, and agreements with rights holders.

Like XrML, the ODRL is also positioned to be extended by different industry sectors (e-books, music, audio, mobile, software, and so on) and to be a core interoperability language. It has well structured and detailed high-level documentation. Unlike XrML, ODRL is developed in the spirit of open source software and without intellectual property claims. It does not have any license requirements, but XrML patents may cover ODRL also. Compared to XrML. ODRL is quite new and less mature an entrant because version 1.0 was released only in late fall 2001.

```
<rights>
   <context>.
      <uid> ... </uid>
   </context>
   <offer>
      <asset> ... </asset>
      <permission>
         <permission-type>
            <requirement> ... </requirement>
            <constraint> ... </constraint>
         </permission-type>
         <condition> ... </condition>
      </permission>
      <party>
         <context> ... </context>
         <rightsholder> ... </rightsholder>
      </party>
   </offer>
   <agreement>
      <context> ... </context>
      <party> ... </party>
      <permission> ... </permission>
      <asset> ... </asset>
   </agreement>
</rights>
```

ODRL Foundation Model XML Syntax according to ODRL specification version 1.0 [136]

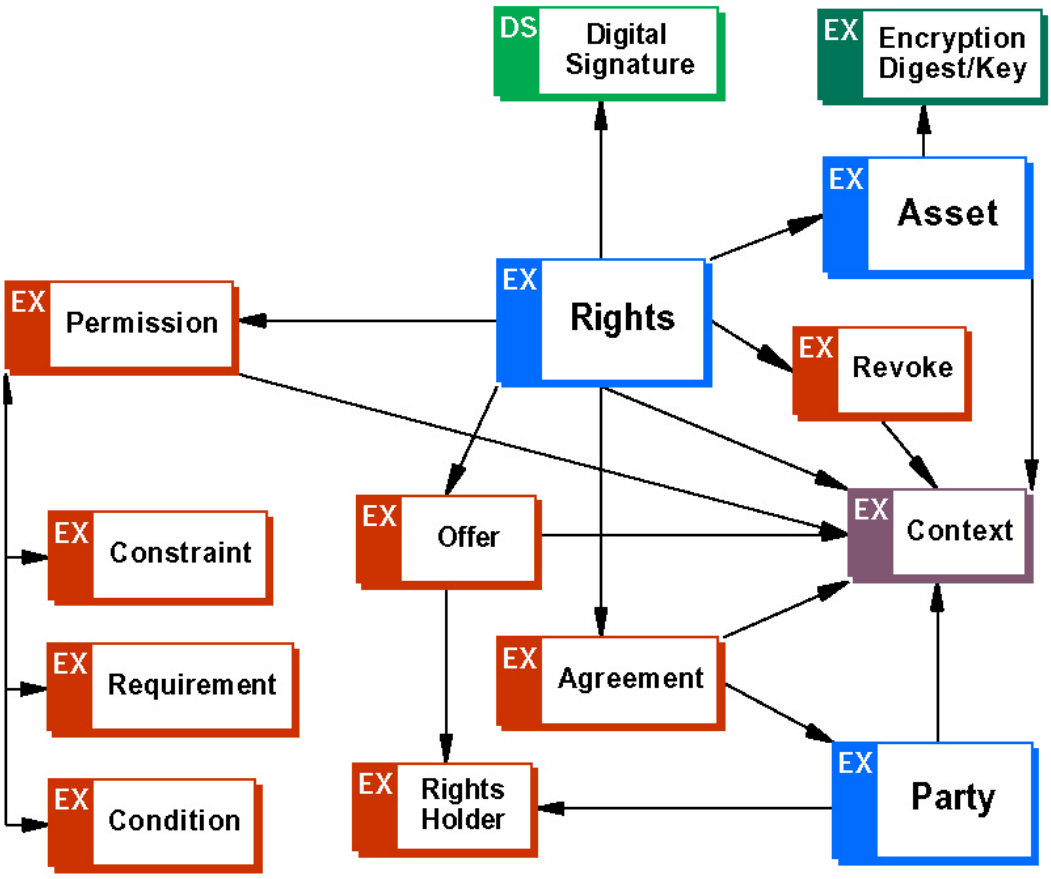

Figure 14. ODRL Foundation Model according to ODRL specification [136]

Microsoft

Among many information product platforms, Microsoft also has a product called Microsoft Reader. It is eBook reader software for Pocket PC devices and for other PCs. According to Microsoft, the special emphasis during the development work has been on readability. [112]

MUSIC

Music industry is probably the best known field of digital rights management. That is because of the widely reported court cases of Napster and other peer-to-peer music distribution systems. However, digital rights management in music products is much more than just a couple of questionable court cases. In the following I give an overview of the field.

COPYRIGHT IN MUSIC

Considering copyright in music, composers and lyricists are normally the original copyright owners. The arrangement can be a derivative work and its creator owns copyright in it. However, the rights in performances and recordings are also interesting. The performance and the recording as such are usually not considered copyrighted works. Instead many countries, like for instance Finland, provide rights for them through legal doctrines called neighboring rights. [24, 96] In the USA, common law has provided some protection to performances, but copyright law has not. However, in 1994, pursuant to the GATT TRIPs Agreement, federal neighboring rights to protect live musical performances were enacted. [6, 95, 97] According to GATT TRIPs Agreement, member countries provide performers with right to prevent the fixation of their unfixed performance and the reproduction of such fixation. Performers have also the possibility of preventing the broadcasting by wireless means and the communication to the public of their live performance. Producers of phonograms have the right to authorize or prohibit the direct or indirect reproduction of their phonograms. Broadcasting organizations have the right to prohibit the fixation, the reproduction of fixations, and the rebroadcasting by wireless means of broadcasts, as well as the communication to the public of television broadcasts of the same. [95]

Intellectual property owners can authorize special organizations to license their intellectual property. A user would pay a license fee to such an organization to obtain rights to the intellectual property. The organization then accounts the payments to the owners of the intellectual property. These kinds of organizations are quite common in the music industry, though they exist in other fields of intellectual property also.

The American Society of Composers, Authors and Publishers (ASCAP) is a membership association of over 80,000 American composers, songwriters, lyricists and music publishers. In Japan, an organization called JASRAC is authorized to govern the rights of lyric writers, composers and music publishers. For example, in Germany, Gesellschaft für musikalische Aufführungs- und mechanische Vervielfältigungsrechte (GEMA), in France, Société des Auteurs, Compositeurs et Editeurs de Musique (SACEM), in the United Kingdom, The Performing Right Society (PRS) and Mechanical Copyright Protection Society (MCPS), and in Finland, Teosto protect the rights of their members by licensing and paying royalties for using copyrighted works.

The organizations mentioned above are national. Music distribution on the Internet does not obey boarders. A user may download music from whichever country through the Internet. Therefore national organizations are facing serious challenges. Perhaps they are able to network so that those national organizations together can form an international system. Another possibility is to establish a new international organization that could operate worldwide.

Napster , Gnutella, Kazaa, and other peer-to-peer solutions

In general, copyright owners have an exclusive right to copy their works. That is, making copies of a copyrighted work without permission infringes copyright. However, in most countries, it is legal for private persons to make few copies for their own use. In the USA, for example, this right is within the statutory *fair use,* while some other countries like Finland have a special private use provision in their copyright law. [24, 43, 49, 96, 97]

An essential prerequisite of making copies for private use is that the number of copies is small. It is legal to make a photocopy or two of a book, but not to print hundreds of copies in a printing press.

Napster is an Internet company that provided software for sharing information on the Internet. Napster's software made it very easy to share and copy music files over the Internet. Users allowed others to download files directly from their computers. Napster had a database that included reference information about the available files so that users were easily able to find the files they wanted anywhere in the world. Although Napster did not keep any of the music files on its own servers, it effectively helped users to download their favorite music to their computers. Napster became enormously popular and the number of files downloaded using the software was very large. This is why RIAA, the Recording Industry Association of America filed a lawsuit against Napster. RIAA did not want to sue individual users although they were actually copying the music files in large quantities. The law suit ended Napster in its original form. [134, 139]

There are many alternatives following Napster, Gnutella and KaZaa being some of the best known of them. [52] Therefore even though Napster was shut down, other solutions keep distributing music files all over the Internet. Those newer services are more distributed and decentralized. Therefore, they are less vulnerable to lawsuits and harder to control. If the music industry had considered the situation more carefully before killing Napster, it might have noticed that Napster was actually a good enemy, quite easy to tame. Music companies could have made Napster an efficient way to sell their products through the Internet. By destroying Napster and by chasing its millions of users away to other systems the music industry lost its opportunity. Now they have an awful big and expensive job to rebuild a system to sell music over the Internet.

