LEGAL CONSTRAINTS IN READINESS TO EXPLOIT MOBILE TECHNOLOGIES IN B2B

Olli Pitkänen, Aura Soininen

Helsinki Institute for Information Technology (HIIT)
[olli.pitkanen, aura.soininen]@hiit.fi

Petteri Laaksonen, Pia Hurmelinna

Telecom Business Research Center (TBRC)
[petteri.laaksonen, pia.hurmelinna]@lut.fi

Abstract

The article illustrates how legal constraints affect companies' readiness to exploit mobile technologies in business-to-business relationships. We discuss general issues affecting readiness and the elements thereof. Three examples of businesses taking advantage of wireless technologies are presented. The most important legal areas are studied and the constraints related to them are analyzed. We discuss mostly contractual, liability, intellectual property, and confidentiality issues. Of all legal areas, they seem to have most impact on readiness. We conclude that hardly any legal area includes constraints that absolutely prohibit companies to exploit mobile and wireless technologies. On the other hand, a number of legal issues can potentially harm a company. So, the analysis of the legal constraints easily turns into risk management.

Keywords: readiness, mobility, wireless technologies, legal issues, risk management

Introduction

Readiness

Readiness, in this study, refers to the degree to which a company is prepared to exploit mobile technologies. In general, readiness is measured by evaluating the organization's advancement in the areas that are critical for adapting the most important applications of mobile technologies. Companies' readiness to implement new technologies reflects their ability to benefit from mobile business models and wireless E-Business.

The concept of readiness as it emerges in previous studies as well as the elements of it will be studied closer later. We are considering readiness both in general and in the light of some examples. The aim is to find out what is the relationship between legal constraints and readiness.

Previously the concept of readiness has usually been connected with personal and organizational levels, but hardly with societal level. We focus mainly on organizational level, but want to point out that societal level, especially legal structures and regulation, are also essential in relation to readiness.

Constraints

In this paper, we study how legal issues may constrain readiness. Constraints refer to issues that limit companies' ability to exploit mobile technologies. Even if a company is otherwise ready to gain from new technologies, a constraint can prevent the utilization of new methods.

It should be noted that in general legal structures may constrain, but also enable business. Laws make it easier to anticipate the future legal conditions. For example, it is hard to foresee how a contractual relationship is assessed legally if there is no governing law. For that reason, legal structures generally diminish risks involved in business and thus enable business methods. In this paper, the focus nevertheless is on legal constraints. Although some of them are due to rules that positively prohibit certain actions, many of them, on the other hand, are in fact results from the lack of enabling legal structures. So, in many cases enabling and constraining legal issues are merely the other sides of the same coin.

As discussed further below, legal constraints are not necessarily absolute obstacles, but noteworthy risks. On obstacle refers here to something that prevents a company to use a new technology. For example, the European Directive on the protection of personal data (Directive 95/46/EC) bans certain usages of personal information. A business model that would essentially be based on such a usage is thus prohibited. In other words, there exists a legal obstacle. On the other hand, more typically, uncertainty that often relates to decision making is hardly an obstacle, but points to risks that are involved in business models. Therefore assessing legal constraints is closely related to risk management.

In this study, we focus on business-to-business relationships. The study is only partially jurisprudential. We utilize also technological, economic, and societal analyses. Because of our interdisciplinary approach, we are able to consider all those aspects in connection with legal issues. We go through the legal areas that have most impact on readiness. With help of sample cases we analyze the emerging legal issues, and discuss their importance from a business perspective (see also Pitkänen et al., 2002)

Mobile and wireless technologies

The meaning of *mobility* depends on one's viewpoint. On a protocol level, a significant characteristic of mobility is that the access point is not fixed. Therefore packet routing to a mobile terminal on the protocol level needs to be dynamic and may change during a communication session. This perspective does not necessarily imply that the terminal should be wireless or portable. (Pitkänen et al., 2002)

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 paper is mainly related to the service level. Hence, we emphasize the wireless and portable properties of terminal devices. Some of the issues nevertheless will relate also to the protocol levels. (Pitkänen et al., 2002)

Wireless and portable devices make it possible for the users to move around while they are connected to a communications network. This includes both the ability to access the network in different places (*nomadic usage*) and the ability to use the network while moving. (Pitkänen et al., 2002)

The main focus in this paper is on *Wireless E-Business*, which refers to any Internet initiative that includes a wireless component transforming business relationships (adapted from Hartman and Sifonis, 2000). In general, those relationships can be business-to-consumer, business-to-business, intra-business, or even consumer-to-consumer, but in this paper, we focus on business-to-business (B2B) relationships.

An essential feature of mobility is *flexibility*. As further illustrated in the following examples, mobility in general enables dynamic business models in which an organization can rapidly adapt its behavior in accordance with the changing situations. On the other hand, to fully benefit from mobile technologies, an organization must be able to apply more or less flexible operational methods. Thus we can say that mobility both requires and enables flexibility. In an inflexible organization, transactions are similar and most managerial decisions as well as for example related information management is relatively simple. The more flexible an organization is, the more manifold situations can occur. This often leads to ever increasing complexity and to more demanding management. Mobility, flexibility, and complexity are often correlated.

Motivation to study readiness and legal constraints

As shown in Figure 1 below, the number of e-business transactions is estimated to grow rapidly. For a company's competitiveness in that kind of markets, it is essential to be able to take advantage of new technologies. For many companies it will be crucial to utilize e.g. wireless and mobile technologies in order to survive. A company that is not able to follow the

technological development will be forced out of the markets while another company that is ready to exploit new technologies will be competitive and benefit from the growing business.

