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Abstract

This article aims at describing the future legal challenges related to information products and services on the Mobile Internet and World Wide Web. Using a scenario-based methodology, we describe the most essential characteristics of the future Mobile Internet and how information products and services would be used on it. The scenarios are built using a systematic method. As the emerging problems are very complex, we must take into account several major factors that delineate the Mobile Internet and its use. We consider not only technological changes and economic factors, but also societal issues and how individuals feel and behave. The scenarios enable us to identify what kinds of legal challenges are likely to emerge. Based on our analysis of the scenarios, we conclude that the legal areas that will include most challenges on the Mobile Internet are intellectual property rights, privacy, and contracts. We also outline further research into how these challenges may be addressed or contained.

Keywords: Mobile Internet, Information Product, Legal Issues, Digital Rights Management (DRM), Intellectual Property Rights (IPR), Contracts, Privacy, Scenario Methods, Societal Aspects of Information Technology

1 Introduction

The Mobile Internet is likely to constitute the next major generation shift in computing. Fueled by the introduction of ubiquitous wireless access through wide-area networks such as 2.5 and 3rd generation mobile telephony, local-area networks such as wireless LAN (WiFi), and proximity networks such as Bluetooth, the Mobile Internet will cover perhaps a billion users by the end of the decade. For many of the users, it will be their first and sole connection to the Internet.

In addition to ubiquitous access, the Mobile Internet is likely to offer functionality and application enablers that set it apart from the wired Internet. These functionalities include service roaming, terminal positioning, presence service, context management, and ultimately the “disappearance” of computing into both the everyday surroundings and the users themselves.

These characteristics of the Mobile Internet will enable many new business opportunities for various kinds of companies, such as telecom operators; media houses; financial service companies like banks; industrial companies; and a great variety of other services from travel and tourism to education and cultural services. Just like the wired Internet, it may also offer a rich set of tools and platform services to end users and user communities for creating their own services.

While certainly very attractive, the new services made possible by the Mobile Internet are also vulnerable to legal risks and challenges such as unauthorized use of information. One of the most important ways for companies to utilize the Mobile Internet will be to commercialize their intangible assets. Companies have learned methods to do that on digital markets. Still, it is not well known how they could extract the most value from the information they possess. [24, 26] It seems to be a major concern and a business obstacle that the entities do not yet know what kind of legal challenges they will face on the Mobile Internet. For example, peer-to-peer network services are very effective for information product distribution, but recent examples (e.g., Napster) starting from the late 1999 in music and movie products suggest it to be difficult. [16]

By *legal challenges* we mean difficulties in legal reasoning or somehow unsatisfying outcome of the legal process. It should be noted that in general legal structures are intended – among other purposes – to facilitate business: they diminish risks, encourage trust formation, and thus enable business methods. In a novel business environment, however, existing legal structures may become outdated, contradictory, or difficult to apply to new and complex situation even when sound rules exist and can be found. This increases the transaction costs, and slows down the development of value networks and the market in general. At worst, companies become vulnerable to risks that could be avoided or contained if the legal challenges were better understood. [18] The poor understanding of legal challenges may also lead governments or standards bodies to regulate markets in an unsatisfactory way and even to create obstacles to services that might be important and useful both for users and the society at large. In this article, we focus on studying the challenges from the viewpoints of content providers, operators, device vendors, and end users.

The objective of the research reported in this article we aim to identify and study some of the most likely legal challenges related to information products and services on the Mobile Internet and Web. Instead of formal completeness based on a well-formed theory, we aim at

the more pragmatic goal of identifying challenges which both companies and policy makers should concentrate on to avoid the worst legal barriers. Moreover, we hope that our analysis can expose candidate solutions to these challenges by legal, technical, or economical means.