The Recording Industry Association of America, Inc. (RIAA)

The Recording Industry Association of America, Inc. (RIAA) has an active role in the music industry. It supports strong copyright protection. It has, for example, launched Soundbyting Campaign and been active in court cases related to copyright infringement. [139]

Secure Digital Music Initiative (SDMI)

In response to the threat that music industry feels it is facing because of unauthorized copying, RIAA and other central entities in the music industry have started an project called Secure Digital Music Initiative (SDMI). It is not yet clear how the initiative will succeed. [142] As of now, the project does not look very successful.

SAMPLE SCENARIOS

INTRODUCTION

In this chapter, I am presenting a few scenarios and analyzing them to show what kind of legal challenges will arise on the Mobile Internet. I have above described the most important attributes related to the Mobile Internet. In this chapter, I am portraying scenarios that include those attributes. I am also identifying legal challenges involved in scenarios. The legal challenges are then classified by legal areas, assessed and prioritized. In conclusion I am giving a list of legal areas that will hold significant challenges on the Mobile Internet.

I try to cover all the important attributes in scenarios. In our research project, we have created a number of scenarios, but it is unnecessary to describe all of them in this thesis. I have chosen four scenarios that best illustrate the factors and attributes discussed above. Table 2 below illustrates how the scenarios cover the attributes. An X means that the corresponding scenario covers the attribute.

	Factors and Attributes														
	Technology				Economy						Society and individuals				
Scenarios	Moving user	Context-awareness	Content adaptation	Ubiquitous computing	Dynamic capabilities	Intangible resources	Flat hierarchies	Network economics	Lock-in	Branding	Globalization	Market culture	Political systems	Mind and behavior	Changing work
Weather service	X	X	X			X			X						
Shared pictures				X	X	X	X	X		X	X	X	X		X
Health monitor	X	X		X		X			X		X	X		X	X
P2P database	X			X		X									

Table 2. The attribute-coverage of the scenarios.

WEATHER SERVICE

DESCRIPTION

In this scenario, a user has a service agreement with a Mobile Internet Service Provider (MISP). The MISP's portal includes a weather service that is actually provided by a Weather Service Provider (acting as Mobile Application Service Provider, MASP). The data for the weather service come from Weather Data Providers and are aggregated and refined by the MASP. The user moves beyond the geographical area covered by the MISP and connects to a local Access Operator. The service should adapt to the local context and give information about local weather.

Where does the adaptation take place? It might make most sense to adapt the weather service as near the user as possible, i.e. by the Access Operator. In addition to the users themselves, only the Access Operators know for sure their location. However, the Access Operator does not necessarily know enough about the service to make the adaptation. Therefore it may be necessary to move the adaptation of the service up to the Weather Service Provider, which on the other hand probably does not have information about the user's location.

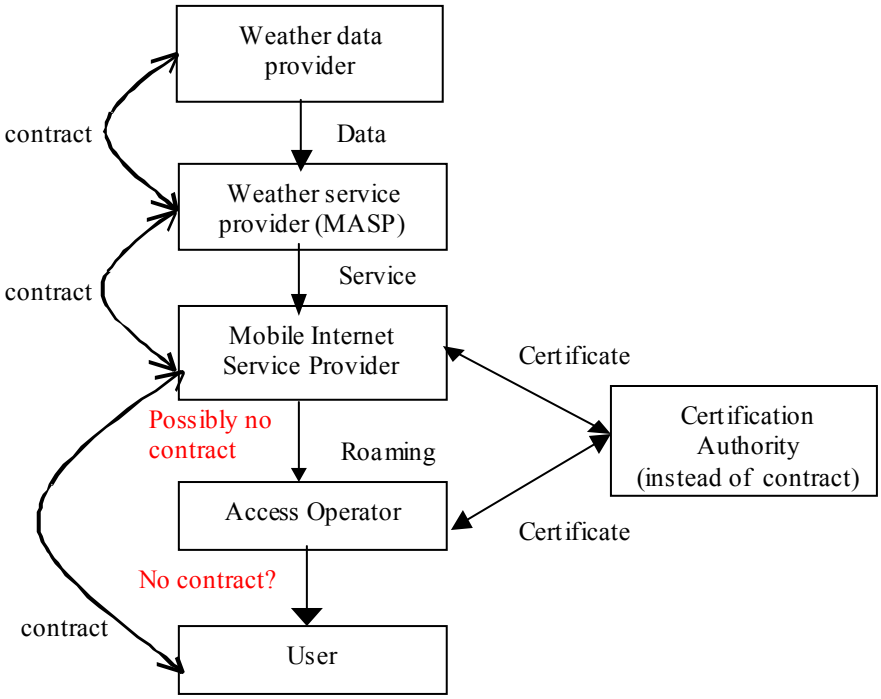

Figure 15. Weather Service

LEGAL ANALYSIS

Contracts. Who is authorized to adapt the content? It is possible that the Access Operator does not have an agreement with the user nor with the MISP or MASP. It is also possible that the context information is transferred from the Access Operator to either the MISP or the Weather Service Provider and they are adapting the content.

If the Access Operator does not have an agreement with the user, it is questionable whether it is allowed to disclose the end-user's location and other information. Technically, it might not be the optimal solution to adapt content far away from the user. If the end-user's mobile device has information about its location, it is possible to make the end-user disclose position info directly to the MISP or the MASP. In that case, user's privacy is smaller an issue. However, technically it is still not optimal to adapt content that far.

Technically the problem could be at least partially solved using metadata. For example, the Weather Service Provider could first send to Access Operator only metadata on what kind of information is available. Based on the metadata, the Access Operator requests information that is appropriate for the context. With that information, the Weather Service Provider sends also metadata describing how the information can be adapted. Legally however, it still remains questionable how the parties make sure that all the rights are respected and how the terms and conditions are obeyed if there do not exist appropriate contracts.

In general, on the Mobile Internet it is not quite deterministic in what way information flows from a sender to a recipient. It is not possible to precisely predict which parties will take part in the chain and therefore making agreements in advance can be difficult. Also, it can be difficult to define what is the subject of a contract. For instance, if contracting parties want to make an agreement about intellectual property rights, but they cannot be sure if any right covers certain subject matter, the contract is not on a solid legal base.

Intellectual Property Rights. What is the legal status of the information? There may be different kinds of Intellectual Property Rights involved in weather information. Though the basic weather data is hardly subject to copyright it might be covered by database protection in the countries that have such a law. Database protection does not cover individual data items but the database as a whole. The service itself and especially certain edited parts of information can be copyrighted. The more original information is included in the service, the better legal protection is achieved.

For example, a third party could establish a competing weather service, make unauthorized copies of valuable information, and further distribute them, but adapting, copying or distributing copyrighted parts requires often the consent of the copyright holder. The service can also be trademarked so that adaptation is not allowed with a claim it came from the original source. Some parts of the service could be patentable as well. If adaptation or copying touches patented parts, it is not possible without permission.

International Law. It is difficult to predict which jurisdictions are involved in a transaction on the Mobile Internet. As the laws are quite different, the legal interpretation of a transaction depends on the jurisdictions involved.

SHARED PICTURES

DESCRIPTION

This scenario is about sharing pictures between users. Imagine digital cameras with wireless Internet connection or indirect connection via e.g. Bluetooth technology. [114] A user can allow others to access pictures inside his camera. This is done without any other services but the file sharing software in the camera and the basic network infrastructure.

Think about the following scenario. Jaakko takes a trip to Mexico; he can immediately publish in his camera some of the pictures he is taking. His friend Gina can access those pictures instantly. Jaakko is also interested in birds. His pictures on rare birds quickly spread on the Internet.