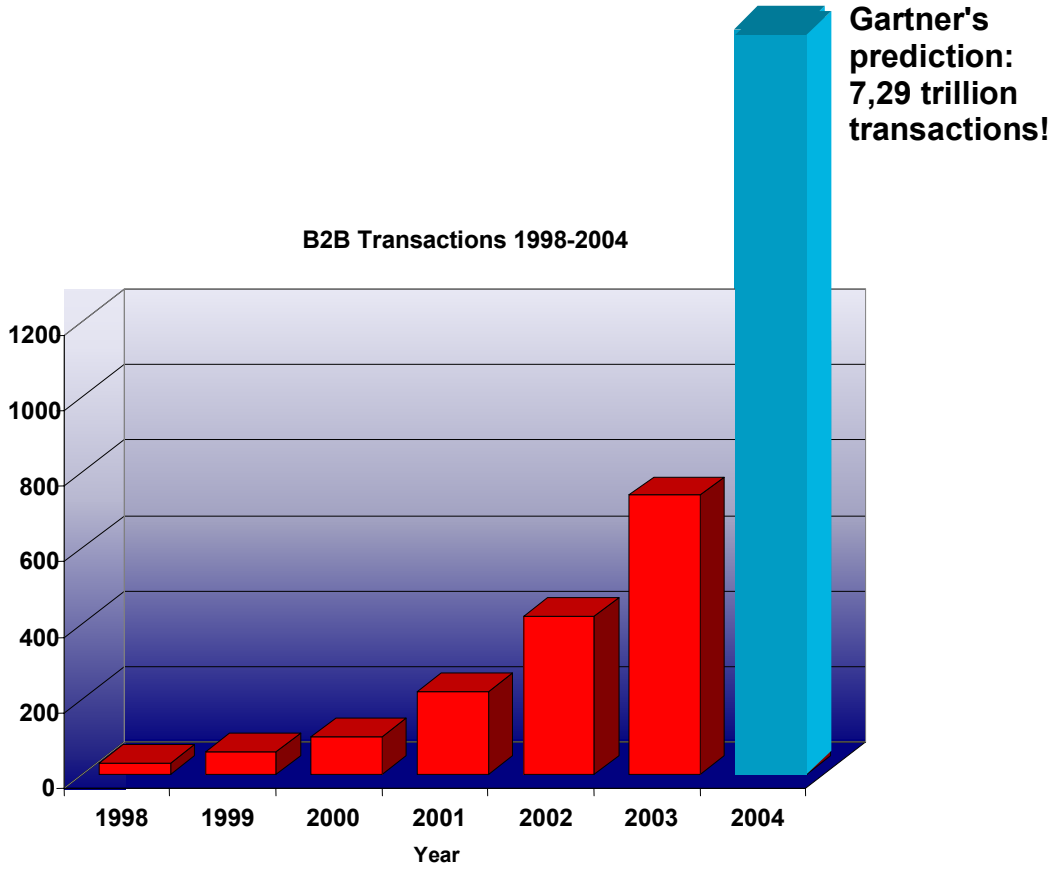

Figure 1. Estimated e-business transaction growth, (Keenan Vision; De Souza and Clark, 2002)

As a result, readiness is turning out to be one of the key success factors for companies. Anything that may constrain the readiness should be assessed carefully. One obvious set of potential constraints is related to the legal environment in which the company is operating. For any company willing to success in the future wireless e-business, the legal constraints that may limit the company's readiness are therefore essential to understand and evaluate.

Readiness

Readiness– previous studies

In general, there are six key areas that are fundamental in building a business exploiting mobile technologies. These are *customers*, *globalization*, *partnerships*, *employees*, *culture,* and *access*. Customers are well informed and they have high expectations. The companies have to be able to deliver consistent value irrespective of geographic distances. The open nature of the Internet enhances alliances and employees have to have access to information. Company culture has to be set to customer satisfaction and it has to be so flexible that changes can be turned into competitive advantages. Last but not least companies have to balance the need for open access to information and the need for security and concealment.

According to Harman and Sifonis (2000) the four elements of readiness are *leadership*, *governance*, *competencies,* and *technology*. Thus, they state that readiness is a combination of four elements or drivers that enables enterprises to organize

high-impact Web-enabled business processes that are focused, accountable and measurable. Readiness is unique to each organization but the attributes driving e-business success seems to be basically the same. Readiness is a measure of a company's preparedness to exploit the opportunities in the Internet economy.

Eleven trends of readiness according to Snyder-Halpern (2001, p. 36) are:

1. Content and container: the value is in the migration
2. Processes are transforming from simple to complex
3. Industries are shifting from static to dynamic as products and services mutate from tangible to intangible
4. Customization: constituents are becoming less forgiving and more discerning
5. Distribution channels are becoming more adaptable
6. New infomediaries are extracting value
7. In convergence, there is opportunity
8. Digitization: separation of form and function
9. Informatization: smart products are proliferating
10. Compression: transaction costs are being reduced
11. Advantage is becoming more temporary

We would like to point out especially the second and the third trends. The transformation of processes towards increasing complexity as well as the shifting towards dynamic industries and intangible products and services must be taken into consideration when planning new business methods, evaluating new technologies for them, and assessing companies' readiness to use those technologies. We study these issues further below.

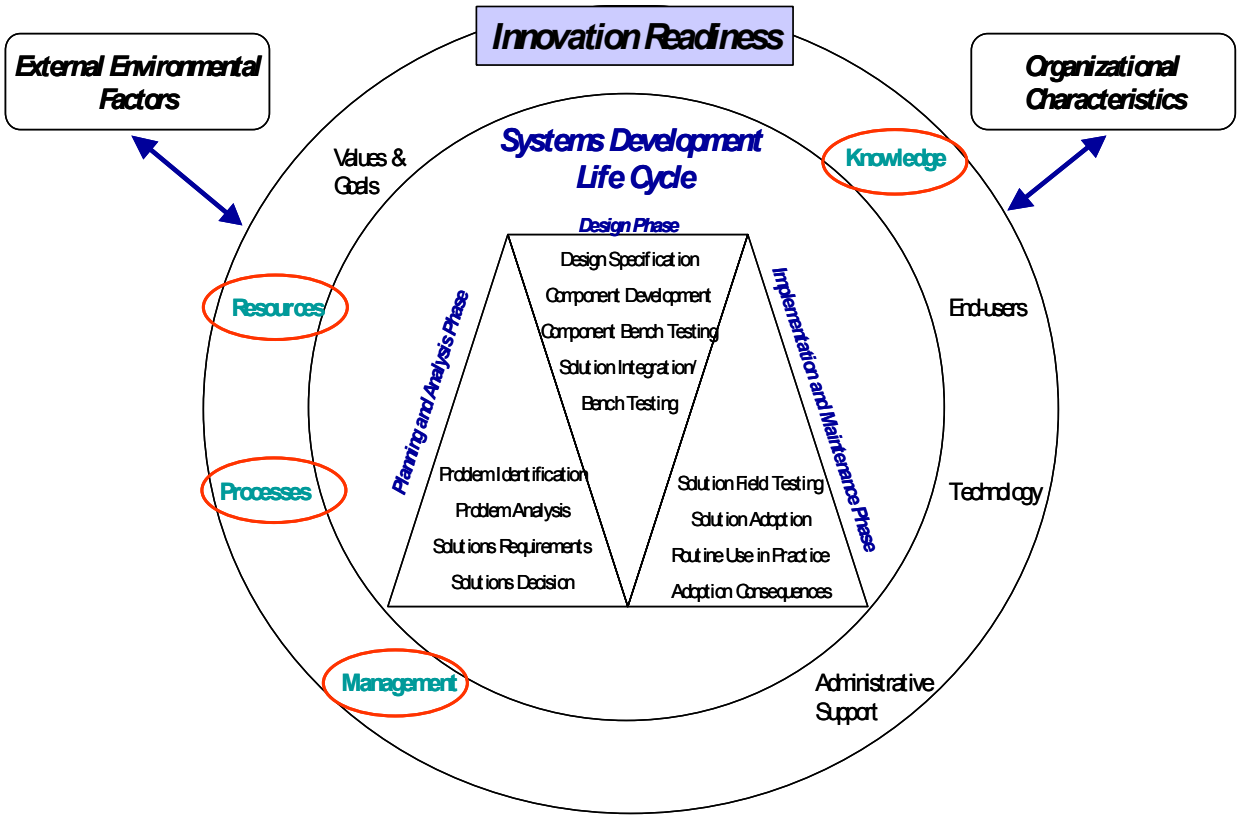

Figure 2. Innovation Readiness adapted from Snyder-Halpern (Snyder-Halpern2001)

Information Technology and System Innovation Readiness

Snyder-Halpern's study, Indicators of organizational readiness for clinical information technology/systems innovation: a Delphi study (Snyder-Halpern 2001) defines an OITIM model that covers in a very practical manner innovation adoption in an organization. The study focuses on health care organization readiness for clinical information technology/system (IT/S)

innovation. Even though the industry, in which the method has been applied, differs from the industries in our research, organizational readiness model is general for all organizations.