The article is structured as follows. First, we describe our scenario-based research method for identifying and analyzing candidate future Mobile Internet services. Next, in Section 3 we discuss what we consider the most essential characteristics of the Mobile Internet relevant for our work. Section 4 discusses the main dimensions of our analysis: technical, economical, and societal factors and attributes of the Mobile Internet. Next, Section 5 describes the scenarios that we have identified using our method, and discusses three of them in more detail to illustrate the nature of the analysis. Finally, Section 6 summarizes our findings and suggests directions for further research.

2 Research Method

In this study, we try to recognize legal challenges arising in conditions that largely do not yet exist. Mainstream 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 predict the future using conventional jurisprudential methods. Instead, futures research provides us with more suitable methods. Especially scenarios are useful when we want to describe how the world may be like and what kinds of legal challenges may occur. Scenario-based methods offer a scientific basis for describing future states and evaluating them from the present day perspective. Scenarios used in other fields of science are typically quite broad. In this study, scenarios are relatively narrow: they merely describe a possible service or a use-case. [8, 28]

We do not claim that any of our scenarios would actually be realized as such. Instead, they are intended to form a holistic picture of possibilities and concerns that may exist in the future. Scientifically we are facing serious concerns since – in terms of POPPER – we are making conjectures without immediate possibility to refutation. [21] We believe, however, that it will be possible to test the validity of the scenarios in later research with true use cases or prototypes further derived from the scenarios. [9]

The major problem we face is how we should create our scenarios to cover possible situations adequately. If we create them randomly, we will not be able to claim that they embody important issues to a sufficient breadth and depth. To avoid such biasing, we should be able to create the scenarios in some systematic way. For that, we need to understand the underlying factors and their attributes that influence legal challenges on the Mobile Internet.

We think that specific *factors* and their *attributes* can be identified that by interacting with the existing law imply the legal challenges. Based on the literature referred below and the discussions with domain experts (see Acknowledgements below), we suggest that the most important factors of the deployment and use of emerging Mobile Internet services from this article's viewpoint are *technology*, *economy*, and *society and individuals*. We summarize from literature, which *attributes* of each factor mostly seem to relate to the Mobile Internet. In the terms of futures research our attributes include also weak signals and trends. Then we create *scenarios* so that each of those attributes occurs at least in one scenario. Next, we identify legal challenges involved in the scenarios. We 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 we are able to form a list of legal areas that will hold significant challenges. Moreover, we can also indicate a plausible rationale and mechanism of why and how these challenges emerge. This suggests further work including structural innovations and changes to value networks and their legal rules. [17]

[Figure 1]

The method has some noteworthy threats to *validity*. We may make mistakes in defining the factors, choose wrong attributes, create scenarios that do not represent adequately the future situations, analyze the scenarios to insufficient depth, make erroneous conclusions, identify legal challenges incorrectly or insufficiently, and finally assess and therefore prioritize the issues erroneously. Based on the careful design of the study, however, we are quite confident that these threats to validity are limited. Our confidence is further strengthened by continuous discussions of the relevance of the scenarios with technology experts in leading technology companies and research institutions of the field (see Acknowledgements below). We have presented the work to them already in its early phases and they have commented it and helped us to improve the scenarios and the analysis. [4, 8, 9, 21, 29]

On the other hand, we can also argue that the question is not so much about validity as *relevance* of our research. Indeed, from an interpretivist/critical perspective it is not possible to create an accurate model of reality in the first place. Instead, the reality is interpreted and reinterpreted in various social contexts, aiming at exposing relevant aspects and viewpoints of the reality for a particular discourse in a particular context. Therefore, instead of formal validity, what matters is the pragmatic and operational relevance of the results to the stakeholders and the context. [3, 28]

3 The Mobile Internet

The sense of *mobility* depends on one's viewpoint. On a protocol level, a significant property of mobility is that the access point of a user's terminal is not fixed. Therefore packet routing to the terminal must be dynamic and may change during a communication session. This perspective 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. Therefore, to be mobile in practice, terminal devices must be wireless and portable. Our focus in this article is mainly related to the service level. Therefore, we emphasize the wireless and portable properties of terminal devices. Some of the issues however will relate also to the protocol levels. The *Mobile Internet*, in this article, refers to a computer network to which the end-users connect largely using mobile, wireless appliances. The *Mobile Web*, on the other hand, is the universe of information that the users are able to access through the Mobile Internet [30]. An *information product*, then again, is a set of valuable information, which is technically delineated in a form that can be controlled and transferred between entities. It may include content, metadata, and computer programs.