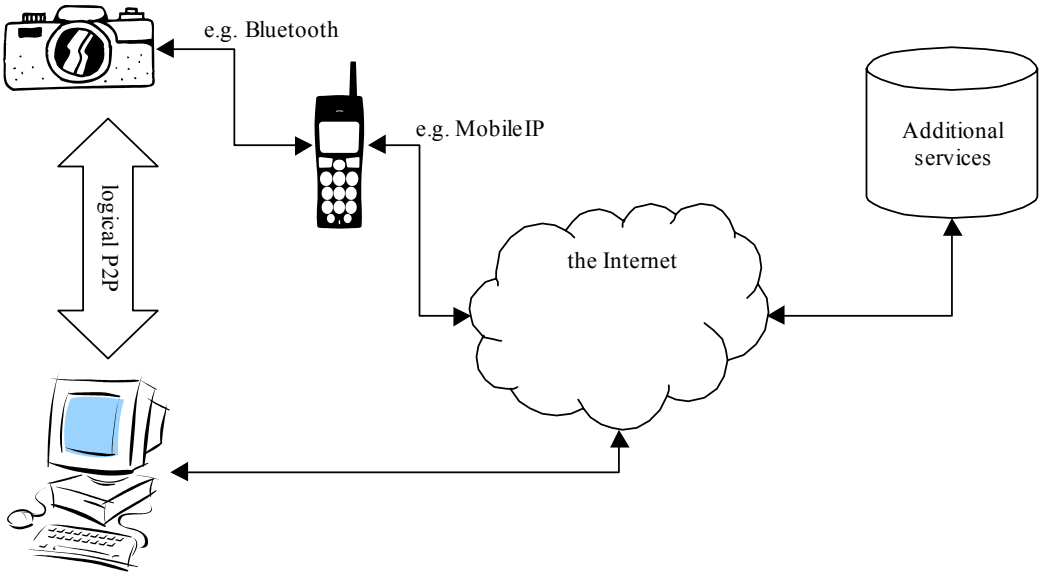

Figure 16. Digital camera and shared pictures.

This is a typical example of a peer-to-peer (P2P) distribution model. However, it is possible to include value-adding third party Internet services. For example, there could be a printing service: a user could order high-quality paper copies of selected pictures by sending them to the printing service on the Internet. Or there could be an editing service: cameras include only limited picture editing capabilities because editing requires powerful computers and sophisticated applications. Those could be accessed through the Internet using the camera as a user-interface. Business opportunities seem endless. It seems natural that this kind of mixed P2P and B2C (business-to-consumer) model will be quite common. Users will interact and share information with other users without commercial services, but they will also buy additional services when needed.

Some professional photographers and other content producers may also find P2P models changing their ways to work. Imagine José is a professional photographer. He started his job as a hobby, but soon he realized that people are willing to pay for his pictures. So he started to commodify the pictures he is taking and now makes his living by traveling after crises around the world to take demanded news-pictures in distant locations. Occasionally he is also taking pictures on events or famous people. The Mobile Internet will change his work in many ways. First of all, he will not need a large organization or a back-office. He will be able to sell his pictures directly from his camera to the public. He may join other photographers and form a loose group to coordinate their work and especially to build a brand for marketing purposes. The group could harmonize their infrastructure and offer the customers access to a larger number of photos using the same systems.

Are there limits to the effects of this development? If José is not only a good photographer but also an idealist, he might shake the political systems. His pictures on injustices and unfairness could make people to realize how they are treated poorly. The borderless Mobile Internet will be a difficult challenge for autocratic governments willing to censor the information.

LEGAL ANALYSIS

First, depending on the content of the pictures there can be identified several kinds of legal challenges.

Fine art. A picture as such can be valuable. It may be creative and original, or it may include important information in itself. If it is original it can be copyrighted. Some jurisdictions also provide specific rights to photographers (e.g. Finnish Copyright Act 49 a §). The photographer may decide who can copy and distribute the pictures and on what conditions. Yet, sharing pictures in a peer-to-peer fashion on the Internet makes it difficult to enforce these rights.

Pornography. A special case is extremely demanded such as pornographic and erotic pictures. Their economic value means commercial publishers have interest to manage rights in them. In the scenario described above however, the photographers are not likely to sell porno pictures. Instead they might sometimes take pictures in private occasions that other people would consider erotic or pornographic. The legal challenge is to make sure that these pictures are not distributed against the will of the people they show.

Event. It is common to restrict photographing and televising in some events, like concerts or sports competitions. That is because organizers want to get revenues by selling rights to photograph and televise to media companies. Interestingly those rights are based on contracts, not intellectual property law. To claim that somebody has infringed contractual rights the plaintiff needs to show that there is a binding agreement. If an ordinary consumer goes to an event and takes pictures, it may be difficult for organizers to show that there is a binding contract that forbids photographing. On the other hand, if a person is able to share the pictures on the Mobile Internet directly in the event, it can be very troublesome to even find out, who the photographer is, and it does not necessarily help much to later learn who took them, because the economic effects have already occurred. A possibility to get damages from a random private person is not relevant. The legal challenge here is to manage those photographing and televising rights also in the new situation. Otherwise the organizers have to develop new business models to get revenues some other way.

Paparazzi. People are willing to pay for candid photographs on celebrities. Therefore it can be worth to aggressively pursue famous people to get outspoken pictures on them without consent. This will become easier, faster and thus more profitable using the Mobile Internet. Legal challenges in this area are not different from those with current paparazzi, but they will become more serious. They include issues related to right of privacy and right of publicity that in turn can be quite different in different jurisdictions.

Birds. A number of pictures are documentary and related to hobbies in a way that they do not represent a great monetary value. Instead they can be important in a certain social context. For example, a picture on a rare bird can prove to ornithology community that the photographer actually saw the bird. The legal challenge is related to moral rights: the photographer should have a right to be recognized as the one who took the picture.

Family pictures. Again, some pictures like those on relatives and personal occasions and trips have hardly any value to outsiders, but they can be very important to photographers themselves and their family members. The legal challenge is again related to moral rights, but this time the emphasis is on how pictures are used. The photographer and the people shown in pictures want to make sure that they are respected and the pictures are not used in a defamatory way. Sometimes pictures can also include private information, for example, on places where somebody has been or on someone's habits. The legal challenge is to make sure that no-one's moral rights and privacy are infringed.

Pictures on other works. A picture can also be a copy of another copyrighted work. Digital cameras make it very easy to copy and distribute any works of visual arts or literary works.

Second, legal challenges in this scenario can be grouped according to legal areas. In each area I further analyze the challenges from the viewpoint of different actors. The legal interpretation changes if the photographer is an amateur or a professional. Also, device manufacturers as well as operators, other intermediaries, and service providers have different perspectives on legal challenges.

Copyright issues at large are important especially to those who want to get return from information. In this scenario, the professional photographer is the most interested in copyright. It includes particularly photographers' exclusive right to make copies of pictures and the right to distribute them. Also, moral rights can be important in particular for an art photographer. Moral rights, where enforceable, include for example the right to claim authorship of the picture and to object to any distortion, mutilation or other modification of the picture, which would be prejudicial to photographer's honor or reputation. Intermediaries are careful not to be liable for copyright infringements. Other actors, like device manufacturers and service providers, can find business opportunities by enabling copyright protection.

Other intellectual property rights may be significant. Especially database protection is important in respect to the scenario because pictures in a camera plausibly form a database. Trademark is essential if photographers wish to build a brand as described in the scenario.

Privacy is very important for private persons. In this scenario, it concerns mostly amateur photographers. The other actors should make sure that they do not infringe people's privacy and that their systems enable appropriate privacy protection.

Labor law, in this scenario, affects professional photographers and their employers. In many countries, labor laws are badly outdated in respect to this kind of scenario. They are hard to apply in situations where working hours, company or group formation and other conditions are extremely flexible. Also, international issues will be significant. If a professional photographer travels rapidly around the world, it is not clear which country has jurisdiction over his employment.

Tax laws face similar challenges to labor law. Traditional tax laws are hard to apply in new kind of transactions on mobile networks. It is also unclear which fisc has jurisdiction to tax certain transaction.

Contracts affect everybody in this scenario. As laws are in general outdated and cannot be revised quickly enough, most legal problems must be solved in contracts. However, all actors do not know each other on the Mobile Internet. It can be even impossible to predict who will be the other parties in a certain transaction, because they can be moving and the connections are changing. Therefore challenges in contract law will affect everyone on the Mobile Internet.

Criminal law is the ultimate legal protection system. Typically photographers do not face criminal law in their everyday life, but it remains the eventual legal solution.