The overall purposes of the study were to validate the seven innovation readiness sub-dimensions of a heuristic organizational information technology/systems innovation model developed in phase one of the research program, and to identify indicators to assess the validated sub-dimensions. The study was conducted with an expert panel using a two-round modified Delphi technique. Produced preliminary taxonomy was used to develop an organizational information technology/systems innovation readiness scale that is currently being pilot tested in phase three of the research program.

In our study, in order to evaluate the future decisions, we suggest that extra importance should be given to four elements: *knowledge*, *management*, *processes* and *resources*.

Psychological characteristics

As discussed above, the concept of readiness is connected not only to the organizational level, but also to the societal and the personal levels. The individual decision-makers and other actors within an organization are always affected by their own personal characteristics. In the following, we briefly introduce some basic factors on the personal level of readiness.

A person's choices are influenced by four major psychological processes: *motivation*, *perception*, *learning*, and *beliefs and attitudes*. (Kotler 1980) Psychologists have offered various theories of human motivation. Two of the most popular are Maslow's and Freud's.

Maslow's theory of motivation is based on human factors. A person will have many needs that will vary in importance and therefore can be ranked in a hierarchy. The person will seek to satisfy the most important need first. When the person succeeds in satisfying an important need, it will cease being a motivator for the time being. The person will then turn his or her attention to the next important need. According to Maslow, the needs, in order of their importance, are physiological needs, safety needs, social needs, esteem needs, and self-actualization needs. (Maslow 1954)

Freud, on the other hand, asserts that people are not likely to be conscious of the real motives guiding their behavior because these motives have been shaped in early childhood and are often repressed from their own consciousness. Only through special methods of probing can their motives really be discovered and understood.

Elements of readiness

In this study we are combining the elements of readiness found in previous studies. Since end-users and administrative support are elements which develop during the introduction and piloting of the technology and do not necessary exist at the early phases of diffusion of new technology, we excluded these and have selected the following drivers for closer examination.

Leadership needed nowadays differs significantly from traditional leadership and is a necessary condition for readiness. Even with other elements of readiness being in place without leadership there would be a well-organized, technologically skilled, competent organization going nowhere. When considering leadership issues that have to be taken into account to enhance exploitation of mobile technologies one should remember to solve business process problems first no matter how tempting it would be to start with the technical issues. Leaders should have high tolerance for ambiguity and chaos, find the opportunities and see the threats caused by mobile technologies and take personal responsibility for participating in efforts needed to exploit technologies available. In addition to this they should be able to communicate their visions throughout the organization. That's why in this study values and goals are included in the leadership element.

Governance is the operating model that defines the nature of the organization and relationships within the organization as well as outside the formal organization. Governance involves not only rules and regulations that make the organization a legal entity but also control, accountability, authority and responsibility. Structurally rigid frameworks do not work very well when pursuing readiness, and that's why we have included processes and management into the governance element of readiness. Establishing cross-functional (e.g. business and technology, business and law) teams, promoting actively use of mobile applications and making funding decisions resemble any other business funding decisions are just few things included in governance models that improve readiness.

Capabilities, that in this study include knowledge and competencies, can be determined as ability to navigate among other elements of readiness and the way organizations respond to changes, exploit available resources and adjust to emerging realities, such as legal constraints. Capability of an organization can also be defined as its established and potential ability to accomplish against the opposition of situation or competition, whatever it sets out to do (Learned & al. 1969). Dynamic

capabilities (term used by Teece) consist of the company's ability to integrate, build and reconfigure internal and external competences to address rapidly chancing environments (Teece & al. 1997). Readiness requires understanding of complexity caused by globalization, real-time activities, demanding customers, insufficiency of critical skills and new levels of competition. Managing knowledge is a prerequisite for readiness.

Even the best *technologies* alone cannot assure readiness if the other elements aren't in place. On the other hand readiness, as we understand it, is out of reach without access to necessary technologies and resources. There has to be a structural design build in the organization that enables organizations to develop and implement new applications rapidly. For this the company needs a standards-based technology platform because without it the company's infrastructure needs to be redesigned for every application and achieving readiness becomes very difficult. In general, though, we think that technology and resources are only enablers for readiness. It is harder to use technology wisely than to solve some technical problem.

Previous studies have often neglected *legal issues*. Still, we feel that they might affect readiness, and the question is whether or not legal issues or constraints should be considered as an element of readiness. In the following we are first bringing up some cases where mobile technologies are used in B2B transactions, and then legal constraints related to the cases and the readiness of companies. By examining these cases we will be able to draw conclusions of the role of legal issues in readiness.

Some examples of the Readiness and Innovation Adoption

Wood Procurement – Case Stora Enso

The total wood area in Finland is 20 million hectares, of which private persons own 61%. 64% of the size of the land ownership is less than 20 hectares (2002), which means that wood procurement is done in very small lots. Forest companies own only 5% of the total wood areas. Stora Enso is the biggest paper and board producer in the world.

Table 1. The ten largest paper and board producers in the world (Metsäteollisuus ry & Paperinfo 2002)

1. Stora Enso	15100
2. International Paper	14700
3. UPM-Kymmene	11800
4. Georgia-Pacific	9400
5. Smurfit-Stone Container	8800
6. Weyerhaeuser + Willamette	8700
7. Nippon Unipac	8600
8. MeadWestvaco	7700
9. Abitibi-Consolidated	7500
10. Norske Skog	6700

Stora Enso Forest has one, integrated wood procurement system for all of its operations in Finland. System covers wood procurement for both pulp and timber production. The system is called MEX and its supplier is TietoEnator MEX. It has unlimited wood handling capacity. The information is stored in a shared forest database, administrated by an organization responsible of wood acquiring.

Stora Enso Forest's raw material flow is planned daily in the wood procurement management system. MEX enables just in time raw material deliveries to production units, cost effectively, ensuring that the whole transportation capacity is used efficiently. Transportation of each shipment is planned individually. The supply planning covers shipment by rail, sea, and road transportation.