For our work, mobility has a number of fundamental qualitative consequences. First and foremost, unlike its wired predecessor, the Mobile Internet and its services have the potential of penetrating the whole kaleidoscopic richness of the everyday life of its end users. No matter where we go, what we do, or what time it is, the services will be there with us, for better or worse. The relation of a user and her services is hence likely to be intimate and personal, and the services should respect the infinitely varying use contexts and roles played

by the user. Moreover, the users are likely to consider their terminals and services as parts of their life-style, even as expressions of how they perceive themselves (or wish to be perceived by their peers), and they are willing to invest in their personalization.

A second consequence is that many Mobile Internet services are likely to relate to shared cognition, socialization, entertainment, and plain fun. Indeed, service designers should focus on the total *user experience* of the services. Apart from utility and usability, this term also includes the emotional tone of service use in a certain social, situational, and physical context. Contextual awareness, gained perhaps from some form of adaptive machine learning, is a key characteristic of such services.

These qualitative characteristics have a direct and deep influence to the topic matter of our work. To see how, recall that the wired Internet is largely based on the *end-to-end principle*: the network itself is neutral to the content of the packages it delivers, and whatever “intelligence” there is resides in the endpoints. Effectively, the Internet is a bit pipe that is agnostic to their meaning.

We conjecture that the mobile Internet will necessarily depart from this long-honored, and very successful, architectural principle. Indeed, the combination of characteristics such as service adaptation, context-awareness, and deep (automatic) profiling and personalization seems to require an overall architecture where the service platform and the underlying network must be aware of the content of the communication in order to facilitate service delivery and respect quality-of-service commitments. Even worse, we believe that the required “intelligence” cannot be localized in some distinct protocol or middleware level, but must penetrate all levels of the architecture.

Thus we seem to have a smoking bomb in our hands: On the one hand, we are expected to create services that infiltrate even the most private and emotionally loaded realms of their users’ lives; on the other hand, the delivery of these services seems to require the involvement of the entire contributing value network. It goes without saying that this combination is loaded with ethical, societal, and legal challenges.

To us, it seems that the resolution of this dilemma is to build the mobile Internet from ground up while observing and enforcing some yet-to-be-formulated rules of conduct that encourage, facilitate, and provide incentives for honoring what we regard as fundamental principles such as privacy, security, and trustworthiness in the mobile Internet. At the same time, the rules should balance the contradictory interests of the end users and the various stakeholders in service creation and provision. This big picture motivates also the research reported in this article.

4 Factors and Attributes

To be pragmatically useful, the fairly abstract concerns expressed in the previous section must be mapped into more concrete terms. In this research, we try to achieve this by considering three *factors* interacting with legal challenges of the Mobile Internet: technology, economy, and society. Each factor, in turn, is characterized in terms of what we consider its most significant *attributes*.

The factors and attributes are derived from the current literature and from the discussions with experts as described above. The list is not intended to be exhaustive, but to represent the most significant factors and attributes of the deployment and use of emerging mobile

services from this article's viewpoint. Table 1 summarizes our list of attributes per factor; the following sections provide further discussion and background.

[Table 1]

It should be stressed again that we make no claims to the completeness of this analysis; nor do we suggest any simple causal relations between the factors and the issues we aim to discover. Instead, we aim to establish a framework for discourse that can potentially facilitate the resolution of the issues.

4.1 Technology

Many interesting and important fields of technology related to computer networks are under rapid development. Many of them are still hidden in the laboratories of universities and in the R&D departments of companies. Yet, some of the major attributes of the Mobile Internet oriented to the future technologies and their use are already visible.

