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Commercial potential of a technology for providing trust in electronic service environments.

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Populärvetenskaplig sammanfattning

Det finns en stor potential på marknaden för mobila tjänster. Denna potential hålls tillbaka av olika orsaker, både tekniska som till exempel brist på standardisering mellan olika mobila handenheter och marknadsmässiga som att operatörerna sitter på en stor del av makten på marknaden och att det råder brist på prismodeller som får kunderna att känna att de vet vad de betalar för. Ett stort problem som måste lösas inför framtiden är den osäkerhet som råder bland tjänsteleverantörer och användare och som gör att marknaden inte vuxit i den takt många trodde för ett par år sedan.

I framtiden kommer tjänsterna som erbjuds vara mer specificerade än vad de är nu. Tjänsterna kan vara mer specialiserade geografiskt eller tidsmässigt vilket gör att det blir svårare för slutanvändaren att veta vilka tjänster som han/hon kan lita på. När det dyker upp en radda nya tjänster i mobilen som kanske bara existerar just där, just då, då är det inte lätt att fatta beslut om de är tillitsvärda eller inte. En förutsättning för att komma åt potentialen på marknaden för mobila tjänster är att denna osäkerhet hjälps bort så att användarna känner sig trygga med den nya tekniken.

Det här examensarbetet fokuserar på just osäkerheten i framtida tjänstemiljöer genom att beskriva en teknik för att bedöma och värdera tillit på tjänstemarknaden. Tekniken är framarbetad inom projektet *Enabling and Promoting Trust in Micro Service Environments*, ett forskningsprojekt vid *Swedish Institute of Computer Science* i samarbete med TeliaSonera och Appear Networks. Tekniken bygger mycket på att användarna ger information till systemet och rekommendationer för andra att ta del av. Projektet kommer att gå från ett forskningsprojekt till ett Open-Source projekt inom en snar framtid.

Rapporten presenterar olika sätt att tänka och resonera kring affärsmässiga möjligheter med tekniken och innehåller en introduktion till ämnesområdet kommersialisering av forskningsresultat och teknik. Olika teorier inom området affärsmodeller gås igenom och en modell föreslås för projektet som fokuserar på viktiga egenskaper hos både tekniken och marknaden att använda sig av för att maximera den affärsmässiga nyttan med projektet. Arbetet innehåller också tankar kring hur det går att tjäna pengar på Open-Source, en beskrivning av tekniken och förslag på fortsatt arbete med tekniken för att maximera den kommersiella potentialen i framtiden.

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Abstract

Commercial potential of a technology for providing trust in electronic service environments.

Eva Sjökvist

This report is written to explore the business potential in a project for providing trust in micro service environments, which is a research project at Swedish Insititute of Comuter Science. The report includes a literature review giving a theoretical framework explaining different issues to take into consideration when commercializing technology. Respondents view on risks on the mobile market and commercial opportunities to explore. The result is a proposed business model which is evaluated and discussed and also suggested future work with the technology.

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1 Introduction

1.1 Preface

This publication is a part of a project at Swedish institute of computer science (SICS), called *Enabling and Promoting Trust in Micro Service Environments* (EPTMSE). The project abstract describes the purpose of the EPTMSE project as follows:

[...to study, design, and implement methods and technology for ensuring a trustworthy experience between users and services in *electronic micro service environments*.]

This project is a part of a vision about individual service provisioning, wherein any user can be a service provider. Micro service environments allow users to create and distribute their own services in addition to using services created by others. This environment opens up a world of new trust issues since the services provided will be specialized, in scope, geography or time, and there is perhaps no time to get authorization from brands or security companies, which are ways in which we build trust today. For a user to know which people to trust in an open environment is really a challenge and it is the belief of the project that this is an important prerequisite in order to properly exploit the market of mobile services.

1.2 The vision underlying the project.

In the future there will no longer be a difference between users and suppliers in service environments. The appropriate level of knowledge necessary to become a personal service provider will be achieved by using many services. This will lead to a boost in the number of services available for users and it is important to discuss the implication this will have on the market. When the services we use become increasingly smaller and more specialized we will have to trust suppliers that we have never seen or heard of before. Therefore, in micro service environments, the need for explicit systems that enable and promote trust increases. The EPTMSE project builds these trust systems and the project is a collaborative project between SICS, Appear Networks, and TeliaSonera. More information can be found on the webpage of the project. [1]

This study is a part of promoting the vision about individuals as suppliers of micro services. In this thesis there is an underlying assumption that this vision will appear. The question is not to see if micro service environments will come but to try and work out what will take place when it happens. This prediction about the future builds on the fact that the social shaping of the Internet and the technical shaping of the global information society has created a critical mass of knowledge in the service-providing domain area.

1.3 Background - SICS – and the project

Swedish Institute of Computers Science is a Swedish research institute located in Kista, Stockholm. SICS has worked as an assigner in this project since the supervisor is a

[1] http://www.sics.se/~espinoza/eptmse/

researcher at the Userware laboratory at the institute. SICS, a non-profit research organization, has as its mission to contribute to the competitive strength of Swedish industry by conducting advanced and focused research in strategic areas of computer science, and to actively promote the use of new research ideas and results in industry and in society. (www.sics.se)

The scope of SICS' research covers future Internet technologies, large scale network-based applications, and human-machine interaction. The research is carried out in close collaboration with industry and the international research community. In the spring of 2003 the EPTMSE project was awarded funding from Vinnova.

The concept of micro service environments can be understood through the following description. [Micro services are created and distributed by small to medium sized producers; sometimes even individual users can provide services, and aim to complement a user's personal service sphere. The user is in center of an electronic service world where s/he brings along his/hers service needs into the everyday life.] (Espinoza 2003,)

The Master thesis application descriptions, (Espinoza 2005) further describes the idea: The micro services environment forms the basic foundation of the user's future service cloud, in which the electronic service is the basic unit and the individual user's needs are catered for by a plethora of such services instead of a few more traditional and monolithic applications. With a great number of possible producers and distribution channels for services in this scenario (e.g. wireless position based distribution) the ability for service consumers to employ the usual methods to ascertain a perceived level of trust decreases.

In this environment new questions about trust emerge and old questions need new answers. An issue that makes this project interesting is that the problem area of trust needs to be solved before it generates the society where it is needed. The vision of micro service environments would be a giant leap to use electronic markets in an entirely new way. A business model for this scenario is a necessity to trigger the development of these environments.

[The characteristics of Individual Service Provisioning include: a lack of centralized coordination, a lack of a central database, incomplete knowledge of the whole system, global emergence of behavior from local interactions, autonomous peers, unreliable peers, and connections between peers.] Espinoza (2003)

The network around the project consists of SICS, Appear Networks, who has implemented some of the framework into their PDA[2] environment, Vinnova, who is the financier and TeliaSonera.

1.4 Research problem

The purpose of this thesis is to evaluate possible business models and commercial potential of a technology for trusted electronic service environments.

[2] Personal Digital Assistant

1.5 Scope and limitations

The framework for providing trust which this project has created can be used for many applications and processes. I have chosen to focus on the trust issues and business models for mobile commerce. This has been done firstly because I think that mobile services are a growing area which has many interesting factors affecting it. Secondly I am also interested in the technology behind it and the world which this technology creates is a distrustful one where the issues of security will be of great importance.

1.6 Methodology

This study is conducted in parts. The first part is a literature study in the areas of *business models, commercialization of technology results and innovations, and sociotechnical perspective on mobile businesses.* The literature study has been made to give theoretical background to the questions raised by the purpose. The second part is a number of semi-structured interviews conducted in order to understand the market for mobile business in general and the EPTMSE solutions in particular. The facts and views of the respondents are used as input both in the theoretical and empirical sections. The reason behind having semi-structured interviews is that it creates a good relation to the respondent and that it is a good way of letting the respondent speak freely around the topics of interest. (Patel och Davidson, 2003). The respondents of the interviews are the following persons.