Raw material can be procured to need, as purchased, but still standing wood reserves are included in the system. This allows timber to be custom-harvested from the most beneficial location, directly to the right length. Outline of the wood supply process cycle is shown in the following figure.

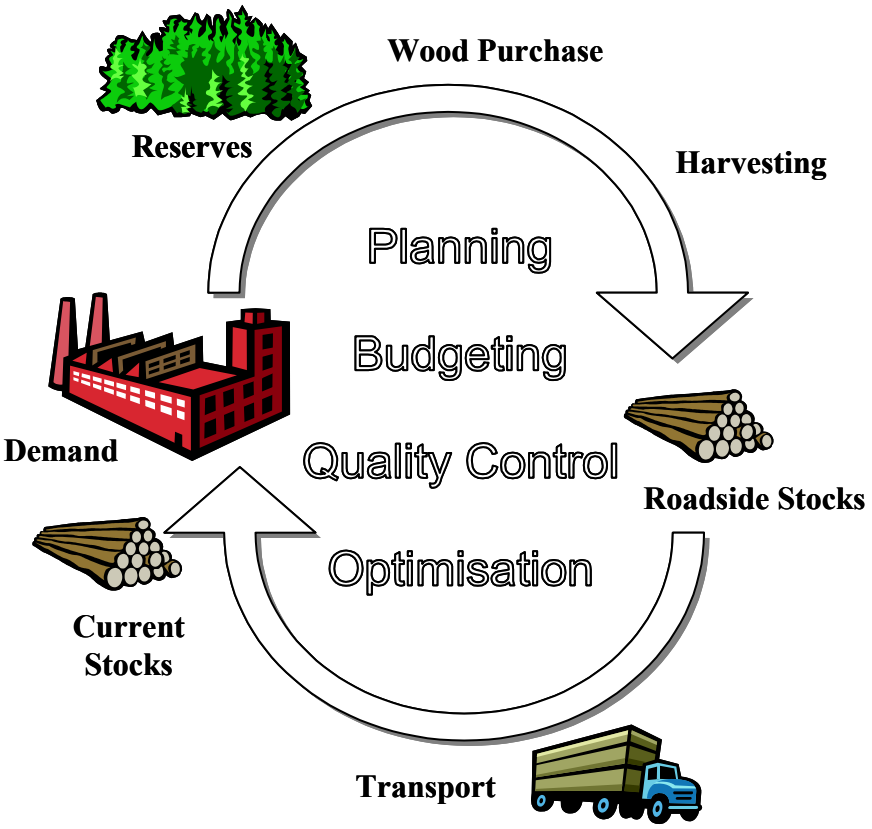

Figure 3. Wood supply operations

Wood demand from the pulp and saw mills is the input data to wood supply planning. Planning is done in 12, 6 and 3 month periods adjusting to the current needs. Standing reserves and mill inventories are also inputs to the demand-planning phase. The total demand is distributed to local precincts and further to smaller supply teams as specified targets. The smallest centralized planned unit is a monthly supply target for a one team.

The basic element of the system is one wood lot, one timber assortment from one purchase. The tiniest ones are smaller than 0.5 cubic meters and every day there are tens of thousands of these wood lots active in the system to track and optimize.

After the commercial procurement, the forest area to be harvested is entered in the forest system and the harvesting route is optimized. More and more importance is also given to the different length specifications in contrast to the stock length harvesting in the part years. The initial information is sent to the harvester operator few days before the work. During the harvesting work the operator has also on-line access to necessary. Harvester measures the actual wood quantities and qualities during the process and transfers data forward immediately.

The harvesting information is sent via wireless link to forwarders and the wood is transported to roadside stocks. While short hauling, the operator is updating the stock status and estimating the final stock amount on-line, so the final transportation of the roadside stock can be planned beforehand. Wood is virtually stocked right after harvesting. As a result of the real-time information, the planning cycle and the lead-time of the stocks are significantly reduced.

The forest system optimizes the *transporting* routes from the roadside stocks to the mills and reception sites. Routes are combined whenever possible. This improves the truck capacity utilization. The truck application uses on-line positioning to show the truck, stocks and the reception site on a digital map. Truck operators get the information on routes two times a week.

When the cargo routes are planned the reception sites are also informed on the deliveries. The time window to deliver the load to the reception site is 15 minutes. When the truck is approaching the mill, it confirms the delivery time and the possible

delays and changes in the delivery time can be arranged. The delivery time optimizing helps to balance the incoming flow to the reception site. The incoming trains and reception of floating timber are also considered.

The system comprises 270 harvesters, 300 forwarders and 250 trucks. There are over 18 reception sites included. Currently used networks are Mobitex and GSM networks, but the forest system is currently switching to pure GSM based network. The GSM evolution into GPRS was one of the things making the network standardization faster and more attractive.

The system is operated in standard client-server architecture with communication links. Workstations in vehicles are NT based industrial stock PCs. Layout of the system is in demonstrated in the following figure. (Hiltunen 2001)

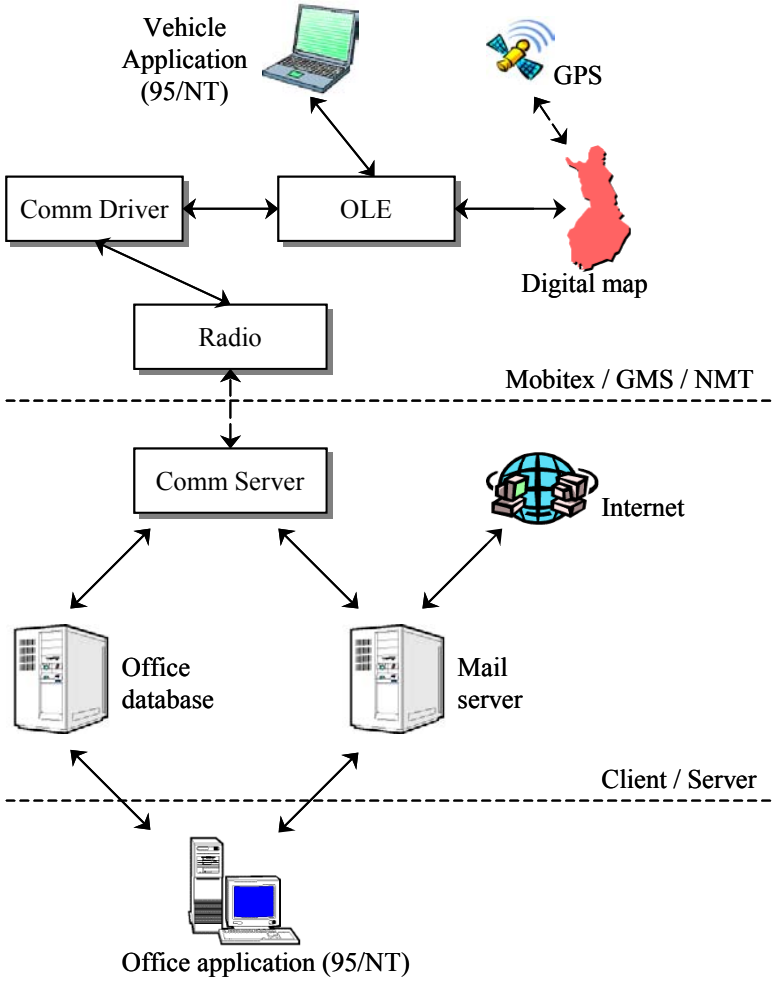

Figure 4. Main components of the wood procurement information system

In the history of the application the Wood Procurement system was a radical business concept innovation. It changed all the elements of the wood procurement of the company and its suppliers.