The first of them is the concept of *mobility*. Wireless and portable devices make it possible for the users to move around while having access to the Internet. This includes both the ability to access the Web in different places (*nomadic usage*) and the ability to use the Web while moving. Generally, this requires the capability of fluent *handoff* between various access networks and their access nodes. A related but distinct concept is *roaming* that means the capability of maintaining uninterrupted service sessions independent of the present point of access to the network. This generally requires the maintenance and mobility of some session state information as a result of handoff.

The second attribute is *context-awareness*. Context includes all the circumstances and facts that surround a particular situation or event. If a system is aware of the context, it may adapt its behavior accordingly. Typically, context includes facts like location and proximity, user and device identity, time, history, and activity. [11] It seems that location information will be one of the most important pieces of context information. 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 locations and gain added value of their inherent characteristics and constraints.

The third attribute is *content adaptation*. It is necessary to manipulate content information based on several reasons. They will include device features, user profiles, context information, and content's own characteristics as well as service properties. In particular, the characteristics of the wireless link between the wireless terminal and the access node should be taken into account in content adaptation.

The fourth attribute is *ubiquitous* or *ambient* computing. This concept extends the reach of computation and information beyond the traditional framework of a computer application running on a fixed set of hosts. The extension may be physical, breaking the ties of the wired desktop computer. Alternatively, the extension may be in scope, providing information services to the public in a form that does not require technical expertise. [13] Ultimately, this attribute may lead to the disappearance of computing into the fixed infrastructure and environment, or into the users themselves in the form of computing-enhanced clothes or ornaments.

4.2 Economy

The fast pace of technological progress makes people often forget that the laws of economics do not change easily. [24] We try to map the key economic attributes. First we separate them in two: those describing entities and those describing their economic environment. Then we identify three major attributes in both groups.

The *dynamic capabilities* of the organization become increasingly important. [18] In firms, this means strong change culture through specialized scope and focus on innovative niche products and markets; indeed, in the mobile Internet, the niches are likely to become ever more fragmented and transitory. TEECE has described dynamic capabilities as the ability to sense and seize new opportunities and manage intellectual assets. [27] To contrast, static capabilities focus on the efficiencies of existing procedures.

Second, the *resources* become more *intangible*. 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. [24, 26, 27]

Third, organizational entities and internal processes become more integrated with *low hierarchy*. The lifetime of a low hierarchy may be very short as new kinds of ad-hoc hierarchies emerge for specific purposes, such as providing a contextual service for a unique event. [1, 13, 27]

On the environment level, mainly on the markets, *network economics* and network effects are perhaps the most determinant attributes. Firms tie alliances and partnerships for strong external relations. Products and services that rely on demand side economies of scale turn out to be winning. [24]

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 the information exchange can be further tailored according to the needs of the parties. [24] In the Mobile Internet, the intimate relation between a user and her personalized terminal and services may strengthen the lock-in effect.

Third, the networked economy strengthens the importance of *branding*. 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. Sports, music and movies are already commodified into brands. On the other hand, existing brands do not automatically guarantee success on the digital environment. [23, 24] Brands also contribute to trust formation and maintenance.

4.3 Society and Individuals

Globalization is one of the most discussed attributes describing the fundamental societal change in the information age. Vaguely defined globalization is a complex set of economic, technical, cultural, and political processes taking place all over the human world. Global capitalism is taking over nation states and local political systems. The global institutional infrastructure lags way behind the power and movements of financial capital. According to SOROS, this creates a fundamental instability, which may lead to financial crises shaking societies at large. On the other hand, globalization has strengthened cultural and fundamentalist local communities that reject common values and build their own, contributing to value fragmentation. Globalization also influences everyday life of individuals where we,

following GIDDENS, have anything between cosmopolitans and fundamentals trying to live together. [1, 7, 25]