Magnus Aldén, TeliaSonera
Christer Areskoug, Swedish National Post and Telecom Agency (PTS)
David Axmark, MySQL
Jonas Bergwall, Appear Networks
Erik Borälv, Swedish IT-user centre (NITA)
Xavier Diab, Appear Networks
Johan Mårtensson, Manager Swedish Centre of IT-incidents (SITIC)
Joakim Nilsson, Business coach Kista Innovation and growth

A couple of the theories presented in this thesis are applicable to the internet and e-business, but what about the market for mobile services. Nissilä, (p.33 argues that it is possible to replace e-business with any other name connected to the Information and Communications Technology (ICT) driven field of business and still keep consistency. This is why I have chosen to include these theories into the thesis.

1.7 Disposition of the report.

The background study is divided into three parts where the first one gives an orientation about business models in general, the second gives a background to the concept of innovations and the third focuses on the model chosen for the project. The theory should give the reader an opportunity to understand and evaluate the model proposed for the project.

The report goes on with the empirical description, focusing on the risks at hand, the market for mobile services and the technological solution that the project provides. The information about the two companies in the project is presented as cases mostly to make it

easier for the participants themselves. The cases include the participants' view on market issues and risks.

Thereafter the analysis provides a suggestion of what the business model has at hand for our solution in particular. The analysis section also provides some free thoughts on the subject of commercialization of the project's technology result. The report ends with suggested future work, both regarding the technological implementation and the introduction of the innovation.

2 Theory

When trying to find commercial potential for the project's technology result it is evident that there exist a lot of theories and cases showing how profit can be made out of scientific research. A theoretical framework is presented to give the reader an opportunity to put the research questions and problem into a context.

2.1 Business Models in general

In order to reason about and build a business model for the technology results of the project, the idea of business models must be defined and presented. This is done in the following section.

Wikipedia (2006-03-07) defines a business model as: A business model is the mechanism by which a business intends to generate revenue and profits. It is a summary of how a company plans to serve its customers. It involves both strategy and implementation. It is the totality of how a business:

Finds its customers
Defines and differentiates its product offerings
Creates value for its customers
Acquires and keeps customers
Promotes and distributes its offering.
Makes use of its resources
Captures the profit created

To simplify things a business model can be described as anything that answers the questions: what is being sold? To whom? And for how much? It is about identifying flows of products, services and money and developing a value chain with suppliers, re-sellers, distributors and target market. It is important to think about how the service should be well adjusted to the target group and reach out to the market in a simple, clear and easily communicated way. In the beginning, one of the most valuable goals is to find a marginal to be able to get money to develop the concept further. (Nilsson)

Another issue to think about is that no one ever has the whole picture. Information is missing or contradicting, knowledge is missing etcetera, the important thing is not the result but rather the iterative process of discussing the issues involved in a business model. A good process forces the actors to learn about the market. (Nilsson)

Tsalgatido & Pitoura (2001) give the following business model definition: a logical architecture for product, service or information flows, including a description of the involved business actors and their roles. Tsalgatido & Pitoura (2001) continue by stating that companies need innovative ways to capitalize on both the power of the technology as well as the changes in the market. To be able to do this an appropriate business model is necessary and should include the following:

Core Competencies
Special characteristics of the technology
The different contexts, situations and circumstances when the artifact is being used.
Internet e-commerce models.
Market needs
Other actors and players in the field
Previous success stories

There is no general definition applicable to all business models and the diversity among the definitions stretches from different concepts of what it is concretely, where strategy, business concept and revenue model has been proposed, to different ways of seeing what it should be on a more abstract level, where architecture, plan, method or assumption has been proposed. (Morris et al, 2005, p.726) The definitions above works as an example of how undeceive this concept is. Magretta (2002) also concludes that the term has been carelessly used, leading to a broad and vague understanding of what it is. A business model is successful only when it offers a favorable way of executing activities to produce the firms offering, (Magretta, 2002) A bad business model can have many flaws, two of them being that the economic rationale is wrong and the model does not generate value in the appropriate way and the other being that the strategic logic is wrong from the beginning, for examples if assumptions about customers needs are never met. (Magretta 2002, p. 86-92).

It is important to note, however, that even though there is no agreement on the decision elements included, there is a consensus that a good business model shows that a company or business is more than the sum of its parts, capturing the essence of how the business system will be focused. (Morris et al, 2005, p.728). The business model construct builds upon central ideas in business strategy and is closely associated with business theory such as value creation.

Researchers often develop a technology; a product without knowing exactly what applications can be developed out of it, what is unique about it, or who should be the customer. Mostly the researchers focus on a couple of cool technological attributes. There are often a number of different ways to find the suitable solution from the technological attributes. A good starting point is to find who has a problem and how can it be solved. Do we solve the problem better than anyone else? Another issue is the priority of the problem solved. Is it number one or number twenty-two? That makes a big difference in willingness to pay. The golden rule is that if you solve problems for someone and can communicate this to that particular group, you will earn money. (Nilsson)

According to Joakim Nilsson, researchers often have another viewpoint in the business development context. Researchers often have many international contacts and are good at cooperative projects and they also often have experience from applying for funding. Generally speaking researchers are less ready in their way of thinking about the market. Another big difference is that it is not really accepted in the research world to

commercialize. It does not give any extra status to have a patented technology if you compare to having written many articles.

2.2 Chosen Business Model for the project

Morris et al, (2005, p.729f) present a background study of the concept of business models saying that decision elements include stakeholder identification, value creation, differentiation, vision, values and alliances. (Morris et al, 2005, p.727) This model is from now on defined as the business model for the project and we will call it Morris´ business model. This model will work as a framework throughout the report and it is chosen because it is a broad framework and a flexible model. It is necessary though to address the fact that the later two factors; economic possibilities and size ambitions will be treated in the analysis but without any empiric facts.

Morris´ model points out six important issues to take into consideration when forming a business model. These are:

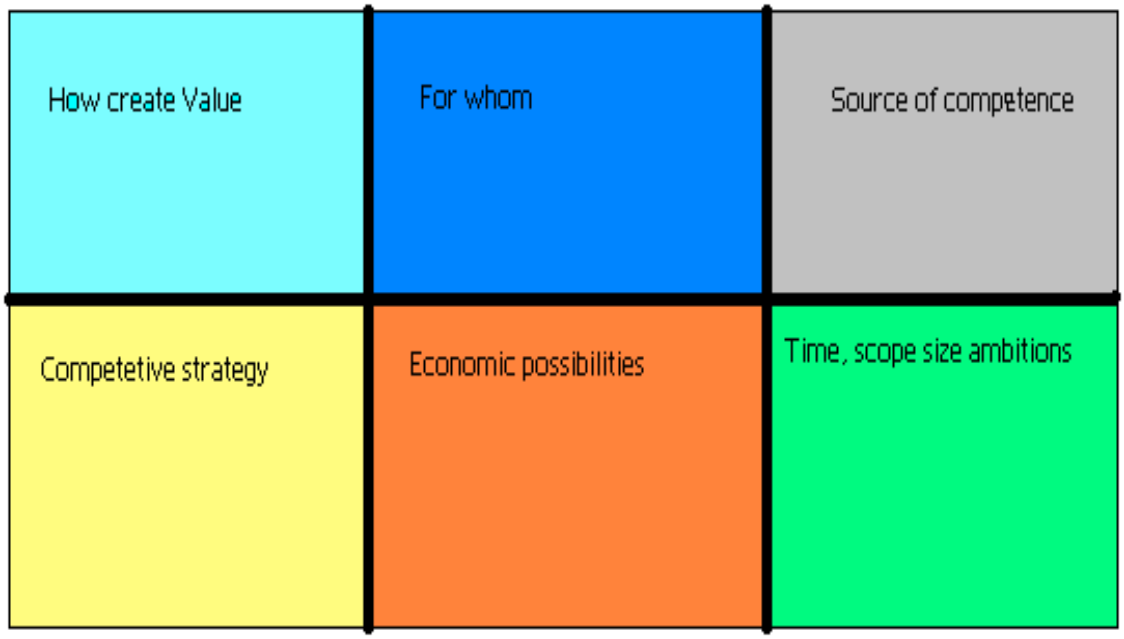

Figure 1 – Morris´ business model.