Main driver must have been a vision of achievable benefits against the risks involved in technology and governance of the network of actors. The vision falls strongly into *leadership* readiness driver. *Technology* was not ready at the time of the investment decision neither the *capabilities*. It took many years to have all the components ready, but today the application is based on standard technology blocks. The new method also sets entry barriers to new entrants because the operating model is more complicated and requires larger investments and training.

Home-Care Service

In this fictional example, 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. In this paper, we focus on B2B relationships and therefore we emphasize the link between HO and HCS.

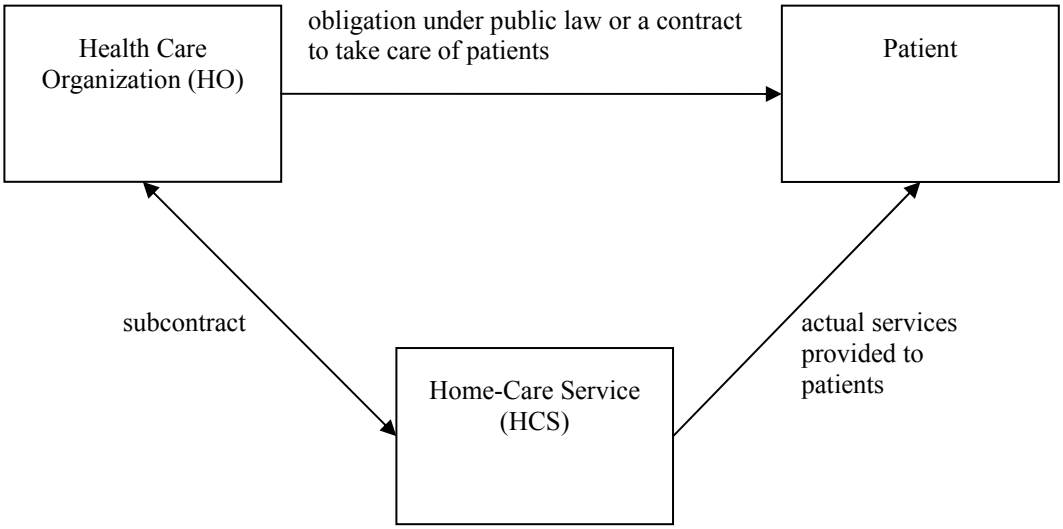

Figure 5. Relationships between the parties in the home-care service example

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. (e.g. Davie et al. 2001)

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. (Pitkänen et al. 2002; Davie et al. 2001)

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. (Pitkänen et al. 2002; Davie et al. 2001)

The case of home-care service requires all the elements of readiness to be in place. *Technology* is needed to enable the mobile and dynamic work of the home-care personnel, and in this case resources are very important, one could say the basis, for readiness. In the end, though, producing or getting applications needed is not very likely to be the problem when the task solutions are needed for is known and otherwise well organized. What is needed more is the ability to use the technology efficiently. Enhancing the readiness to exploit mobile technologies between HO and HCS requires the companies to have many *capabilities*. There might be, for example, emerge situations where patients resist this kind of systems. Also legislation sets certain conditions the companies need to adjust to. Opportunities in this case are obvious, but there are also threats that need to be handled.

In this example *governing* the cooperation between HO and HCS may be much more challenging, since managing communication and information flows is essential. Also, as the personnel are not under employer's supervision all the time, *leadership* requires different methods. The requirements are directed not only to the leaders of HCS but also of the HO. Leaders in HCS need to make the employees to understand the benefits of new system and leaders of HO have to create confidence in the system among their organization. It is up to the leadership to settle authorization issues and encourage using new technologies.

Maintenance, service and product data management

Large industrial products, like elevators, paper machines, or marine engines, involve remarkable amount of information that is needed throughout the whole lifecycle of the product. Each product can be individual and requires more or less distinguished set of information. For example, when a serviceperson goes to fix an elevator or travels to repair an engine in a ship far away, it is important to know which specific unit it is, what its configuration is and what components it includes, how it has been changed, and so on. All the necessary information should be easily available. The information is stored in documents: e.g. drawings and other design documents, delivery documents, and maintenance documents. Typically they include subdocuments, have a number of versions, and have multiphase acceptance procedures. It is not uncommon that the current, accepted version of the right document is hard to find. (Peltonen et al. 1996)

Product data management systems (PDMS) and document management systems can improve the situation remarkably. They manage documents, subdocuments, versions, their states, and relations between them. They also include a lot of metadata that describes the documents and the information they contain. In principle, if a PDMS is functional enough and used correctly, it easily finds the correct version of the document that contains the needed information. However, PDMSs are typically rather heavy systems and documents can be very large. (Peltonen et al. 1996) Therefore, it usually requires powerful computers and fast connections to access the documents in a PDMS. Usually, this can be achieved only with wired connections. Nevertheless, as wireless devices become more powerful and wireless connections faster, it becomes possible to supplement a PDMS with a mobile, wireless interface. For example, when service personnel leave for repairing an engine in a distant ship, they gather all the information they expect to need using PDMS and wired connection at the office and take the documents in paper or in electronic form with them. But in the ship, when they realize that they need more information, they can connect to the PDMS using wireless devices and download the missing documents.

The product itself can also be connected to the system. For example, a marine engine can send service personnel information about its current status using wireless technologies. Hence, the service personnel can prepare better for a task, when they are about to go to service the product.