By the attribute *market culture* we aim to convey how all kinds of social interactions are being commodified increasingly broadly and deeply. At the level of individuals, clear monetary incentives result in building networks for every imaginable individual interest. Digital computer technology and computing networks lower the entry barriers for new products and services. Meanwhile at the firm level, producers of cultural products rely more on market analysis than artistic taste. Individuals in the information society seem to consume faster and get easily tired. [23]

At the level of individuals, the changing concept of *work* is affecting daily life. Concepts such as networkers and fleximers [1] or e-lancers [14] illustrate this 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 many traditional work environments will change: more virtual offices will emerge, more employees will telecommute, and non-traditional work schedules will be the norm. [1] Described by HIMANEN, a *hacker ethic* contests what was before the basis of individuals' "protestant" obligation to work. [9]

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. [2] HIMANEN illustrates the role of information technology in the Kosovo crisis of 1999. [9] 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 any 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. Ever increasing surveillance and ubiquitous computing change people's notion on privacy. In general, there are many important issues on the individual level yet to be researched.

5 Scenarios

5.1 General

We have created a total number of twelve scenarios and analyzed them carefully. To keep this article focused, we have chosen three scenarios that best illustrate the factors and attributes discussed above. The scenarios that were left out do not affect qualitatively the results of this article. Table 2 illustrates how the sample scenarios cover the attributes. Abandoning any one of these three scenarios would leave some attributes uncovered; hence they constitute a minimal cover of the attribute space.

All the three scenarios in this article are quite positive in tone, and they give an attractive view of the future that the Mobile Internet will enable. We have also considered the dark side of the mobile technologies and discussed the problems related to them in some other scenarios, hence trying to avoid the lure of techno-optimism.

[Table 2]

5.2 Weather Service

In this scenario, the user has a service agreement with a Mobile Internet Service Provider (MISP) including a weather service that is actually provided by a Weather Service Provider (WSP). 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? From the technical viewpoint, 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.

Contracts. Who is authorized to adapt the content? It is possible that the Access Operator does not have an agreement with the user or with the MISP or WSP. It is also possible that the context information is transferred from the Access Operator to either the MISP or WSP and they are adapting the content.

If the Access Operator does not have an agreement with the user, it is questionable whether it is permitted to disclose the end-user's location and other information. 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 MISP or WSP. In that case, user's privacy is smaller an issue. However, technically it is still not optimal to adapt content that far from the terminal.

The problem could be at least partially solved using metadata. For example, WSP 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. WSP could also send 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 if there do not exist appropriate contracts.

In general, it is not quite deterministic in what way information flows from a sender to a recipient on the Mobile Internet. It is not possible to precisely predict which parties will take part in the chain and therefore making agreements in advance can be difficult.

Intellectual Property Rights. Though the basic weather data is hardly subject to copyright it might be covered by database protection in some countries. The service itself and especially certain edited parts of information it embodies can be copyrighted. The more original information is included in the service, the better legal protection can be achieved. The service can also be trademarked so that adaptation is not allowed with a claim that it came from the original source. Some parts of the service could be patentable as well.

International Law. It can be difficult to predict which jurisdictions are involved in a transaction on the Mobile Internet although the legal interpretation of the transaction depends on the jurisdictions involved.

5.3 Shared Pictures

The second scenario is about sharing pictures between users. Imagine digital cameras with wireless Internet connection or indirect connection via a proximity network such as Bluetooth technology. A user can allow others to access pictures inside her camera. This is done without any other services but the file sharing software in the camera and the basic network infrastructure.

[Figure 2]

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 interested in birds. His pictures on rare birds quickly spread on the Internet in a peer-to-peer-fashion (P2P). However, it is possible to include also value-adding third party Internet services. For example, a user could order paper copies of pictures by sending them to the printing service on the Internet. Or, cameras include only limited picture editing capabilities because editing requires computing power and sophisticated applications. Those could be accessed through the Internet using the camera as a user interface. Business opportunities seem endless. It suggests that this kind of mixed P2P and B2C (business-to-consumer) model may become common.

Some professional photographers 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 started to commodify the pictures 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. 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 peer 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.