HOME-CARE AND HEALTH MONITORING SERVICE

DESCRIPTION

In this scenario, a health care organization (HO) – like a public health care system, a hospital, or a health maintenance organization (HMO) – is responsible for the health care of a group of individuals. The responsibility can be based on an obligation under public law or under a contract. Mostly to reduce costs, HO makes a subcontract with a Home-Care Service (HCS) so that the HCS provides some of the individuals with home-care that HO is responsible for. HCS can, for instance, take care of a senior citizen that does not need to be hospitalized but needs daily visits by medical personnel. The responsible physicians are still within HO, but nurses and support personnel that provide daily care are employed by HCS. The scenario covers both B2B relationships (HO—HCS) and B2C relationships (HO—patient and HCS—patient). [59, 61]

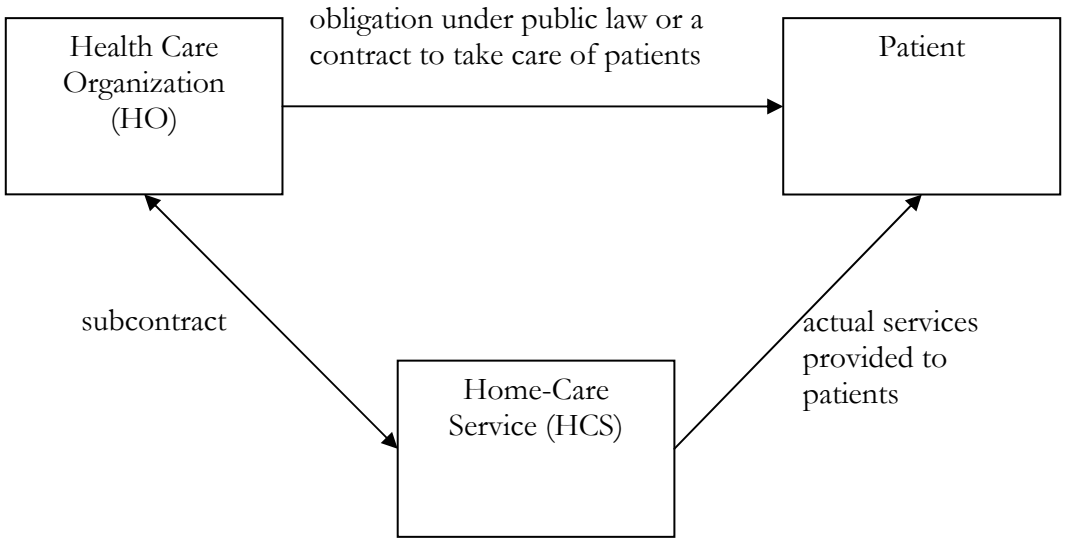

Figure 17. Relationships between the parties in the home-care service example

A home-care service by its nature is very mobile. The personnel are constantly moving between, for example, homes and the office. Often their schedule has to be changed during a day due to the unexpected needs of the patients. However, conventional technologies and operational models do not especially support that kind of dynamic and mobile work. The usage of personnel is inefficient, response times are long, and changes are hard to make. It is often difficult to get the right information when needed. The knowledge base is huge and it is impossible to keep all the important information within reach when home-care personnel are visiting patients. Instead, they often have to go back to the office to get more information. Same applies to authorization issues: in health-related services, it is crucial that a person is authorized to accomplish a certain action. In changing situations, it is often necessary to go back and ask for permission to complete some measures. That is inconvenient at very least.

Wireless technologies can improve the service remarkably. The personnel are always connected with the office and they can instantly get new directions and information as the tasks change. They can immediately contact physicians at HO whenever a patient needs doctor's help or some additional authorization is required. [15]

In a more advanced system, patients can also be equipped with wireless devices that help them to communicate with HCS personnel or even automatically call help. That might include a set of wearable sensors that send information about person's vital functions to a control center. Optionally some of the sensors can be installed inside customer's body. The service sends reports and instructions how to improve their health. In the case of emergency, the service can call an ambulance, a doctor, or other help provided it gets patient's location information. The customer could even be equipped with a dosage device so that with the permission of HO's physician HCS control center can remotely give for example insulin, vitamins and micronutrients or heart medicine when needed. [15, 61]

The capabilities of the service are heavily based on information. First, a lot of information is extracted from the users and stored in the service. Second, a large computerized knowledgebase is used to help the doctors to make decisions and even to automate some choices. Third, the doctors and other professionals within the service obviously use their own knowledge to help the customers. All this information can be very valuable and therefore the service operator can be interested to sell it further. Perhaps it is possible to fund the service by selling such information to other entities. Also, this kind of sensitive personal information can be attractive for malice usage. So, it is an essential question who should be able to control this valuable information: patient, HCS, HO, or someone else. [15, 61]

Health services have traditionally been very local. A doctor cannot serve people in a very large area. However, the service described in this scenario is not geographically limited. It could be offered to the customers around the globe.

This scenario represents a sample application of ubiquitous computing. New business models are also involved. Some important mental aspects should be considered, like how the users feel if some unknown people in a control center, "a big brother", even with their permission, is always monitoring them and knowing better than themselves how they are doing. This might be also an example of changing work. A doctor can be sunbathing on a beach while on duty. In an emergency, the doctor gets all the information on the patient, including the medical history and the current condition, and is able to interview the patient using a mobile terminal still lying by the sea. [e.g. 15]

LEGAL ANALYSIS

Contracts. In this scenario, just like in the previous two, contractual issues may become central.

International Law. If the service is provided globally or if a customer travels abroad while using the service, international aspects become vital. Laws concerning health services are quite different around the world so it may have a vast impact on the service under whose jurisdiction it is.

Intellectual Property Rights. In this scenario, intellectual property rights do not protect remarkable portion of information. Data on a customer, a single advise from a physician, a control message from the control center are very important, but hardly protected by copyright or other intellectual property rights. The more data are collected in a database the more likely the whole base is covered by database protection. Refined advises, edited messages, and sophisticated automation programs are also more likely to be copyrighted. Therefore intellectual property rights will be more important in this scenario if the service is further developed towards a more mature system that not only transfers data, but stores and distributes refined information in a stylish way.

Privacy. Large part of the information managed in this scenario is private by its nature. People do not want to see information on their health spreading around. Therefore the system must support privacy and confidentiality extremely well. On the other hand, many companies and public agencies would be very interested in accessing those data. For example, a commercial company would be able to direct marketing quite accurately to right individuals if it knew that much about their habits and health as this system knows. Some customers might be willing to benefit from the situation while others are so concerned about their privacy that they would not dream of letting this service to sell the information. In European Union, the data protection directive (Directive 95/46/EC) has set quite strict rules, but in the USA, for example, the discussion about privacy protection has not led to comparable statutes so far.

Professional Negligence and Torts. The scenario presents a situation where physicians and other experts have a remarkable liability on people's health and life. It is extremely difficult to make this kind of a system completely reliable. In some countries, the potential damages based on medical malpractice or products liability could be enormous. In general, entities that offer expert services through the Internet may be accused of professional negligence. It is possible that the legal risks prevent this kind of services even if both the customers and potential service providers want them. In addition, many countries have strictly limited who is allowed to give medical services in their jurisdictions. A service like the one described here would possibly conflict with these rules.