2.2.1 How will the firm create value?

This part of the business model includes factors related to the offering such as the mix between products and services, the firm's role in production or service delivery and relationships to others in the network. Another important sub question is how standardized vs. customized is the service? A defined value proposition is a prerequisite for a justified business entity. (Morris et al. 2005, p. 729)

2.2.1.1 Value creation in virtual markets.

Virtual markets is defined by Amit and Zott (p.495) as settings in which business transactions are conducted via open networks based on the infrastructure of the internet. These markets have the following characteristics: High connectivity, a focus on transactions, the importance of information goods and networks as well as high reach, and richness of information. Reach is the number of people and products that are reachable quickly and cheaply in virtual markets and richness refers to the depth and detail of information that can be accumulated and offered to consumers.

Within virtual markets strategic networks are defined as stable organizational ties which are strategically important to participating firms. Traditionally, according to Amit & Zott (2001) network theorists have focused on implications of network structure for value creation. For example the size, density and centrality have been considered as determinants of the availability of valuable information. Strategic management and entrepreneurship scholars have moved beyond structural arguments to explore the importance of other issues such as trust, resources and capabilities. Strategic networks can assist a business through the potential to share risks, generate economies of scale and scope, shorten time to market and reduce asymmetries of information. (Amit & Zott, p. 498) Amit & Zott´s own theory about sources of value creation in e-business includes among others Efficiency and Complementaries. By leveraging the cheap interconnectivity of virtual markets, new business models can further enhance the transaction ***efficiency*** by making the decision-making faster and more informed. ***Complementaries*** are present whenever having a certain basket of goods together provides more value to the consumer than having each of the goods separately.

The value-creating potential of an e-business is enhanced by the extent to which customers are motivated to engage in repeated interaction and transactions and to what extent to which partners find it meaningful to maintain and improve their relationships.

2.2.1.2 For whom will the firm create value?

Is this a b2b or b2c situation? Where is the customer in the value chain? These questions concern the nature and scope of the market in which the business is situated and the stakeholders involved. This factor in the model strives to identify customer types, and their interaction requirements as well as definition of the market. More theoretical issues on different users and adopters are presented and discussed in the section regarding diffusion of innovations below in the section 2.3.1.

2.2.2 What is our source of competence?

The term core competencies are used to define in what ways the business distinguishes itself from other businesses. The concept tries to capture which internal capabilities are hidden within the business network.

2.2.3 Does it matter that it is open source?

Open source software, OSS, is software that is made available for all and the development projects are usually internet based communities of developers and users who voluntarily

collaborate to develop software. OSS is becoming a significant economic and social phenomenon. (Von Hippel & Von Krogh, s. 209)

Open source business models have so far been rather simplified, focusing on descriptions on how to make money with open source. Nissilä (2004) connects the contemporary business model to open source strategies. In his work a business model is defined in different levels. First, on the rudimentary level it is just an economic model handling profit generation. Second, at the operational level, the model describes the architectural configuration around a business innovation, focusing on internal processes and design of value creation infrastructure. Finally there is also a strategic level where the model represents the overall direction in positioning, inter organizational boundaries and opportunities for growth. (p.32, 2004, TUCS, Turku institute for computer science - Contemporary business model concept and open source software.)

The growing area of open-source software is showing that users solve their own and others problems and are willing to except that they are not getting an appropriate private return on their invested time. It is a combination of private and collective models of innovation and can provide the best from different worlds. (Von Hippel & Von Krogh p. 209).

The two ways of inducing innovations in our world has been on an individual basis or by collective action for public goods. Society has built a large pool of instruments ensuring that there is enough incentive for individuals to innovate. Examples of such instruments are patents, copyrights and trade secrets. These rights help innovators in getting returns from their investments. For collective goods it is required that contributors give up the control over knowledge they have developed and supplying it to the world as in the scientific society. In the case of OSS development projects one must ask oneself, why bother? The open source model is an outcome of a handover of informative, valuable and incentive signal that potential contributors are analyzing constructively. (Iannacci, s.1) One of the most well-known theories about OSS is that it is an information good exhibiting network externalities stemming from standardization. (Shapiro & Varian 1999 in Iannacci 2002 p. 3). The open source software exhibits increasing marginal value deriving from increasing number of users and developers. The larger the number of individuals using the standard, the higher value of the software. (Iannacci, p.3)

One major problem with new technology is to get people to try it. It takes a lot of effort and money to get people to pay for trying a product. With OSS it is the other way around. It is easy to get people to try but hard to get them to pay for a license. This is necessary to get a critical mass of users. To be able to get people to engage in developing, the basis of users must be sufficiently big. It is important to note that Open Source movement is not only about the money, it is also about empowering the developers and giving them a feeling of freedom. (Axmark)

With OSS you can learn by yourself and intuitively by trying. It does not matter how good you are, in a closed system you are always a back seat driver. If you are going into the OSS world you have to go all the way, there is nothing in between especially if the solution is in infrastructure. Then it is important to become a standard. It does not work with many competing systems because the user does not have the energy to the keep differences apart.

Once you have established a brand then you can take out money. The main focus is to get people to invest their time, not necessarily their money, but their time. (Axmark)

2.2.4 Online Communities and their commercialization

Man is a social being and as such has always wanted to confine in others and to form groupings, partner- and friendships. The technological solution of the project is exploring this fact by using the consumers and users as input into the system. This is the reason for this piece of theory to fit in the bigger theory puzzle.

With every new form of social order the alliances and groups have changed but nevertheless existed and flourished. The birth of computer networks and Internet is no exception. The communities that arise in the electronic world are first and foremost social entities. It is a number of people who relate to one another by using a specific technology. (Klang & Olsson, p.2) One of the most important building blocks is an active membership. In traditional communities you address your membership by your presence but in virtual communities you show your presence by being active. To be a member of a virtual community is to be committed and active on a voluntary basis. Klang & Olsson attempts to put these communities into an economic context. The Virtual community is a marketing tool. A working community provides sellers with a perfect market segment ready to explore.

The single most important factor in electronic commerce is the factor of trust according to Klang & Olsson. They further state that this is an area where communities can be used with big success and it is a way to promote an environment of trust. (Klang & Olsson p.10)

Krieger and Műller also state that Community-based business models aim to profit from the value which is created when communities solve problems of collective action by controlling access, aggregating data or realizing side payments.

Many recent studies of communities rely on methodological individualism to explain why members choose to be in a community. This is according to Krieger and Műller a too easy explanation since communities by definition are larger then their members. If a community can be legitimized and reproduced then value for its members is created. But in order to translate this value into business profit the entrepreneur must position the community correctly in its competitive environment.

Why do community members act collectively rationally? To get a community functioning properly it is important that the trade-off between what you put in as effort and what you get out of it is well-balanced. It is always easier for an individual to free-ride, but the fact that members choose not to do so is what creates the value for the rest of the community.

When talking in economical terms about individual behavior it is almost always assumed that every individual acts rationally for themselves. However if every member of a community does this then there is no community. The reason for doing the collectively rational is according to Krieger and Műller that individuals feel that they belong to

communities and therefore act as if they had a collective consciousness. Communities can be seen as unusual businesses where your customers also create the value you sell them. (Rheingold, 2000) Both markets and communities are social institutions dealing with problems of collective action that is a divergence from what we expect is rational for an individual and a collective. As social institutions, communities and markets offers different solutions to the problems of collective action. When building, and profiting from a community it is important to differentiate between acting as market participant and acting as a communal entrepreneur. Businesses interacting with competitors and customers in a marketplace have very different strategic options than an entrepreneur building and sustaining a community. Very few companies have been able to balance the social project, the community with the business case (Rheingold, 2000) Business models, which aim to create communities in order to generate profits, have to focus on legitimacy and reproduction within the community and externally on withstanding the competitive dynamic of the commercial environment. If an entrepreneur is able to create and manage a community so that it is valuable for its members and also translate this value into profits building communities should be an enticing business proposition.