If José is not only a good photographer but also an idealist, he might shake the political systems. His pictures on injustices 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 brings forth a few issues. 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 on the Internet makes it difficult to enforce these rights.
- *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. Yet, if a consumer goes to an event and takes pictures, it may be difficult to show that a binding contract 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 troublesome to find out who the photographer is. The legal challenge here is to manage photographing and televising rights in the new situation.

- *Intimacy*. People are willing to pay for candid photographs on celebrities. Legal challenges in this area are not different from those with current paparazzi, but they will become more serious. Extremely demanded pictures, such as pornography, form a special case. Their economic value means commercial publishers have interest to manage rights in them. In the scenario however, the photographers are not likely to sell porn pictures. Instead, sometimes pictures may be on private occasions or they can 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.
- *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.
- *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 we further analyze the challenges from the viewpoint of different actors.

- *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. 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.
- *Privacy* is very important for private persons. In this scenario, it concerns mostly amateur photographers.
- *Labor law* 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.
- *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 fiscal entity 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.

5.4 Health Monitoring Service

People who want to be aware of the condition of their health will be able to buy a Health Monitoring Service. The basic service includes a set of wearable sensors that send information about person's vital functions through the Mobile Internet to a control center. Optionally some of the sensors can be installed inside customer's body. To customers the service sends reports and instructions how to improve their health. In the case of emergency, the service can also call an ambulance, a doctor, or other help provided it gets customer's location information. The customer could even be equipped with a dosage device so that a physician in the control center can remotely give for example insulin, vitamins and micronutrients, or heart medicine when needed.

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 knowledge base 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.

Health services have traditionally been very local. However, the service described in this scenario is not geographically limited.

This scenario represents a sample application of ubiquitous computing. New business models are also involved. Some important psychological aspects should be considered, like how the users feel if some unknown person 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 while still lying by the sea. [e.g., 4]

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.

Intellectual Property Rights. In this scenario, intellectual property rights do not protect remarkable portion of information. Data on a customer, a single advice from a physician, or a control message from the control center are very important, but hardly protected by intellectual property rights. Intellectual property rights will be more important if the service is developed towards a more mature system that not only transfers data, but also stores and distributes refined information.

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 the European Union, the data protection directive has set quite strict rules for applications such as this scenario, but in the USA, for example, the discussion about privacy protection has not led to comparable statutes so far. It remains to be seen which approach ultimately proves to be more attractive: although privacy is extremely important and must be protected, too strict privacy protection may lead to the unintended result that some useful services are simply not developed in the first place.

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 conceivably conflict with these rules.

6 Conclusions and Future Work

It depends profoundly on the viewpoint, which legal challenges are considered the most important. We have focused on four viewpoints, those of content provider, operator, device vendor, and user, because they represent satisfactorily different entities on the Mobile Internet. Based on the three scenarios analyzed in this article, we conclude that the legal areas including most challenges on the Mobile web 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 article 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. In addition to legal protection, the future information products will be increasingly protected by digital rights management (DRM) systems and other technical measures. On the other hand, to provide high quality service, it should be possible to flexibly distribute content and adapt it on the basis of context. There will be remarkable challenges to fit these different aspects together.

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. Context-awareness becomes most beneficial, if context-information can be used on the fixed network side of the wireless link. However, the user does not necessarily trust the access provider and does not want disclose context information that may impart private matters. 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 the subject of a contract is. 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 the governing law is and which authorities have jurisdiction over disputes. A fundamental reason for the contractual challenges is the structure of the Mobile Internet that will supposedly be quite fragmented.

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 whether 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 areas do not seem to bring forth as crucial challenges as the first three.

The work presented in the article is clearly incomplete, and several avenues of further work are open to us. First, our research method is still immature, and should be extended both in scope and in depth through inclusion of further attributes and analysis viewpoints. Obviously, its unorthodox character also raises issues that remain to be fully addressed. At a more pragmatic level, we should also investigate further how external experts should be more fully integrated in the analysis and discourse that forms an essential aspect of our method.