MOBILE P2P DATABASE

DESCRIPTION

Imagine users moving around and accessing a certain service through their mobile devices. The service is not physically located in a central server, but distributed in the user devices on the network. A conventional way to build a service on the Internet is to have a central database, application software on top of the database and users accessing the application through the network. In a P2P solution, both the database and the application is split and distributed into the user devices. That is, each user device includes software that not only provides the user with a view to the service but also shares information in the device with other users. A portion of the database is stored in each device. For performance, quality of service (QoS), and safety reasons, some data are replicated in many devices. No device however needs to have all the data. In other words, the database is not located in one physical place or device, but distributed in a number of mobile devices. [60]

Depending on the service, users themselves can produce information and store it in the system, or the system can be used merely to distribute information from other sources to the users. At least some of the data is produced automatically within the system. The application software sends queries through the network to other devices and combines the answers to form a single view to the database. [1, 12] The user does not need to know where the information is located and where the answers come from. To a user, the system at its best will look like whole the service and all the information is in the user's terminal device. This will enable ubiquitous services in which moving users have always and everywhere access to enormous databases. [60]

It seems possible that in the future P2P systems will be combined with commercial services that add value to the free P2P systems. For example, a free mobile P2P database could be enhanced with commercial value-adding services like updated news or access to some IPR protected resources. Also, companies are implementing digital rights management (DRM) systems into P2P networks making it possible to control the usage of any data in the system. [60]

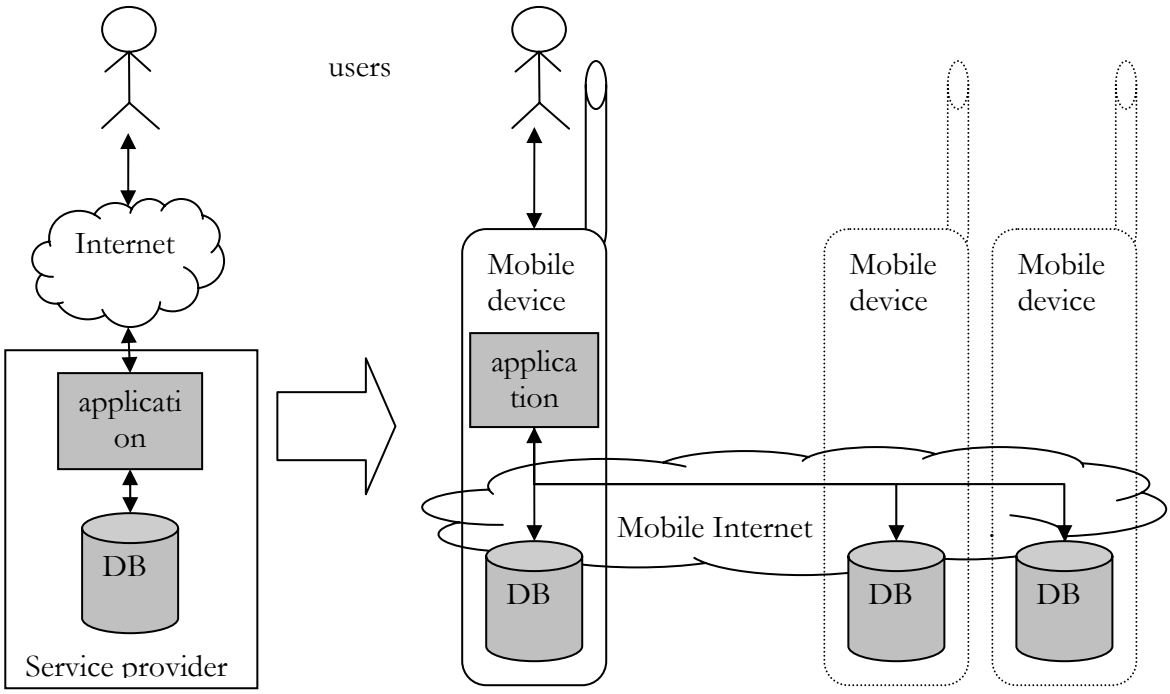

Figure 18. Change from the conventional Internet service to a mobile P2P model.

Obviously, the P2P model has some significant technical preconditions that are not fulfilled so far. For example, the current mobile devices do not have enough computing power and storage capacity nor do mobile networks at the moment provide enough bandwidth to enable this kind of solutions. However, taking the fast pace of technological development into consideration, it seems inevitable that in a few years it will be possible to build such systems. [60]

LEGAL ANALYSIS

In the following, I analyze the database right in the context of the mobile P2P databases. As described earlier, (see *Database protection*, page 32) the database sui generis right definitions seem to have problems even as far as conventional database systems are concerned. The mobility and peer-to-peer applications hardly remove any of those difficulties.

For example, more than ever, it will be troublesome to characterize some databases as arranged in a systematic or methodical way. The physical structure of a database will be in continuous change as the devices move around, access points change, and connections and routings vary. The momentary snap-shot of a database can appear arranged, but after a split second, the arrangement is completely different. Of course, that again depends on the level of abstraction. Certain levels, logical dependencies within database schema, and so on remain unchanged, although devices move. Yet, as discussed above, it is quite unclear on what level of abstraction database right requires certain arrangement.

I have concluded above that the requirement of substantial investment is central in the database sui generis right. Will the mobility or peer-to-peer approach change something in investments? In general, the mobility will be achieved with the help of enabling infrastructure and middleware. Those who build databases will not usually need to worry much about technical details related to mobility and peer-to-peer approach.

Although significant investments will be required to develop sophisticated technologies to enable mobile P2P databases, they will not be investments in a particular database and they do not help to achieve the sui generis right. Instead, investments in a database as such will not change much. Also in the mobile P2P databases, there will be qualitatively and quantitatively substantial investments in the obtaining, verification and presentation of the contents. However, if the users will obtain, verify, or present the contents themselves in a peer-to-peer fashion, then it is likely that no single person or entity has contributed substantial investments. Such a P2P database may remain out-side of sui generis right. That, nevertheless, is probably desirable. Most users, in all likelihood, prefer that no-one gets exclusive rights in the outcome of their joint effort.

Another interpretation could be that if the total investment is substantial, then the database is protected and all the users that have contributed get a collective right. In practice that kind of collective right is very difficult to manage and does not necessarily satisfy users' expectations. The directive nonetheless does not tell us which interpretation is correct. Yet, if peer-to-peer technologies are used only to deliver a database to users, but the content is obtained, verified, and presented by a single entity, a service provider, then this entity will have the database right.

The Mobile Internet will be significantly international. It means that mobile P2P databases can spread among different countries effortlessly. The rights in databases nonetheless depend heavily on jurisdiction. Within European Union the database sui generis right brings forth a common legal ground for business models based on mobile databases. However, as a mobile database spreads further, the legal situation becomes more complex. From international perspective it would be desirable for the mobile business and ubiquitous services that countries adopt similar database protection laws. [60]

In practice, however, efficient DRM systems may solve many of the legal uncertainties. An efficient DRM is also able to manage database rights to the information. From business perspective, therefore, it is a sound strategy to implement a DRM system in order to control the usage of databases. If appropriately protected a DRM will protect all layers of data regardless to its semantic characterization as information or data, and regardless to its representation and value to the user.

I conclude that, in general, the present arguments in favor and against the database sui generis right will stay with respect to the future mobile peer-to-peer databases. Some of the problems that are already visible will be highlighted. New technical solutions may solve some of the problems in practice. However, the fundamental idea behind the database right, that of protecting substantial investments, will remain central as regards to mobile P2P databases.

SUMMARY

Based on the scenarios analyzed in the thesis, I conclude that the legal areas including most challenges on the mobile Internet will be

- intellectual property rights,
- privacy, and
- contracts.

It seems that intellectual property rights, particularly copyright, will be the legal area where most of the challenges come up. That is not surprising considering that the focus of the study is information products, and intellectual property rights often protect them. The interesting point, however, is that there seem to be emerging new kinds of challenges. Especially issues related to content adaptation will be significantly more challenging on the Mobile Internet than before.

On the other hand, although digital technology in general has made for example unauthorized copying very easy, challenges related to copying, distribution and other fields of intellectual property rights do not necessarily change a lot from how they occur, say, on the wired Internet. Still, the increasing volume of certain subject matters will make even some well-known challenges more important. Challenges related to database protection for example will be more and more important because there will be rapidly increasing number of many kinds of databases on the Mobile Internet. Their legal significance will multiply even if there would not be any new challenges related to them. Similarly patents will be more important on the Mobile Internet because there will be many more patentable inventions, and trademarks will be increasingly important because of the growing importance of brands.

Another very important legal area will be privacy. Mobility, context-awareness, and ubiquity will bring computer networks even into the most intimate places and walks of life. Challenges to privacy are much greater on the Mobile Internet than ever before.

There will be major challenges related to contracts. First, on the Mobile Internet, it is not always easy to find out, who the contracting parties are. Second, it will be sometimes difficult to state what is the subject of a contract. It can also be complicated to determine when the parties have committed to the contract. Moreover, on a mobile network it can be troublesome to decide which is the correct law to govern a certain contract as well as which authorities have jurisdiction over disputes concerning it.