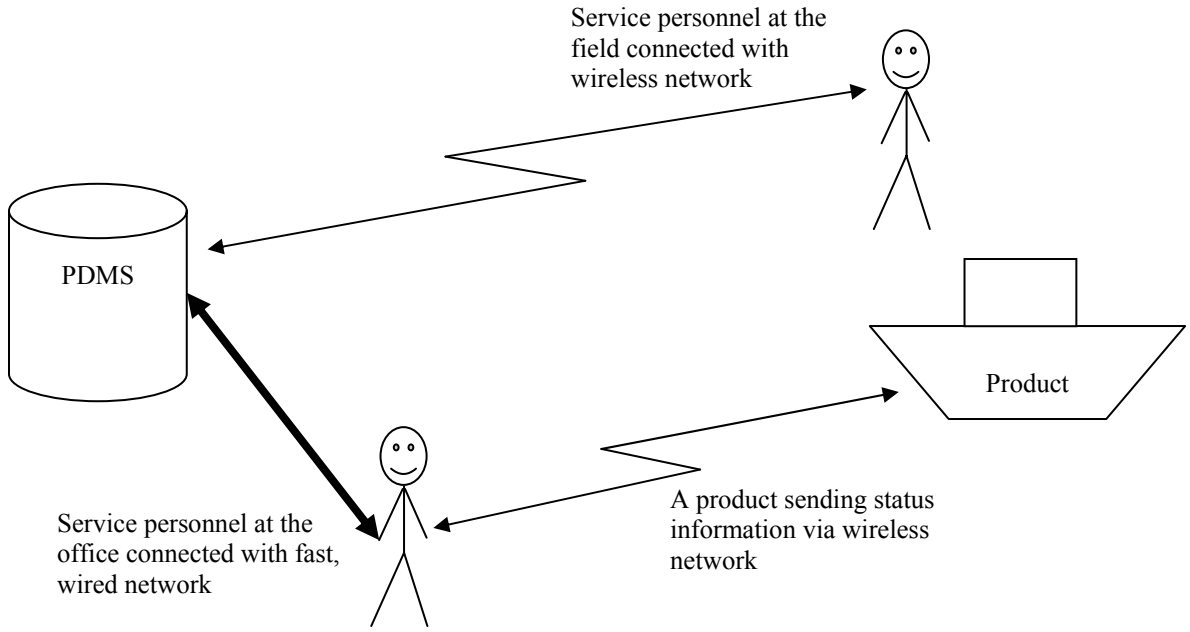

Figure 6. Maintenance product data management system may be accessed using either wired or wireless connections

The ability to exploit the above-described system does not require as much from the *leadership* as in the home-care example. Even though the system may be new, it is not so radically different from previous systems. The benefits are easy to see and the threats seem relatively small (at least compared to the threats of something going wrong with taking care of people and their health). Also, the role of *technology* is very similar to the home-care case: it is the enabler for a new system. The problem – getting better information for the service personnel so that immobility does not set unnecessary restrictions – is known and it should be relatively easy to find technology suitable for solving this.

Readiness, in this case requires more from *capabilities* and *governance*. Processes and management need to be flexible so that service personnel are, for example, entitled to access easily the needed information that sometimes can be confidential, or that they are able to find parts they need without delays. If personnel can get information fast but have to wait for spare parts for weeks the point in using mobile technologies is diminished. Thus, the competencies to combine different operations are essential.

Contracts and contractual liability

At first, let us discuss how the *existing contracts* may force companies to remain with old technologies and business models. Do the existing contracts make the companies to stay with old processes?

> *HO and HCS in the home-care service example probably have a contract that specifies the processes they use. For instance, the contract may state the procedures that HCS must follow when new instructions are needed. HO is liable and therefore it has to make sure that HCS adequately acquires the instructions and follows the rules. The contract cannot give too many liberties to complete the tasks. Therefore it easily solidifies the processes and makes them hard to change.*

In general, contracts do not usually specify in detail, how something should be accomplished, but state the expected outcome as well as the compensations if the results are not fully achieved. It is normally up to the contracting parties how they choose to carry out the tasks they have committed to finish. In that case, contracts do not constrain the parties' readiness to exploit new technologies. However, many contracts do specify, how the tasks are to be get done and what kind of processes should be used. Especially, quality standards and manuals often spell out the procedures in detail. If, for example, a contract states

that the service provider must follow the customer's detailed quality standard, it does not leave much choice. (e.g. Kontio et al., 1998)

Obviously, it is usually possible to *renegotiate* a contract. For example, let us assume that a service provider finds out that the tasks it should carry out to fulfill a contract would be better to accomplish in a way that the contract does not permit. The service provider can always suggest the customer changes in the agreement. However, sometimes it is quite troublesome to renegotiate an agreement: the other party may not be willing to change its standard terms; opening one condition in the agreement can lead to a number of other changes or even risk the whole partnership; and the renegotiations can be time-consuming and expensive. All in all, it can make more sense to keep the old terms and conditions although they force to stay with old technologies. At least, it involves risks to count on the possibility to renegotiate contracts.

So far, *electronic contracts* have only a little tradition. The huge body of statutes, case-law, and legal tradition govern the interpretation of conventional contracts. Each law student can tell, for example, when a contract is binding. Therefore risks involved in traditional contracts are limited and manageable. However, as of now, electronic contracts involve a lot more severe risks. New laws and for example the new European directives are improving the situation (e.g. the Directive 1999/93/EC). Yet, until the field is well enough established a company takes more risks if it makes electronic agreements than making conventional contracts.

It should be noted that certain types of contracts cannot be in an electronic form. For example, in Finland the sale of real estate must meet the requirements in form prescribed in law. An electronic contract cannot fulfill those requirements and thus the sale of real estate cannot be accomplished completely electronically. That would be an absolute obstacle for a business model that was based on an idea to make electronic sales of real estate.

> *The forest company in the first example could replace conventional contracts with electronic agreements. Instead of awkward long-term paper-contracts, it could flexibly call for competition subcontractors and make electronic agreements separately on each conveyance. However, in this case electronic agreements present more risks. Conventional agreements involve smaller risks because they are well-established and better known. Therefore, the company is not ready to use electronic agreements, but it stays with the old, less flexible business model.*

In an electronic market place, buyers and sellers can agree flexibly on each transaction. If however, companies are worried about uncertainties related to the electronic form of contracts, they are willing to stay with old well-known formats. In other words, they are not ready to exploit new technologies.

A compromise between conventional and electronic contracts can be an arrangement in which parties make a skeleton agreement in paper. It regulates the contractual relationship in general and specifies how electronic agreements bind the parties. For each transaction thereon it is relatively safe to make agreements in electronic form. Obviously that complex an arrangement is not always possible.

Electronic agreements make most sense in B2B relationships when they can be automated. For example, if a manufacturer needs to order parts from a subcontractor and the number of transactions is very large, it would be beneficial if the manufacturer's computerized inventory management system was able to send orders automatically to the subcontractor's delivery system. The subcontractor's system in turn could send an acknowledgement and confirm the details of the delivery. If something needs to be changed, the two systems could again send messages and agree on the new conditions. The messages those systems send and receive could form binding contracts. [Increasing amount of wireless transactions will increase the problems.] That however requires at least two things:

1. From the legal point of view, the messages must represent the will of the companies and form a mutual understanding between them. In general, agreements between computer systems are problematic as computers in general cannot legally represent companies. Often, it is possible to remove that obstacle by the skeleton agreement arrangement described above.
2. From the technical point of view, it is not enough that the *systems can send messages to each other*. Even a general set of *common specifications*, like ebXML (Electronic Business using eXtensible Markup Language), is not enough. The two systems must have the same *ontology*, that is, they have to share the same understanding of concepts. If the systems do not have a common language to describe, for example, what is the object of purchase, it is impossible to make an agreement. The new technological advances and common standards (e.g. RosettaNet, http://www.rosettanet.org/) are reducing these problems.