2.2.5 Sociotechnical view on the core competences.

In order to properly explore the potential of the solution presented in the project it is important to understand that technologies evolve in collaboration with cultural, social and economic processes. To seek new innovations instead of technological progress can be a really dynamic way of finding and building new applications. (Allen 2003, s.23) The research in the sociology of technology shows that the development of new applications shall be seen as a process driven by social interaction. (Allen 2003, s 24). Sociotechnological views on innovations are important to understand the evolvement of mobile services and the complex relationships between technology and social processes. (Allen, 2003, s.24). The field where our application is to be used, users and security, is no exception. A user's ability to trust suppliers of services is a social process which is in need of technological support. Allen (p.24) also states that both technological and social detail must be taken seriously in IT research. There is a danger that the artifact itself is taken for granted once it is built and installed. It is important to apply a sociotechnical perspective because it is likely to be useful for understanding new mobile applications and the complex interrelationships between technological and social progress. A sociotechnical perspective argues that the emergence of new applications is an attempt to create a common definition that will help further development, acquisition, and use. A common definition of a new technology makes sure that all actors and stakeholders know what the technology does, what it is good for, what it is trying to achieve and it's most important features. To think of applications in a Sociotechnological way helps create a fundament for finding appropriate users, consumers and marketing issues.

According to Kuhn, cited in Allen (p. 25) a technological framework needs at least three different types of resources for sustained social interaction.

> The most important problem to be solved by a technology, expressed as a vision of a barrier or dilemma faced by a particular set of users.

The most important performance criteria for a technology, offering a potential solution to the problem.

An exemplary artifact, a material example that serves as a role model of what a technology should be.

Kuhn(1962) as well as Pinch and Bijker (1987) highlight the importance of including many different social groups in the development of new technology. It is a common problem that the developers of new products and services focuses mainly on the early adopters and forgets that to get a product which is sustainable through the whole product cycle it needs many and different users in the development process. To be able to commercialize a new technology one must know which factors are building the technology and which users are having problems to be solved.

2.3 How do we competitively position ourselves?

The internal competencies presented in the earlier section provide a starting point for a business strategy. Another part of a successful commercialization and business model is to find ways to promote and position these competencies. Issues questioned in this stage can for example be quality management, innovation possibilities and cost efficiency. (Morris et al, 2005)

2.3.1 Diffusion of new technology.

Technological innovation is a main area of research. In order to see how we can position our self it is important to understand in which ways innovation diffuses and spreads. Economists, business people and developers need to take diffusion of innovations into account when they plan what and how to develop technology. There are a lot of parameters affecting the degree of diffusion for a technology. Of course the technology itself is important but there are other perspectives to include as well. Geographical networks, human resources network, market timing, easiness to users, marketing channels, distribution channels and degree of novelty are examples of other perspectives.
The speed of adoption of new technologies is a major issue when estimating the market potential. One of the most cited theories is Rogers's diffusion model, which will be presented below. Diffusion according to Rogers is defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system." Diffusion is also intertwined with social change, as the innovation alters the function and structure of the social system. (Schildknecht, 2002, p.13)

Rogers also suggests five attributes of innovations by which an innovation can be described. The individual receiver's perception of these attributes predicts an innovation's rate of adoption. (Rogers, p. 250)

Rate of adoption: relative speed with which an innovation is adopted by a social system.

Relative advantage: Degree to which an innovation is perceived as better than the idea it improves. The relative advantage of an innovation is positively related to its rate of adoption.

Compability is the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters. The perceived compability of an innovation is positively related to its rate of adoption.

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and to use. A high complexity lowers the rate of adoption for an innovation.

Trialability is the degree to which an innovation may be experimented with on a limited basis. The more you can try an innovation the more likely you are to adopt it.

Observability is the way that the results of an innovation are visible to others. If an innovation has high observability the rate of adoption will be high. (Rogers, p. 250)

When judging and exploring the commercial potential in a technology all of these attributes must be taken into consideration. Examples of what they mean in the EPTMSE case will be presented in the analysis.

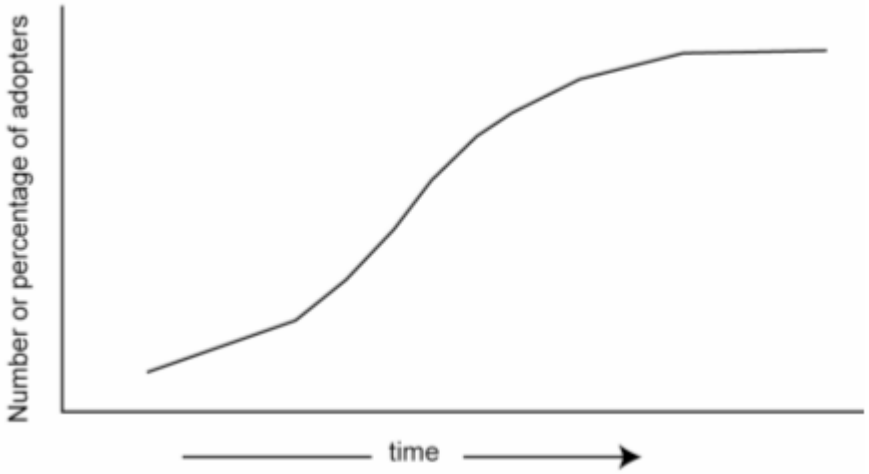

Figure 2 - Example of Roger's s-shaped curve.

The relative speed with which members of a social system adapt to a new innovation can be plotted on a cumulative frequency basis over time, the resulting distribution is an *s-shaped curve.* The slope of ´S´ varies between different innovations, indicating the very speed of adoption. The time variable in the model allows for both classification of adopter categories and plotting of diffusion curves. Diffusion usually takes off once the personal networks become activated in the spreading of subjective evaluations of an innovation within a social system. The area of the diffusion curve from ten percent adoption up to 20-25 percent adoption is the most important part of the innovation process. Once the numbers are up to 25 percent or beyond it is practically impossible to stop the further diffusion of the new idea.(Schildknecht, 2002, p. 13-14) This can be compared with Metcalfe's law which states

that the value of a telecommunications network is proportional to the square of the number of users of the system (n^2). (Wikipedia 2006-08-06). The law of Metcalfe issues the benefits of a network or a communication channel. Since the EPTMSE solution is dependent on user interactivity it is a relevant theory to be mentioned. The principle is one of the reasons that many communications technologies are experiencing trouble in the beginning of their commercialization. The critical mass needed to exploit the resources with the technology must be reached. (Lindgren et al. 2001, p.76)

Since the project is in the ICT area it is interesting to see what special questions this creates. Lennstrand (2000) has argued that even though Roger's theories are classic and has a great value for decision makers there are a few problems with the model when applied to diffusion of ICT. The solution provided by EPTMSE is also situated in the ICT area which makes it interesting to see which things in particular that need consideration. The issues to focus on are connected to a number of assumptions in Roger's theory which are not properly fulfilled in the context of ICT. The troublesome assumptions and the problems with them are stated below with Roger's assumptions in Italic text and the problems that Lennstrand found to be connected with them in regular text.

The diffusion of an innovation is independent of all other innovations.

The next generation services are far from being independent on the diffusion of a couple of enabling technologies.

The nature of an innovation does not change over time.

Network, handsets enabling technologies and also available services are constantly changing. The way that other services raise or lower the need for security issues will needless to say affect the rate and scope of the diffusion of our product.

Diffusion of an innovation is not influenced by marketing strategies.

Pricing, a part of Kotler's marketing mix (Kotler 2005) and thus a marketing strategy, for example played a major role of the diffusion of the Internet. A full diffusion is only possible when all new consumer groups are met by a price which satisfies their price sensitivity and ability to pay (Schildknecht, p. 16). Areskoug also argues that a crucial factor for the growth on mobile services is that the consumers know pre-transaction what the price for a service will be. (Areskoug)

There is only one single adoption by each adoption unit.