We also contemplate extending our research in constructive direction through some form of business method prototyping. One alternative that we have experimented separately is role games; they seem to be particularly useful for studying mobile users' roles and perceptions of a service, and they might be generalized to cover also other stakeholders and viewpoints.

[12]

Finally, we also plan to export findings to our work to a related research effort recently begun at our institute that aims to study horizontal service management in the Mobile Internet. In this work, we plan to focus in the creation of value networks, and in particular in automatically created and enforced contracts between the nodes of a network. The longer-term aim of this work is to understand how (and to which extent) a service infrastructure can embed the legal rules related to the provision of a particular service.

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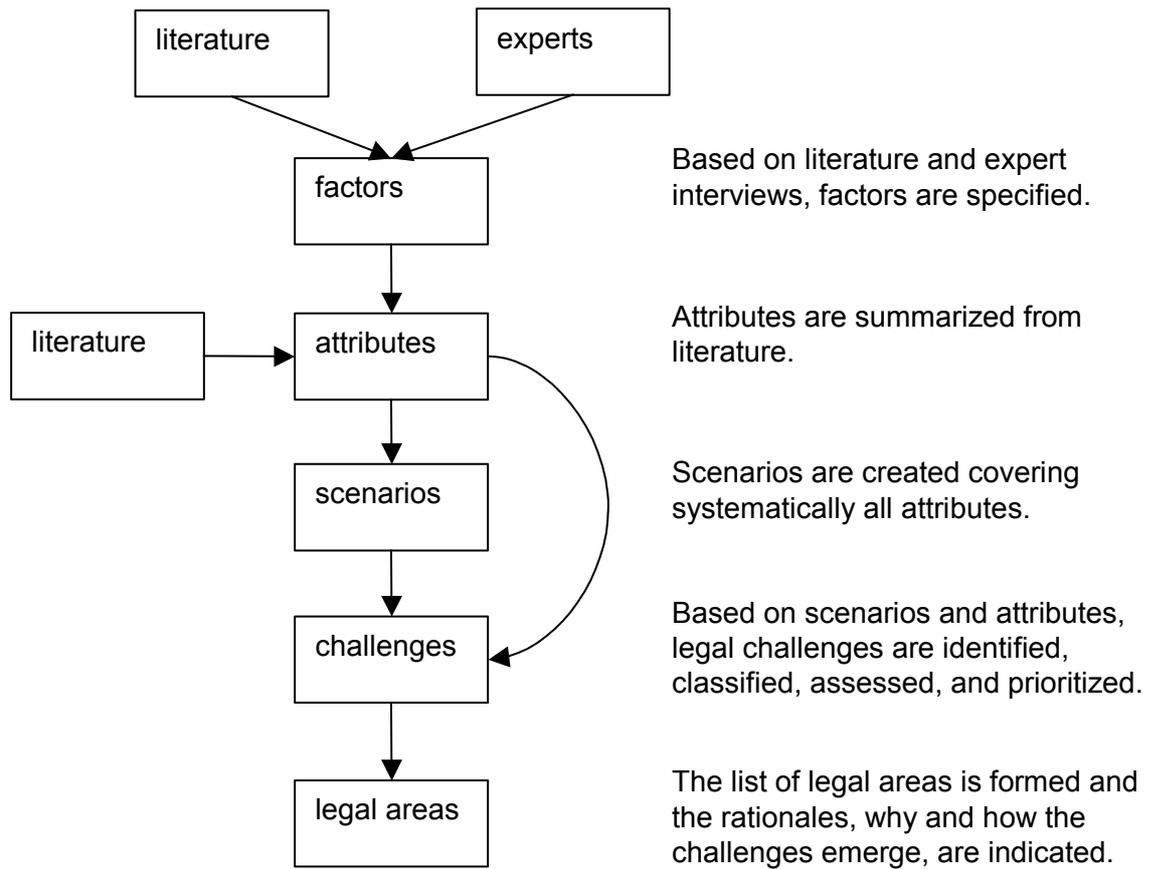