There will be noteworthy challenges in other legal areas too. For example, international law in general will be important, because of globalization and moving users. Labor law will face challenges because of changing work. Tax laws meet challenges because of new kinds of transactions, resources, and incomes as well as moving users, globalization, and changing work. Criminal law will be challenged not only by new kind of international and computerized criminals but also because it will be very difficult to decide weather some objectionable act in the new environment is punishable according to the existing law. Constitutions can face challenges as political systems are challenged. Nevertheless, based on the scenario analysis, those other legal areas do not seem to bring forth as crucial challenges as the first three. In addition, legal areas like corporation law, environmental law, family law, procedures and litigation, property, administrative law, and torts will hardly have new challenges because of the Mobile Internet.

It depends profoundly on the viewpoint, which legal challenges are the most important. I have focused on four viewpoints, those of content provider, operator, device vendor, and user, because they represent satisfactorily different entities on the Mobile Internet. The following table summarizes how much legal challenges I expect that there will occur in the legal areas from the viewpoints.

In addition to the scenarios presented in this thesis, I have analyzed several other scenarios as well as the attributes presented above and made sure that they do not put on any other important legal challenges. Therefore the challenges above seem to be the most crucial in the scope of this thesis.

From the methodological point of view, I believe I have demonstrated the usefulness of scenario generation and analysis in legal research, even though this departs strongly from the conventional practice of jurisprudence. I believe that adopting such new ways of thinking and analysis will be important to maintain the usefulness of legal research in the Information Age.

For our work, scenarios were chosen also for other reasons. In the future, we should be able to use the scenarios in other studies as well. Our continued research will focus on digital rights management, systems interoperability, intermediary liabilities, trusted third parties, and so on. I expect that the scenarios will help us to assess different options in each of those focus areas.

	Content provider	**Operator**	**Device vendor**	**User**
Intellectual Property Rights	Numerous vital challenges	Some liability issues, need to support solutions	Support solutions	Few challenges
Privacy	Numerous liability issues and constraints	Some liability issues and constraints	Support solutions	Numerous challenges
Contracts	Numerous challenges	Numerous challenges	Support solutions	Numerous challenges
International law	Some challenges	Some challenges	Support solutions	Some challenges
Labor law	Few challenges	Few challenges	Support solutions	Some challenges
Tax	Some challenges	Some challenges	Support solutions	Some challenges
Criminal law	Few challenges	Few challenges	Few challenges	Some challenges

Table 3. Expected legal challenges in the legal areas from the viewpoints

DRM FRAMEWORK

INTRODUCTION

This chapter presents a draft framework that aims at helping the discussion what is related to digital rights management and where the future work in this field should be focused on. The framework defines the concept of digital rights management, its central parts, and relations between those parts. [58] It should be noted that the framework is only a sketch. My future work will hopefully further develop the framework taking more in detail into consideration the scenarios and legal challenges presented above.

Recently several companies and organizations have published products to manage rights in digital information. Those companies include for example Adobe, IBM, InterTrust, Liquid Audio, and Xerox ContentGuard [112, 115, 126, 128, 131, 146]. However, there seems to be a lack of common understanding what this area includes. All the companies have different concepts. This chapter presents a framework that aims at eliminating common confusions and helping the discussion on rights management, how the products in this field could be made interoperable, and where the work should be focused on. The framework defines the concept of digital rights management, its central parts, and relations between those parts.

According to the definition stated in the beginning of the thesis, *Digital Rights Management* (DRM) is the set of actions, procedures, policies, product properties, and tools that an entity uses to manage its rights in digital information according to requirements.

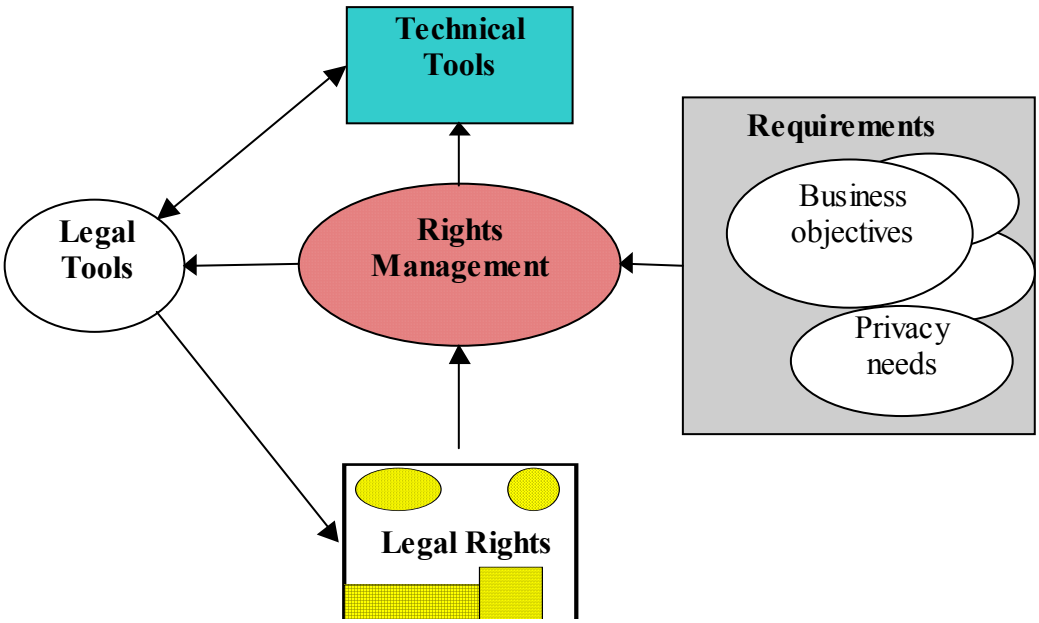

Figure 19. The areas of digital rights management and their relations.

LEGAL RIGHTS

The basement of the framework consists of the rights to be managed. In the bottom are intellectual property rights (IPRs). They protect the valuable outcomes of e.g. content production and software engineering. As described earlier, copyright has traditionally been the most important legal tool to protect for example texts, pictures, computer software, and other original intangible works while patents have been used to protect more hardware related inventions. [24, 49] Nowadays a growing number of inventions related to, for example, multimedia or Internet applications are within patentable subject matter. Although this development has also been widely criticized, it seems obvious that patents will become more and more important.

Other important intellectual property rights that should be taken into consideration in this context include trademarks. A manufacturer or a seller uses them to promote and distinguish its products from those of others. As they protect some valuable parts of an information product, especially brands, they are an essential part of digital rights management. [21] As described earlier, database protection and other intellectual property rights are also noteworthy.

Not only intellectual property rights but also several other kinds of rights may be involved in information products. For example, right of privacy is a fundamental right in many legal systems and can affect the distribution of information products in many ways.

It should be noticed that an entity may have several different legal rights in one single product. Those rights can be overlapping and protecting the same parts of the product, though in principle different rights protect different valuable parts of a product. For instance, patents can protect new, non-obvious ideas related to a product, copyright protects the way ideas have been expressed, trademark protects e.g. brands, and trade secret protects business information that is kept confidential to maintain an advantage over competitors.

There is a number of international treaties that aim at harmonizing intellectual property rights in different countries. Nevertheless, details of legal rules vary from jurisdiction to jurisdiction. For example, patentable and copyrightable subject matters in the US and EU differ in a way that must be taken into account when designing interoperable rights management systems. Therefore, if a product is adequately protected in one country, say, by copyright, in another jurisdiction it might be completely out of legal protection. Thus for an entity that operates on the Internet or otherwise internationally, it is very important to understand the complex international legal situation.

Even in one single country, intellectual property rights are nowadays typically developing in a fast pace. Therefore the situation is very dynamic. Tomorrow, the legal protection of one's products might be quite different from what it is today. An efficient digital rights management system should be able to handle the dynamics of the field in multiple dimensions: entity's own rights change in the course of time, the legal system is changing, and the differences between jurisdictions can be remarkable.

As defined above (see *Definitions*, page 16), a *legal product* is the combination of the parts of a certain information product that are protected by legal rights. Those legal rights can be different in different jurisdictions and different times. Therefore a legal product is a very dynamic concept. The parts of a product that are protected by legal rights are legal components. On the other hand, a legal component itself can be a legal product or an atomic subject matter.

For instance, a multimedia product consists of many kinds of parts, like video clips, texts, and pictures. A video clip, for example, is typically another combination of several parts. Therefore, a multimedia product includes a legal product that may consist of other legal products. At the lowest level, all those legal products are combinations of atomic subject matters like a piece of text that is created by one author or a picture created by one artist.