As long as the market for different terminals is widely growing and the terminals such as laptops, cellular phones and PDA:s is different in what needs they can fulfill, many users will have different variants of terminals possible. (Lennstrand, 2000)

Since the technical solution in the project is built upon a community approach and user inputs, it is important to see how network externalities affect the rate of adoption. According to Burt (1980, p. 331) a potential adopter who is socially integrated into a system of other potential adopters is likely to adopt early and at a time when persons

directly connected to him/her by innovation-relevant relations are adopting the innovation Those who are at the rand of the social network will probably adopt late and on a time more predicted by own preferences. Also Rogers discusses what difference networks and relationships have for the adoption of innovations. The road to success is to find the most central persons in a social network and use them to source viral marketing.

2.3.2 How will the firm make money?

As argued above by Magretta there must always be a defined economic logic determining how to make money. This stage includes pricing options, which margins are proper and what ratio between fixed and variable costs are we looking at?

2.3.3 What are the time, scope and size ambitions?

This is an interesting factor, but since this report is a result of an ongoing project which is about to close these questions are rather hypothetical.

2.3.4 Summary of the theory presented.

This theory section of the report gave an introduction to the different issues and factors important to think about when constructing a business model. Morris's business model was chosen and described.

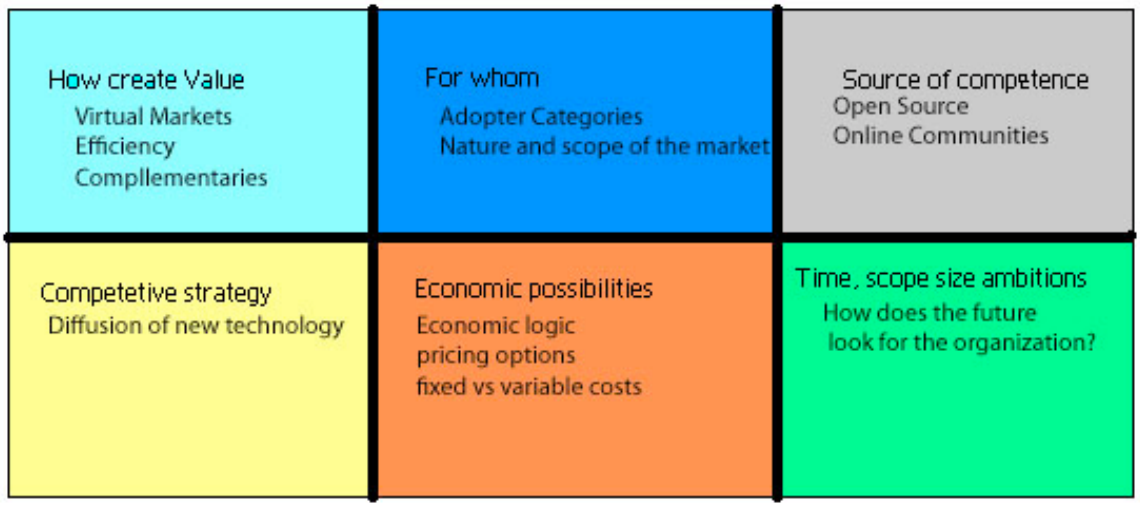

Figure 3 – Summary of the presented theory.

This is a fundament to rely on when reading the descriptive part of the report which comes next. The issues addressed and the theoretical concepts presented will come back in the analysis section where the business model is applied to the competences and resources of the project. In order to understand this analysis, a description of the market for providing trust in mobile services as well as a description of the technology developed in the project will be presented in the next section.

3 EMPIRICAL DESCRIPTION

This section of the report describes aspects of external and internal factors that in different ways influence the commercial potential of the project. At first we look at the technology developed within the framework of the project. The technology is described for the reader to get a picture of what it is that is being evaluated throughout this report. Then we look at what the market says about the emerging risks with mobile terminals, and next we focus on mobile services in general and about our solution. The sections about risks and the market is an aggregated description based on the interviews done for this report. The respondents are listed in the methodology section.

3.1 The technology of the EPTMSE project.

Before starting to describe the technological framework, please remember which characteristics were stated for the concept of individual service provisioning such as: lack of centralized coordination, lack of a central database, incomplete knowledge of the whole system, global emergence of behavior from local interactions, autonomous peers, unreliable peers, and connections between peers. (Espinoza (2003) This part of the report will mediate the framework and the specific technologies in this project. This is done to give the reader a chance to understand what the technology results of the project really are. If you are a project member in any way, you can probably skip through it.

Trust is a concept which is intuitively understood to some degree. We all have learned that trust comes from different sources such as authorities, as we for example trust the police or the government. Also we trust people close to us. We listen carefully to their opinions and recommendations. Trust in mobile or internet societies is hard because we must interactively and simultaneously trust the technical system, the people on the other side of the transaction, which we can't see and do not know anything about and also the society surrounding the transaction, as for example the payment system can be insecure even though the supplier is honest. At the beginning of the project the concepts of trust were examined from different viewpoints and a framework for understanding the complex issue were addressed. (Internal EPTMSE report, 2003). The definitions of different trust-mechanisms are listed below (Internal EPTMSE wiki).

3.1.1 Trust mechanisms

These definitions are made by the project participants in order to concretize the issues behind the concept of trust.

3.1.1.1 Authority – Brand names and certificates

Trust through brand names is enabled by people recognizing the name of a company or a product. The user decides to trust this based on the attributes that s/he has associated with the brand name. One other example of the authority trust mechanism is certificates. Verisign is a certificate authority. The certificates are being trusted because Verisign has established a name in the business, being a reliable player. Another example is Taxi Stockholm, the most well known taxi company in the Stockholm region. It is not considered a risk to order or go with a cab from Taxi Stockholm, even though the

individual taxi cab is a privately held company licensing the Taxi Stockholm brand. You can also book your cab from their website and people subconsciously trust the website, and the individual cabs, enough through the trust they have from the brand of Taxi Stockholm.

3.1.1.2 Reputation – Votes and reviews

People has always liked to gossip. A voting system makes use of this by aggregating user votes and a reputation can be built. It is up to separate individuals to make their own conclusions about the usefulness of the reputation value and the danger connected with it. One must remember that the values are aggregated from many users and the quality of these values depends on which users have given input and With a review the user's opinions are also aggregated but likely it is easier to find nuances among the opinions when someone has actually written something. Of course it is hard to get people to engage in sharing there opinions without incentive. An example that uses both votes and reviews is **Download.com**. The software being available for download is rated from a scale from zero to five, were the mean then is calculated. As a complement there are also reviews from the users who have contributed with their opinions. This trust mechanism is typically a centralized model. The nodes send their comments or reviews to a central server so that everyone can find each other's reputation in the central server. Interesting work has been done to make reputation systems for a Peer-to-Peer system. Because there is no central authority to store nodes' reputation value, the nodes search and evaluate other's reputation themselves. The EPTMSE project has build a reputation based trust mechanism for p2p-systems.

3.1.1.3 Comparison

By comparing *your value* to several other values you can draw some conclusions whether to trust *your value* or not. For example, if you're not sure if your translation of a word is correct you can compare it with other sources to see if it matches.

The most common examples are price comparison sites. If you got a price suggestion of a "good deal" from a seller, you can compare that price, at Pricerunner for example, to see if you can trust the seller. Comparison can also be done between different solutions to the same problem. In the fast changing world of today there is no "best" service in absolute terms; it is a question about need fulfillment vs. risk vs. effort. Users tend to choose a satisfying solution over finding the best solution to a higher expense.

3.1.1.4 Meta Trust Mechanisms

How do we trust trust-mechanisms? If trust mechanisms themselves were being scrutinized, how would they rate? Past experience: a user's past experience can tell whether s/he usually trusts a trust mechanism. For example, a user can decide whether to trust a movie review if s/he knows about other reviews from the reviewer.