Figure 1. The steps of the research method

Table 1. The factors and attributes

Factors	Attributes
Technology	<ul style="list-style-type: none"> • <i>Moving user</i> • <i>Roaming</i> • <i>Context-awareness</i> • <i>Content adaptation</i> • <i>Ubiquitous computing</i>
Economy (entities)	<ul style="list-style-type: none"> • <i>Dynamic capabilities</i> • <i>Intangible resources</i> • <i>Low hierarchy</i>
(economic environment)	<ul style="list-style-type: none"> • <i>Network economics</i> • <i>Lock-in</i> • <i>Branding</i>
Society and Individuals	<ul style="list-style-type: none"> • <i>Globalization</i> • <i>Market culture</i> • <i>Changing work</i> • <i>Challenges to political systems</i> • <i>Changes in minds and behavior</i>

Table 2. The attribute coverage of the scenarios

	Factors and Attributes															
	Technology					Economy						Society and individuals				
Scenarios	Moving user	Roaming	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			X						
Shared pictures		X			X	X	X	X	X		X	X	X	X		X
Health monitor	X	X	X		X		X			X		X	X		X	X

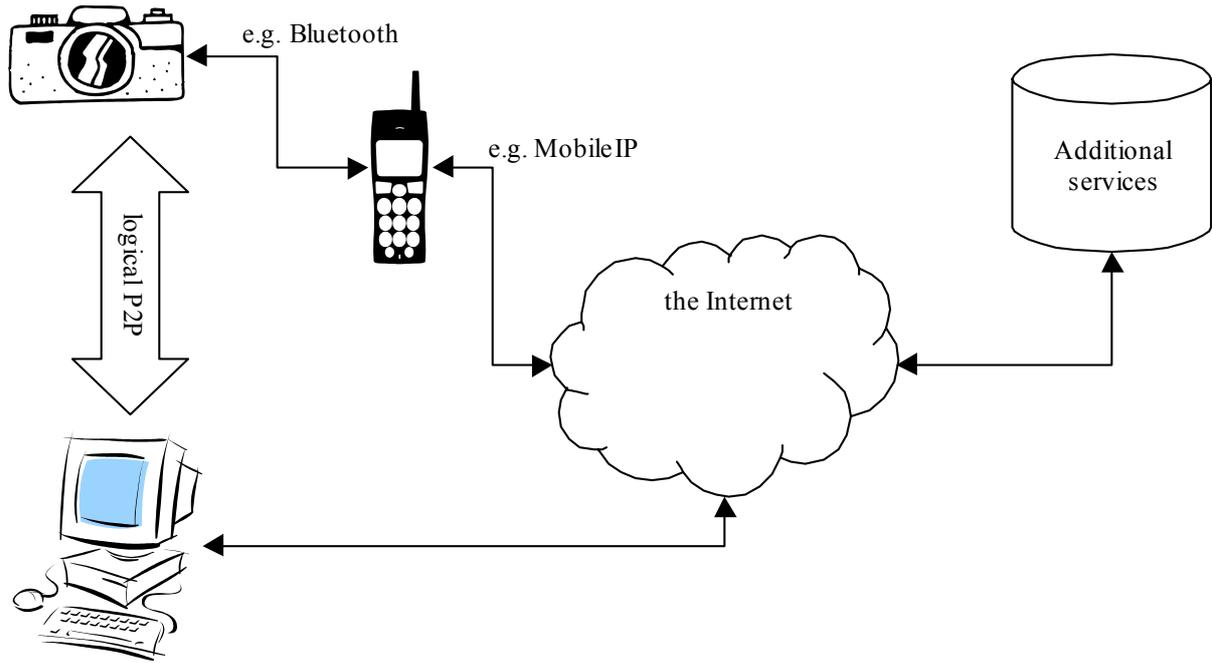


Figure 2. Digital camera and shared pictures