In conclusion, the readiness to use electronic agreements between computer systems usually requires that the companies have agreed in advance on the legal status of the messages that the systems send to each other as well as on the communications standards, the protocols, the languages and the concepts they use.

As discussed above, flexibility is one of the key issues related to mobile technologies. In relation to contracts, it means that the companies should be able to flexibly change their commitments in mutual understanding.

In relation to wireless technologies, there are new kinds of contractual challenges. For instance, while users are moving, they have many kinds of wireless devices, and their access points keep changing, it can be evermore difficult to identify who the user is. From the contractual viewpoint it is troublesome if the other contracting party is not able to be sure who the other party is. This can be helped using for example digital signatures that are certified by a trusted third party. However, that requires technological solutions that may be restricted by the readiness of the companies. (Pitkänen et al., 2002)

An important characteristic of a contract is its *unfalsifiability*. Conventional paper documents have plenty of strength of evidence, because they are not easy to forge. Technologies to be used in connection with electronic agreements should not undermine the probative force of the contracts. Mobile technologies do not necessarily endanger the unfalsifiability of the contracts; on the contrary, empowered by strong cryptography and digital signature technologies they may enable even greater security. (e.g. Directive 1999/93/EC)

The following table gives an overview of the security aspects of different signatures. An *open user-community* refers to a situation in which the group of users is not limited. In a closed user-community, on the other hand, it is restricted in advance, who may use the system. The table shows that a digital signature based on strong, public-key cryptography can be at least as secure as traditional signature on paper. Electronic signature based on less advanced technologies should not be applied unless the user-community is closed and governed e.g. by contracts. (Laine, 2001)

Table 2. The unfalsifiability of contracts (adapted from Laine, 2001)

	Traditional signature	**Electronic signature (secret-key cryptography)**	**Digital signature (public-key cryptography)**
Data origin authentication	Yes	Yes (in closed user-communities) No (in open user-communities)	Yes
Non-repudiation by the author	Yes	Yes (in closed user-communities) No (in open user-communities)	Yes
Integrity	Yes	Yes (in closed user-communities) No (in open user-communities)	Yes
Connected to the content	Yes	Yes (in closed user-communities) No (in open user-communities)	Yes
Easy to authenticate	Yes (in closed user-communities) No (in open user-communities)	Yes (in closed user-communities) No (in open user-communities)	Yes
Hard to falsify	No	No, not by those who share the secret key	Yes
Authenticable as long as legal act has judicial relevance	Yes	Depends on the technology	Yes, but involves costs
Identifying signatories	Yes	Yes (in closed environment) No (in open environment)	Yes

Torts and extra-contractual liability

In this chapter, we discuss products liability issues, but also the other ways mobile technologies can cause direct or indirect damages to third parties.

> *Suppose a physicist at HO sends a message to HCS authorizing a nurse to give certain medicine to a patient. Because of an error in the wireless communication system, the message is changed so that the dosage is multiplied. The overdose causes severe damage to the patient. The damages are claimed on the basis of products liability, and professional negligence.*
>
> *Because of the malfunction of the mobile extension of the PDMS, a maintenance person gets incorrect information and installs a wrong part to an elevator. The result is that the defective elevator falls and the passengers are injured. The maintenance company is responsible on the basis of products liability.*

New technologies always present additional risks (e.g. Boehm, 1993; Kontio, 2001). It is possible that the errors cause damage even to third parties. For example, if company B1 delivers to company B2 a part that is defective because of an error in a new technology and therefore B2 delivers to a consumer a defective product that causes damage to the consumer, B1 may have to compensate it because of products liability.

> *The forest company sends a message to a harvester telling it to cut a certain area of woodland. Because of an error in transmission, the harvester receives erroneous coordinates and fells wrong trees. The owner of the wood requires compensation.*

New technology can cause direct damage to a third party, for example, if it is dangerous. It is more likely, however, that new technology causes indirect damages. For example, a wireless communication system may incorrectly change messages. The receiver trusting in messages acts in accordance with them with harmful results. (e.g. Leveson, 1995)

In general, mobile and wireless technologies do not present much more risks than new technologies at large. Clearly the risks can be more severe if the application is heavily dependable on the information transferred thorough the wireless network. Companies' readiness from this viewpoint depends on their ability to manage risks that problems with wireless and mobile technologies cause damage to third parties.

Intellectual property right

Typically a company uses others' intellectual property in its businesses. Most companies buy technologies, software, databases, maps, brand names, signs, and so on from other entities. Legally, it is often a question about licensing patents, copyright, database sui generis right, trademarks, trade secrets, and so forth. The license terms frequently restrict how the licensed intellectual property can be used. For example, a software license typically allows using the software only in a certain computer environment. A patent license can state in what circumstances the patented method can be used. A trademark license can specify exactly on what conditions the usage of the mark is permitted.

> *The product data management system (PDMS) of an elevator maintenance company is developed on top of a database engine. The cumulative investments in the PDMS have been remarkable. The company does not easily throw the system away and replace it with a new system. When the company decides that it would benefit, if its personnel could access the PDMS from the field using mobile devices, it is not willing to create a totally new mobility-enabled system, but tries to add mobile features to the existing system. However, the database engine's license terms expect that the end-user accesses the database using a device that has a fixed IP number. The wireless technology that the company would like to use does not provide fixed IP numbers, which are technically not necessary. Therefore, it is not possible to extend the PDMS with wireless features because of license terms. In other words, the company's readiness is constrained by the license agreement.*

The license terms can restrict the usage of essential technologies, brands, and so on in connection with new wireless technologies (e.g. Sarvas and Soininen, 2002). The license terms do not usually tend to prohibit business improvements. However, while a license agreement is written, it can be difficult to foresee future possibilities. Therefore license terms and conditions can unintentionally ban advances and rule out wireless and mobile technologies.

For example, suppose a truck company is using digital maps and has bought licenses for the maps from another organization. The maps are mainly used in the office in a desktop computer to plan routes for drivers. The trucks are equipped with

computerized navigation systems that could make use of digital maps. The maps are technically in a format that could be used for many purposes, but the license restricts the usage only to desktop computers. Therefore they cannot be used in trucks. Even if the company manages to get a less restrictive license, it must make sure that third parties do not get unauthorized copies of the map information. While transferring a part of a map to a truck, data goes through an unprotected communication channel and an eavesdropper is able to capture it and produce an unauthorized copy.