3.1.1.5 Recommendation

Recommendation as a trust mechanism is rather intuitive and self-explanatory. You have to have some trust in the one giving the recommendation, such an authority, friend or someone with special knowledge. One example is the SL journey planner, giving suggestions on how to use their transportations from one location to another. Another

example could be information from a Tourist Office or advice from locals. Another recommendation system can be found at One-of-us. Users pick the "experts" to trust and can then find all advice given by them. There is a difference between people you only trust in certain areas such as your financial advisor and persons you choose to trust on every occasion such as your friends and family.

3.1.1.6 Top Lists

If the service you consider to use has been used widely, proved by the number of time it has been used for example, one can make some conclusion whether to trust the service or not. At download.com the most popular downloads are being listed, an average of the votes calculated. At a Google search page, the most linked-to pages, page rank, are being displayed first. This trust mechanism can really be about anything for example usage statistics, time or other measurable variables.

3.1.1.7 Trust by Extension

If some entity has gained some trust, it can forward trust to other entities in relevant areas. For example, a chef may give good advice on other restaurants. Or if there is a website that a user considers has good and trustful information, the links to other pages from that site can also gain some trust.

As stated earlier, the purpose of the project is to implement these mechanisms and turn the project into an open source project where new implementations can be added as well as new trust mechanisms.

3.2 System design

A basis for the mediation of the technology is to concretize the framework into a solution. A couple of goals for the technology were that it should be flexible and adapt well to the public scenario. The idea is that the user should be able to see which services are accessible and at the same time see a value for trust according to one or more of the trust mechanisms. It is the understanding of the project that this will give an opportunity to the user to make better decisions. Since users' opinions are important in the context, the technological system also handles the flow of information which is the user's rating or recommendations through SOAP[3] calls. Below is a picture of the system. (Internal project document)

[3] SOAP is a protocol for exchanging XML-based messages over a computer network, normally using HTTP. SOAP forms the foundation layer of the Web services stack, providing a basic messaging framework those more abstract layers can build on. There are several different types of messaging patterns in SOAP, but by far the most common is the Remote Procedure Call (RPC) pattern, in which one network node (the client) sends a request message to another node (the server), and the server immediately sends a response message to the client.

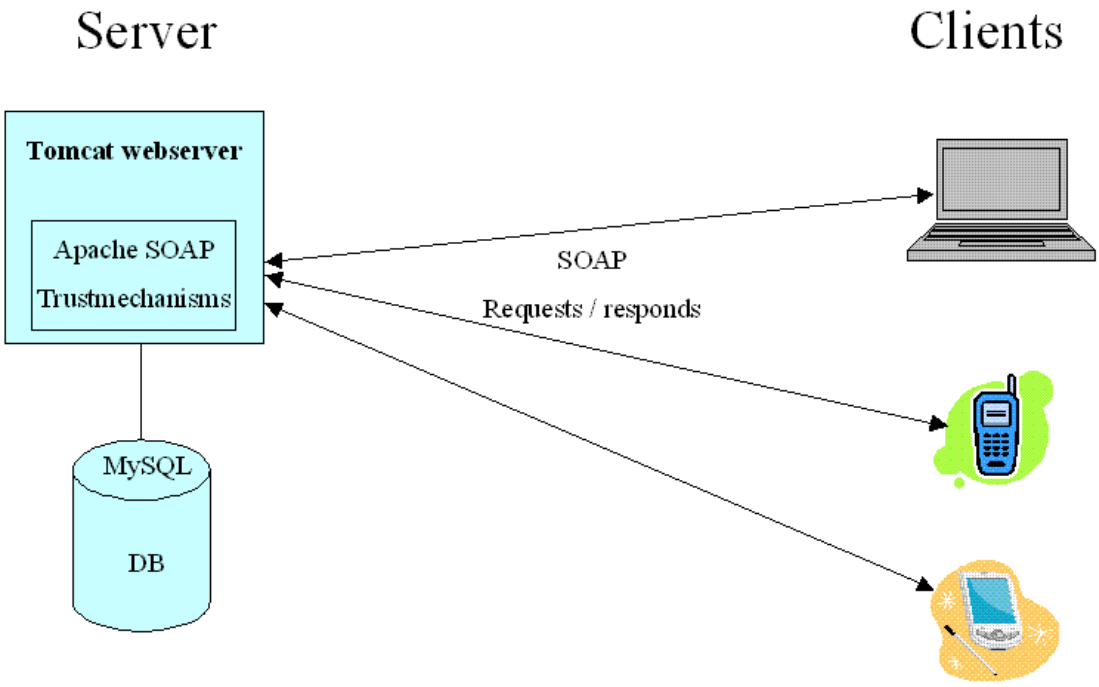

Figure 4 – Overview of the system.

3.3 System Integration

One of the overall goals of the project was to enable the resulting technology to integrate seamlessly with other commonly used technologies. This was deemed as a natural requirement for gaining wide spread use of the project's technology in the long term since integration would be simplified. To this end the overall system design for the technology output was chosen to be based on open and (de-facto) standardized frameworks and protocols (i.e. j2ee, tomcat, SOAP, etc). To concretize and illustrate the concepts and possible methods of such integration, the project in itself has created example integration with related technology in two cases: integration with a system for distribution of network services to hand-held computers in wireless networks (in cooperation with project partner Appear Networks), and integration with commonly used web browsers using JavaScript. The following sections describe these integrations.

3.3.1 Integration with Appear Client

"The Appear Context Engine from Appear Networks gathers context of use data and builds a model based on the information needs of end-users. Available services are filtered against this profile to determine what data is relevant, and this information is then proactively pushed to the wireless device." (http://www.appearnetworks.com/-Appear-Context-Engine-.html)

The concept of Appear Network's product Appear IQ is to gather information about users and then offer an individualized set of services appropriate for each user. The logic for this exists in the Appear Context engine and the most common user terminal is a mobile device. The integration of trust into this architecture builds on the concept of trust being yet another piece of information about users or services. The overall idea is then to complement the information about services with trust information and make this available to the process during which a subset of services is offered to users. In the first implementation, as we will see below in the concrete description of the integration, the trust information is simply appended to existing meta-information about each service. This means that the trust information does not affect the choice of services being offered, it merely allows users to access this information about each service.

In the Appear Network implementation of the service, the trust information is collected in the Proxy server in the context of an individual user requesting an offering of services. Potentially this allows the request to the trust server to be tailored for the particular user and its general context (as provided by the context engine of Appear IQ). The trust information is attached to the service definition that is delivered to the client, where an extension examines the trust level and enhances the service icon with graphics representing the trust in that service. (Internal project document.)

The sequence for pushing and displaying reputation values goes as follows:

- The Client requests an update of the offering
- The proxy requests the offering, including services, from the server
- Before sending the offering to the client, each service is asked to be decorated
- The TrustDecorator queries the EPTMSE project's demonstration Trust Server for a trust value for that particular service and adds any available value to the service properties
- The offering, including decorated services, is sent to the client
- On the client, in the processing of the received offering, each service icon is processed by a stack of icon enhancers
- The TrustIconEnhancer checks if the service has any trust value, and if so adds a colored bar overlay to the service icon depending on the trust value

For each service on the client the user can bring up a context menu with commands for that particular service. The menu is extensible by XML configuration and writing appropriate commands to be executed if clicked on in the menu. In this case, for reporting trust feedback, one command class is created. It is configurable to send either positive or negative feedback on a service, using a SOAP proxy component. In the configuration two differently configured instances of the command class is created and added to the menu configuration. (Internal project document.)

The sequence for reputation feedback goes as follows:

- The command component invokes the SOAP proxy with selected service ID and the configured feedback type (positive or negative)

- The SOAP proxy invokes the Trust Server

- The trust value is appended to the existing set of trust values and processed further by the Trust Server.