Figure 20 below illustrates in UML notation how a legal product is the combination of one or more legal components. An entity can have rights in legal components that are either legal products themselves or atomic subject matters. On the other hand, several entities can have rights in a same legal component. This means that a legal product can be a complex combination of many kinds of legal components and the different rights of a number of entities in components. In general, a rights management system should be able to handle such complex legal products.

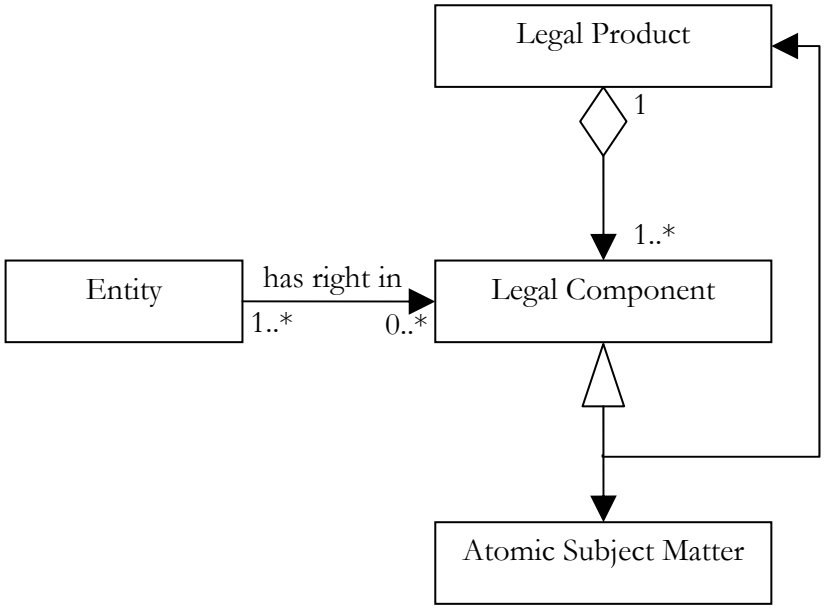

Figure 20. A legal product is the combination of legal components.

Figure 21 illustrates how different intellectual property rights protect different valuable parts of an information product. Those rights can overlap, i.e. sometimes more than one right protects a part of a product. However, it is important to notice that in most products there are gaps, valuable parts that are not protected by any legal right.

From the DRM point of view, an entity needs to manage intellectual property rights not only on a legal product level but even on an atomic subject matter level. For example, a publisher of a multimedia product needs to be able to license all the components of the product and to share the revenues with all the right holders. Also, if somebody wants to reuse a legal part of a product, for instance, if someone would like to copy a picture from a multimedia work to a new book, it should be possible to find out who may legally grant the right for it.

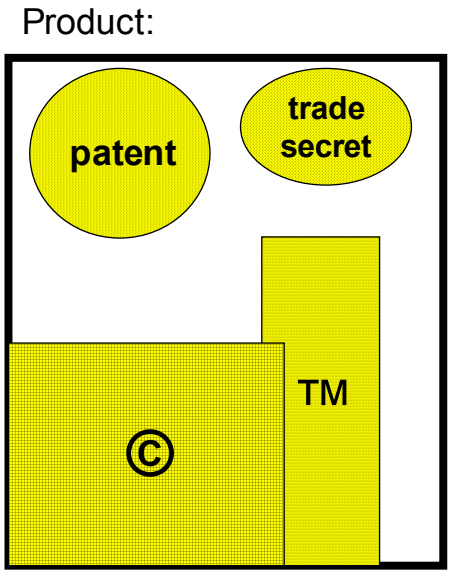

Figure 21. Different intellectual property rights in an information product.

In principle, the framework should not be restricted to legal rights only. An entity might have for example moral rights that are not legally enforceable. An entity may also believe that it has a certain right and act according to that although it actually does not have the right. Those moral and imaginary rights should be considered also, because they have an effect on how an entity manages its rights. Having said that, it is not in the scope of this thesis to discuss them further.

REQUIREMENTS

Not only legal rights have effect on what is included in rights management. An entity has also requirements on rights management based on business objectives and methods, on its role in a delivery chain, on privacy needs, and so forth. Obviously, different entities may have very different requirements. For instance, an author or any originator has quite different needs from those of an intermediary or an end-user. Furthermore, needs among intermediaries vary. Some of them need to take a lot of care of marketing as well as revenue collection and sharing while some other intermediaries are mostly concerned about their potential liabilities on rights infringement. For example publishers and Internet service providers can both be intermediaries but they often have different needs. The strategies of entities can vary between castles and pioneers as described in Chapter *Legal Background*. In addition, each delivery chain is different and each entity has its own special needs. Legacy systems, for instance, may cause particular requirements. Therefore, rights management activities on organizational level should reflect the requirements of that specific entity. In this thesis, I shall not try to define where those requirements actually come from and how they should be managed, although in practice they are most important to be taken into consideration.

RIGHTS MANAGEMENT

Rights management is discussed below on two levels: the organization level and the product level. Both the levels are closely related and they depend on each other.

First, rights management on organization level includes at least the activities that

- *Set and refine rights management policies.* An entity should define and continuously improve definite courses of action on how to manage its rights in information products as part of its intellectual asset management strategy.

- *Make and manage agreements.* Making agreements on rights in information products, and contract management related to those agreements is a part of rights management on the organization level.

- *Manage information on acquired rights.* In most cases, at least some rights in information products are acquired from other entities. It is important to know from whom those rights were received, how broad the rights are, how much and when the entity must pay for the rights, and so on. Managing this information is a part of rights management.

- *Control and enforce licenses.* In most cases, reasonable business requires that a company licenses some rights to other entities. Therefore it is essential that the company is able to control what the others do with its products and, if necessary, enforce the terms of license agreements.

- *Support marketing.* There will be lots of different business models and marketing methods involved in digital information. For that reason, rights management activities need to be flexible enough to support whatever marketing methods an entity decides to use. For instance, if an entity, for marketing purposes, wants to let other entities to use its information for free for a certain period of time or a certain number of times, and thereafter charge an increasing fee for each usage, rights management activities should be able to support that.

- *Support revenue collection and sharing.* Especially for commercial entities, it is crucial to be able to collect revenues from the users of the information. Also, those entities need to be able to account and share revenues to other entities in accordance with agreements on acquired rights.

- *Risk management*. Risks involved in digital rights management are future possible losses related to information in digital form. It is possible to manage those risks in advance in several ways.

Second, rights management on the product level includes product properties that support rights management activities on the organization level. Products should have appropriate properties to support rights management activities on the organization level. Especially the following properties are often useful.

- Adequate *information* on policies, agreements, and rights so that entities can be informed about their rights and responsibilities and so that policies and agreements can be enforced.

- Properties to *enforce* policies and license agreements.

- *Revenue collection* support.

An entity does not have much influence on all the rights it has. In many cases, however, an entity can substantially affect on some of its own rights. For instance, it may apply for a patent or try to acquire rights from other entities. It may also try to influence on legislation and change the law. Therefore not only legal rights affect rights management, but also rights management can have an effect on legal rights.

TECHNICAL TOOLS

Rights management is performed with the help of technical tools. There can be several different kinds of technical tools.

Rights definition languages are meant to precisely describe rights so that all the entities involved can act in accordance with them. For example, using a rights definition language, an entity could describe that it gives to another entity a non-exclusive license to complete specific operations on particular information certain times in a specified period of time if the other entity complies with certain conditions like pays certain fees. Such information is adequately included in the rights description part of an information product's metadata. It is not necessarily packaged with the actual content, but it may be delivered, for instance, in a separate certificate.

On the other hand, rights definition languages can also be used to specify that an information product can be used for free on certain conditions, or even that the product can be used freely and the rights holder has no claims, "no rights reserved". Interesting undertakings related to open source ideology are trying to implement this in practice – most notably *Creative Commons* project. [116]

It is quite demanding to define a formal language that can be used to correctly express all the necessary rights in different jurisdictions. There is some interesting work going on to define such a language. Like described earlier, especially, eXtensible rights Markup Language (XrML) [147] and Open Digital Rights Language (ODRL) by IPR Systems Pty Ltd are quite promising attempts [135].