Many kinds of inventions related to Wireless E-Business are patentable. Not only hardware, software, and wireless communication means can be protected by patents, but also business methods that utilize those technologies. Many patents are ambiguous and obscure. It can be very difficult to estimate whether a planned business model will infringe a certain patent. But even more severe risks are involved in patent applications that are not necessarily public. Even if there did not seem to be any patents that the considered technologies infringed, someone could have applied for a patent that covers essential technologies. Consequently, patents and patent applications always form a risk factor when using new technologies. (Sarvas and Soininen, 2002)

Not only others' intellectual property rights, but also a company's own intellectual property can limit the company's readiness. Especially, the vulnerability of intellectual property rights on mobile networks is significant. Mobile networks tend to be more complicated than fixed networks. A message can easily be transferred through many operators as well as a number of computer and communication systems. Multiple protocols are used. Not all of the organizations, systems and protocols are completely trustworthy. Until a reasonably secure communication system is available, the company takes a significant risk, if it transfers its valuable intellectual property through a mobile network.

> *In the home-care service example, information on patients easily forms a database in which the organization can have a database sui generis right in Europe. The sui generis right provides the maker of a database with the right to prevent extraction and re-utilization of the whole or of a substantial part of the contents of the database. On the other hand, that does not bring to the organization any additional rights in individual data items within the database. For example, information on a certain patient can still be used only in accordance with the data protection laws.*

The recent and upcoming regulations may introduce new constraints related to the intellectual property rights. For example, rights management information should be protected e.g. in accordance with the World Trade Organization's, WTO's agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS, 1994), with the European Directive 2001/29/EC on the harmonisation of certain aspects of copyright and related rights in the information society, and with the U.S. Digital Millennium Copyright Act (DMCA, 1998). On the other hand, it is often necessary to adapt data before it can be sent to mobile devices. That may cause even accidentally the removal or alteration of watermarks and other rights management information. In extreme cases, it is not possible to utilize certain mobile technologies without putting in danger rights management information and thus violating the provisions of the abovementioned regulations.

Trade secrets and data protection

Mobile technologies may introduce new threats to confidentiality. Employees' privacy can be jeopardized by mobile technologies, but also the employer's trade secrets can be in danger and even the confidential information of third parties can be disclosed.

> *In all the above examples, it would be useful for the company to know the location of each employee in real-time. The operations can be planned and changed flexibly if a dispatcher always knows where the personnel are. Mobile technologies enhanced with a positioning means (like the Global Positioning System, GPS) enable that easily. However, for employees, it is insulting if the employer is always able to find out where they are. Employees' privacy is jeopardized.*

As discussed earlier, mobile networks present greater risks to disclose information. Not only intellectual property rights, but also privacy and trade secrets can be in danger. For example, a company may get essential competitive advantage from a logistic innovation. However, if a competitor is able to follow the company's operations by monitoring its wireless communications, the innovation might be possible to be exposed and the advantage is lost. Also, a company, which has legally got a partner's trade secrets and is obliged to keep them secret, can be liable if the information is disclosed to a third party even because of malfunctioning wireless technology.

> *The mobile extension to the PDMS could leak confidential information on products. This can be a noteworthy risk to the company.*

In the home-care service example, a lot of privacy-sensitive information concerning people and their health is managed. Data protection laws require that this kind of information must be protected most carefully. If an unauthorized third party gets privacy-sensitive information, the responsible organization can be strictly liable, i.e. even if it has done everything possible to protect the information, it may have to compensate all the damages to the patient. This risk is very hard to avoid completely and it may constrain the possibilities to take advantages of mobile technologies.

Conclusions and future work

In this paper, we have mostly discussed contractual, liability, intellectual property, and confidentiality issues. Of all legal areas, they seem to have most impact on readiness to exploit mobile technologies in business-to-business relationships. A number of other legal areas may also affect readiness. In general, they do not represent as significant constraints as the areas above, but occasionally they may have severe consequences. For example, a company's and its partners' position in the market may lead to consider situation from the anti-trust viewpoint. A company in a strong market-position planning to implement new business models should take into consideration the characteristics of potential technologies: are they central or distributed, closed or open, and do they increase or decrease competition. For example, if the market leader in fact restricts the competition by requiring that the subcontractors must use a certain technology, it may violate anti-trust regulations. The openness of ontologies, models for electronic contracts, and other standards may also have an effect on competitive situation.

The outcome of the paper is an analysis that will help companies to estimate their readiness to utilize mobile technologies from the legal point of view. Our study does not cover all the details in this complex area. Therefore, we are also suggesting themes for the future work in this area.

Especially, more empirical studies concerning the importance of the above mentioned legal areas are needed. Interviews, case studies, and questionnaires could give us more information on how severe the problems are and what is their actual effect on readiness.

As discussed above, hardly any legal area includes constraints that absolutely prohibit companies to exploit mobile and wireless technologies. On the other hand, a number of legal issues can potentially harm a company. So, the analysis of the legal constraints affecting companies' readiness to exploit mobile technologies easily turns into risk management. The legal constraints are potential risk factors that should be taken into consideration when assessing the new business models enabled by new technologies.

In risk management, information, knowledge, and capabilities are essential (e.g. Kontio, 2001). As discussed in the beginning of this paper, the concept of readiness at large is also closely involved in these same issues. In fact, an organization's readiness and the maturity of its risk management are closely related. Both of them express the organization's ability to look forward.

In this study we presented a question of whether or not legal issues or legal constraints should be considered as one element of readiness. So far, we have found only a few actual obstacles for readiness. A company is not able to take advantage of a certain business method, if it infringes a patent. Prohibition to remove or alter rights-management information may obstruct the usage of some mobile technologies. Data protection laws can prevent certain business methods. Even in these cases constraints may be overcome e.g. by developing some other suitable technology. Instead, most constraints seem to be more like risks and requirements that have to be noted, but that do not necessarily prevent the business. Thus, we do not think that legal issues as such should be an element of readiness. On the other hand, because they do have an effect on readiness, we think that they should be included in other elements of readiness.

The connection between legal constraints and technology is clear. For maintaining readiness it is essential that there are alternatives for the cases where it is not possible to licence technology protected by patents or to develop it inside the company. This requires e.g. capabilities to change the business model so that some other technologies can be used. Leadership as an element of readiness requires leaders to have at least some knowledge of possibilities and restrictions set by a variety of norms and legislation (Meyer 1997). Otherwise severe problems may emerge. Also the government has to be planned so that it will not increase the amount of legal risks. For example competition and employment issues need to be taken into account. Also managing knowledge and intangible assets (and thus IPRs) is a critical part of readiness. Accordingly, we conclude that the relationship between legal constraints and capabilities is very strong. The ability to handle emerging realities and different sides of readiness connects all these areas together and makes sure that readiness is not jeopardised because of legal constraints.

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