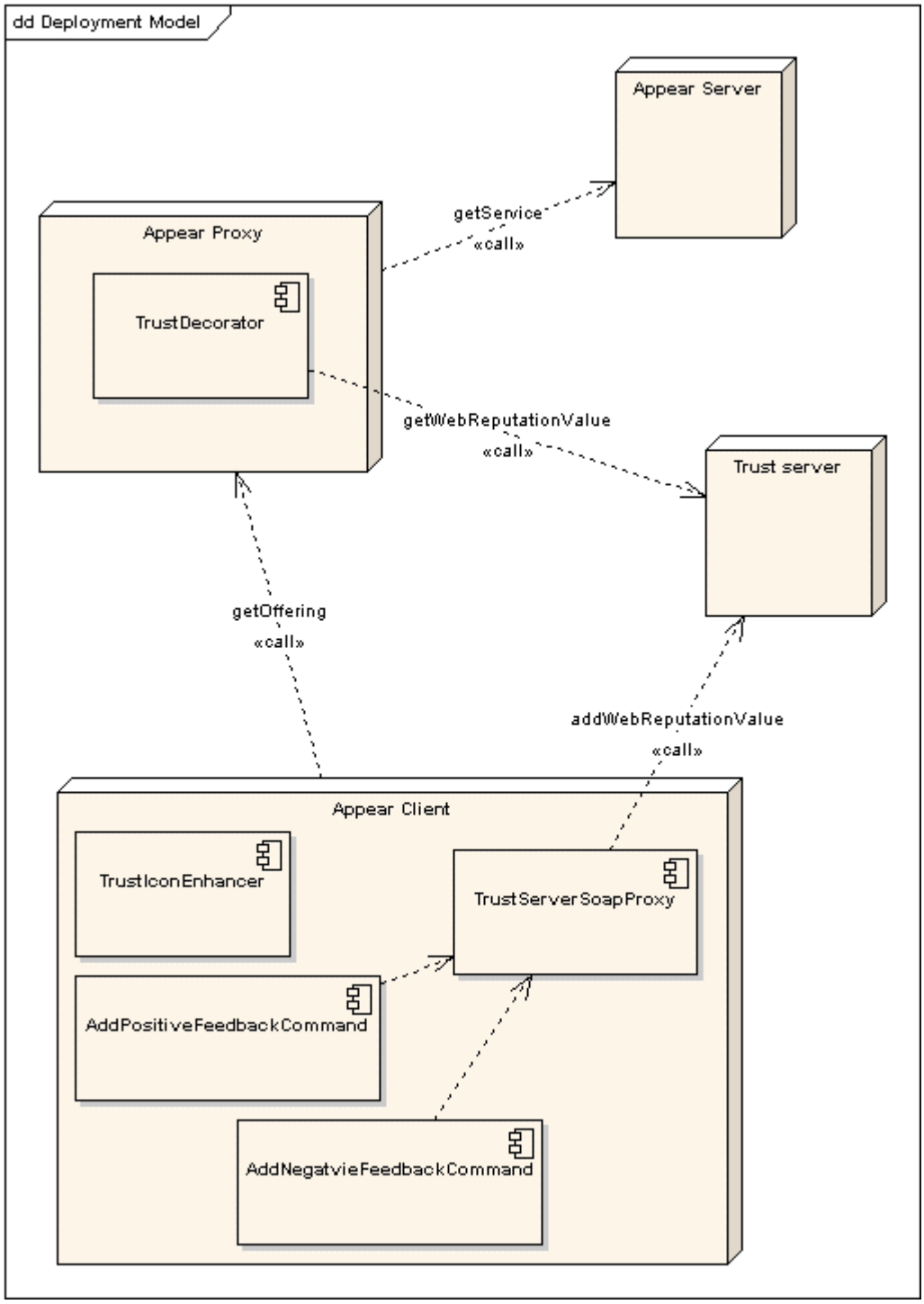

Figure 5 – Overview of integration with Appear´s client.

3.3.2 Integration Effects On Appear Network's Product

At the start of the project, initial proposed solutions instigated an overview of the architecture of the Appear platform.

The following early proposals were given:

- The EPTMSE system could be integrated as a plug-in in Appear IQ
- Appear IQ could be integrated as a plug-in into the EPTMSE system
- The EPTMSE system could be build on top of Appear IQ

The existing framework for plug-in components was inflexible and unsatisfactory for catering to the demands of the EPTMSE project if this technology were to be integrated as a plug-in. The existing framework for user accounts was also too rigid to handle the public usage scenario of the EPTMSE project and had to be reworked. Finally, there were problems with the flexibility of the keyword handling including the context model. A redesign of these items, both on server and client, was performed to cater for future demands.

An internal working group was then created to examine the issues concerning future adaptations and extensions to the Appear platform. The group examined customers' and projects' demands as well as their own ideas about a proper architecture, and consolidated these findings with information about coming new technology platforms that would be relevant for future implementations. The effort resulted in modifications to several sub-systems to adhere to the model of "Inversion of Control" (IoC[4]) with configuration management of the complete system using xml-files. The Spring framework (www.springframework.org/) served as inspiration and also a source for actual framework libraries. Another concrete result was the created company policy to continually strive to build in expansion and adoption possibilities in all parts of the system, which could be used by system integrators or the Appear Networks' developers themselves in the future.

After the introduction of these new capabilities into the Appear platform, several new possibilities for integration with the EPTMSE trust system were evident. These were discussed carefully and the choice fell upon the methods described above. There were, however, several additional possibilities which were not explored during the project but were deemed to be very promising:

- Service filtering based on the trust values of services. This would result in a tailored offering of services to individual users based not only on their context but also on the trust values of the services.

[4] Inversion of Control (IoC) is a design pattern that addresses a component's dependency resolution, configuration and lifecycle.

To increase the impact of the trust server information in the context handling of the Appear IQ platform. This could result in additional context data for more fine grained evaluation of contextual trust information.

3.3.3 Integration with Commonly Used Web Browsers

The second implemented client in EPTMSE is the web client. Its purpose is to make available trust information to users while they are browsing the web. It builds on the same server architecture as the Appear Networks client.

The web client is implemented as a Greasemonkey script. Greasemonkey is a scripting system for the Mozilla Firefox web browser. It enables developers to create scripts which are run when loading web pages and which modify the pages during the loading. This makes it possible to make changes to layout, function, and content after the original page has loaded but before it is presented to the user—and without the original page authors knowledge—since the modifications take place in the web browser. The technology is based on Javascript and dynamic html, i.e. the browser feature that allows Javascript scripts to modify the web page after it has been loaded. Anyone can create Greasemonkey scripts and anyone can install them in their web browser. Specific scripts perform specific functions, for example, there are scripts available for download on the Internet that will add or remove buttons and links or hide parts of the page which may be more or less interesting.

To use Greasemonkey one must first install the Greasemonkey extension in the browser. This is easily done by downloading and installing the extension from the Greasemonkey site (http://greasemonkey.mozdev.org/). After the extension has been installed the user can start installing Greasemonkey scripts. The EPTMSE client Greasemonkey script is used to inform the user about the trustworthiness of content on the web and to enable the user to also give his or her opinion about the trustworthiness.

3.3.3.1 Assessing the Trust Level

To give users an idea of the trust level of content, the web client proactively queries the trust server for trust information about content. This information is displayed to the users as information integrated in the page.

The web client enables users to assess the trust level in two ways: by judging the trust level of content before access through an indicator by the link to the content and through an indicator of the currently displayed content at the top of the content page. In the image below we see an example of a link with a trust indicator to the right. The percentage indicator shows the average vote value of the content available by following the link. This enables users to make an informed choice about the trust level before following the link. The indicator is displayed when the user moves the mouse pointer over the link and is removed when the user moves the pointer away from a link.

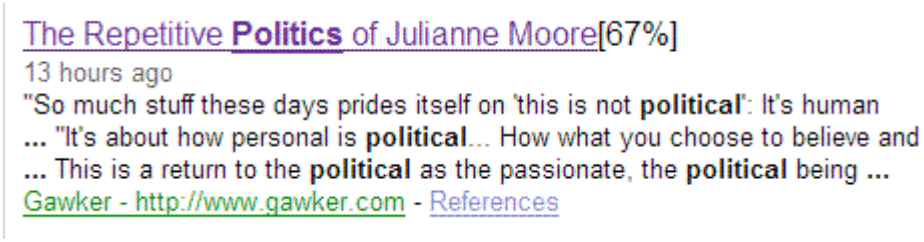

Figure 6 – Trust value presented proactively.