A couple of important problems related to rights description languages remain almost untouched. First, it is possible to describe very complex sets of rules using those powerful and expressive languages. A rights description resembles a computer program – and why not – it is meant to be understood by computers. For a human being, it can be very difficult to understand what those complex sentences mean. However, when somebody buys an information product, it is essential what rights are licensed or assigned. Even if the customer gets the right data, but does not get the rights needed, the customer does not get what was expected. Especially in those countries that have strong consumer protection laws, it is important to inform a consumer in advance what is to be sold. But even if the buyer is not a consumer – but e.g. a company – the transaction must often be cancelled if the buyer does not get what it was anticipating.

Therefore, it would be important to be able to let the buyer understand what is described in the rights description language, but in general it is very difficult. It is not enough that if a DRM tool finds out that certain operation is not allowed, it only gives user an error message telling something like "Operation not allowed" or "Error in certificate line 798." User should be told why the operation was prohibited: a message like "You are not allowed to copy the document because you have already made all the three backup copies that the license grants" would be much more informative. However, a general automatic translator that would produce a clear description of rights in a human language is probably impossible unless the rules are considerably restricted.

The second untouched problem is the lack of general *ontology*. Each legal system as well as – for instance – all those rights description languages form a conceptual system of their own. For example, concepts like "fair use" or "author" have different meanings in different legal systems or some of them may be non-existent in one system while most important in another. To be able to use a DRM system in a number of legal systems, it would be fundamental to share the same concepts.

It is not possible to change all the legal systems to use the same concepts. It is hardly possible to build even a general, universal ontology that would define all the important concepts in all the jurisdictions. That ontology could be used to translate terms between systems, rights description languages and so on. For example, Open eBook Forum has developed a Framework for the Epublishing Ecology [137] that is an excellent starting point but lacks the needed accuracy, particularity, and exhaustiveness. Also, many jurisprudence scholars have published comparative studies that analyze differences between legal systems but they are not general enough and not meant for this purpose.

Actually, it is not possible to define precisely all the legal concepts even within one single jurisdiction. Therefore it is impossible to create a general universal legal ontology. The only reasonable way to achieve common understanding is to accept that there are many coexisting ontologies and try to find some correspondences between them. This could enable the creation of a DRM system that were applicable in several jurisdictions – in a limited way, of course.

In addition to a rights definition language, entities need a common understanding how to transfer data from one entity to another. One of the most important requirements on the DRM technical tools is that they are interoperable enough in a network environment. Therefore at least a defined set of communication protocols is required.

Technical protection systems are mostly in product level and meant to assist on product level rights management. They include software tools for authentication, access control, integrity, watermarking, and so on. In most cases, encryption is an essential part of these tools. Many technical protection systems need hardware support. For instance, it is not possible to make a perfect copy protection system without hardware support – not to say that it is possible even *with* hardware support. The most effective solution, a globally tamperproof hardware, is not easy to develop and standardize. Therefore it remains questionable whether reasonable technical protection systems are possible to implement. There are also other serious concerns related to technical protection including for example usability issues: technical protection systems tend to make products less usable and thus less attractive to customers.

Oftentimes, it is not necessary to prevent unauthorized copying. In many cases, authors would like to see their works spreading everywhere. Instead of restricting copying they can be concerned about their moral rights, for example, that they are mentioned and given credit where it is due. In these cases, technical tools do not need to prevent copying, but they should take care of the moral rights of the authors.

Technical tools to protect certain information products gain special legal protection based on Articles 11 and 12 of the WIPO Copyright Treaty. According to those articles many countries have provided legal protection against the circumvention of technological measures that are used to protect copyright as well as against those who remove or alter rights management information without authority. Yet, there are unsolved questions concerning the legal status of technical protection systems [69]. Those statutes do not require that the technical tools are of high quality. In fact, almost any kind of technical protection system is protected. This raises interesting questions about the role of legal system: does it really make sense to patch up poor engineering with laws?

Rights management systems on an organization level are used to support activities within the organization. A trivial example would be an information management system to manage information on acquired rights and license agreements.

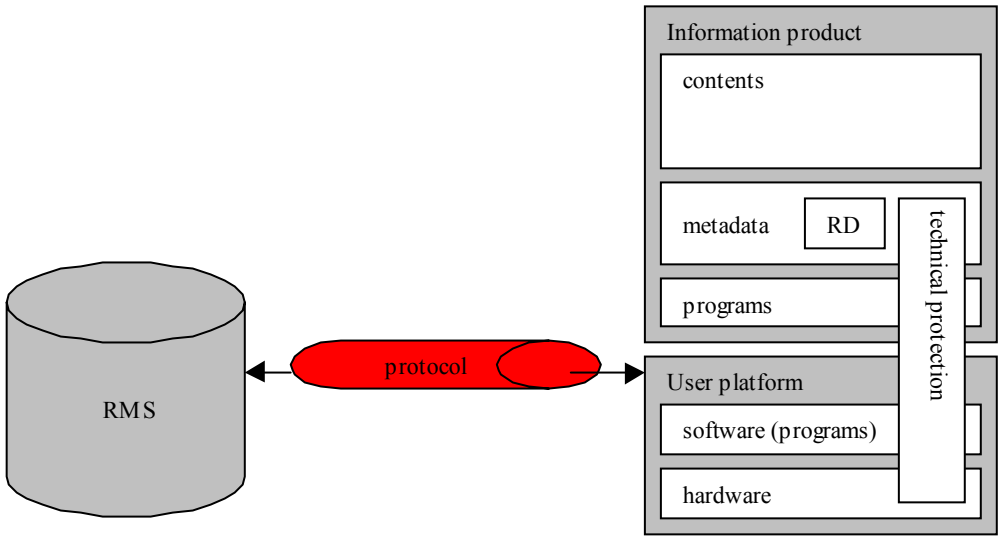

Figure 22. Technical tools in digital rights management.

In Figure 22, an information product consists of contents, metadata and possibly computer programs. An entity accesses the information product using a user platform, which includes hardware and software (i.e. computer programs and data). The technical tools include e.g. the rights description part (RD) of metadata; technical protection tools consisting of metadata, software, and hardware; and the rights management systems (RMS) of intermediaries and originators. The technical tools communicate with each other using a communication protocol.

LEGAL TOOLS

Legal tools, in this thesis, are the set of tools that a legal system provides to protect, create, obtain, assign, and modify one's legal rights. They include, for instance, law enforcement, litigation, arbitration, and execution of court's rulings. Also, the legal procedures – like patent prosecution and trademark registration – that are to create new rights are legal tools. Furthermore, contracts can be used to create, obtain, modify, and assign entities' rights and therefore they are also examples of legal tools.

Legal tools and technical tools may depend on each other. Technical tools may be needed for production of evidence. For example, a technical tool can produce log files that can be used in a court but that are worthless as evidence unless the technical tool is designed correctly. Legal tools may heavily depend on technical tools and, therefore, legal tools need to be considered when designing technical tools.

FUTURE WORK

To make the electronic commerce of information products work, we do not need to solve the problems in all the above fields. It is important to understand where the requirements on rights management come from and how they affect on rights management. Yet, it is not essential at the moment to solve all the problems in requirements elicitation, definition and so forth. Alike, legal tools may have their limitations and difficulties, but let us leave them for now.

The central area to build a working electronic commerce for information products is the combination of legal rights, rights management, and technical tools. Legal rights and the corresponding liabilities need to be fully understood in order to build rights management on top of them. As mentioned earlier, there are also a number of problems related to those rights. They can seriously harm the industry.

The main focus of the further work should be on rights management and especially on technical tools to support it. Although this area is crucial to electronic commerce, today, only a few points are well-known. Linkages between DRM and entity's general intellectual asset management and intellectual property strategy should be studied in more detail. In general, the framework should be elaborated further. For example, going through sample cases that show its shortcomings and faults can refine the framework.

SUMMARY

Digital rights management is of growing importance. Many future business models that are related to information products and the Mobile Internet depend on a reliable rights management system. Today however, we have not yet seen a good solution to all the problems shown in this thesis. Many important policy issues should also be considered. An important question is whether a legal system should protect existing business models, or enable competition and new sustainable business models and leave the decision to the markets.

TABLES OF FIGURES AND TABLES

FIGURES

TABLES

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