In the next image we see the second type of indication, that which is shown when the page is being displayed. In this example we also see the controls for giving feedback on the trust level: the buttons for voting.

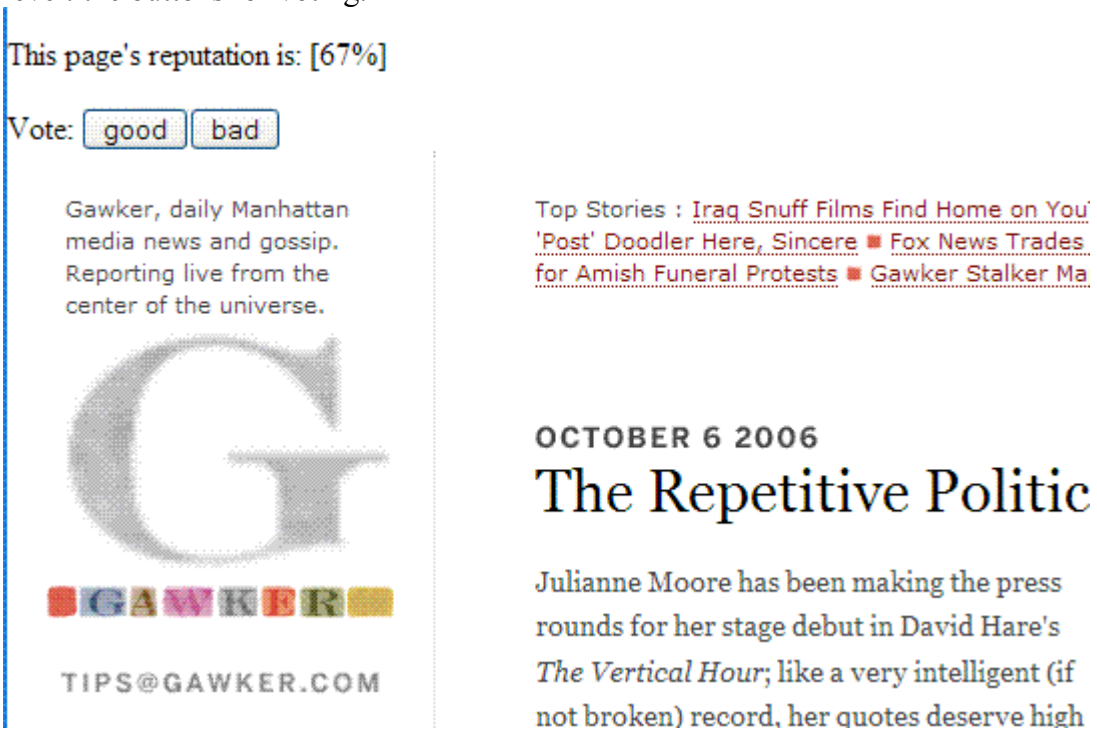

Figure 7 – Showing how the user can give input.

3.3.3.2 Giving Feedback on the Trust Level

The image above shows an example page with the feedback controls being displayed at the top left. The user can give a vote, positive or negative, as too the trust level of the presently displayed page. When the user votes, the database entry for this page is updated on the server.

3.4 Security threats with mobile services – the need for trust

In the report "*Security threats against mobile technology"* which is published by PTS, the threats of today are regarded as small. A couple of general trends can be found which can influence the problem area and make it larger in the future. These trends are mostly connected to the fact that the cellular phones more and more come to look like personal computers. The smart phones are estimated to increase their penetration into 10% in the

year 2007. This fact together with the fact that network speed is increasing and more and more services gets a fixed price business model are stated to be critical factors for increased threats against the phones. All these factors can be derived from the opinion that more and more phones will offer an open interface for development, which can be used to develop new services to the open operative systems (PTS, 2006, p.4) Also Stelacon mentions in it's report that open standards is the single most important prerequisite for the development of mobile content services. (Stelacon, 2004, p.19) The reason for the importance is that a lack of standards brings forward parallel developing paths which is considered time consuming and pricy. Standards lead to lower development costs for the companies and less administration for operators and suppliers. In total it increases the number of actors welcome on the market. This can lead to lower prices for the consumers. (Stelacon, 2004, p.20)

The take-off in Internet related security could be pinpointed to the time when broadband networks reached a high penetration and people started to be online for longer time. The constant access to the net made it more profitable for criminals to try and profit from the vulnerabilities in the technical system. It is likely that the same evolvement will be apparent also when it comes to constant mobile access. (Areskoug) It is also getting more and more difficult for virus protection companies since the number of variations of code is increasing and the model of the virus companies is reactive, which means that they need a sample in order to find the treatment necessary. The criminals are taking advantage of that weakness. It is also evident that a major step in the development of criminal activity on the net was when the number of broadband accessed computers increased. It is possible that the same will be true for mobile access. (Mårtensson) The big difference though between home computers and mobile phones is that there is no counterpart to Windows, that is different phones use different operating systems. To this day, very few incidents are noted on the mobile side but as the evolution of the technology goes forward, with it comes higher risks. (Mårtensson)

Then there is also a gap in the understanding of the risks between the developers and the consumers. People have learnt to protect themselves on the internet using firewalls and virus protection but it is not the same thing to know who to trust. It is important also that if something would happen now before the service sector has really exploded it could have a great impact on the evolution. If the major papers would have a large alarming debate about what can happen to peoples' 5000SEK phone then people could get scared. (Mårtensson)

When discussing the possibilities of the mobile Internet it is important to think of two things. First there is the mobile Internet and secondly there is access to the normal internet through your phone. Smart phones are getting more and more like computers and that means that a person using a smart phone will have access to everything that is offered on the public net and it is not interesting whether or not the information is delivered by a mobile. The ordinary internet has seen a shift during the last two years when it comes to harmful code. The amount of code is about the same but the shift goes from youngsters trying to show themselves, to organized crime. Trojans and bots do not crash your system but us it. It is more and more ordinary crime that is entering the new arena. The big threat is that it is becoming an industry, with resources to develop harmful code, with an infrastructure to spread the code and also spread the money that it generates. (Mårtensson)

It is also a competence problem at the user's side. One of the major security flaws is that people will not consider the development of the technology. They will think that they are carrying around a phone when it is a computer. Another problem is that many smart phones enable Java code to have the phone's resources at its disposal. With suitable Java code it is fairly easy to destroy a phone. People have barely learned to protect their computers, but not at all their phones. When it comes to phone security the users are unsuspecting and naive. The operators and suppliers of services must decide how much they can and want to protect the users from themselves. The issues of security and trust are very much a competence problem at the user side and it is hard for other actors to do something about this. A key issue here is to provide information about who is on the other side of the transaction. People like to know exactly who they are dealing with. (Mårtensson)

Questions like who´s service am I running? Is it the real one or a fake look alike? What will happen if I push this button? Companies that want to provide services for 15 SEK per transaction might be interested in technological solutions that secure the transaction between the terminal and the external server. This can be keys or SSH or other security mechanisms but also that there is some kind of agreement with the user, providing information about past transactions creating an environment that is safe and sound both for the supplier and the user. (Mårtensson)

What is really troublesome also is that in your mobile your money is more easily accessable then when fishing on the regular net. There is much more direct payments to take control over. If you manage to control the phone so that you can buy these services without the users knowing you can do some real harm. That is an extra danger with the mobile services, that non-standardized payment routines opens up for specialized trojans.

This section has presented some of the risks on the market for mobile services as presented by the respondents in the study. We now move on to their description of the market.

3.5 Respondent's description of the market for mobile services.

In order to understand the market for providing trust it is important to understand the general market for mobile services and the trends in this area. This is relevant because the services we are using today create user habits which will affect possible future outcomes in the marketplace. What we are learning today influences both the users' possibilities as well as their interest in understanding and adapting to more advanced services. Also, in many cases money earned is money invested which means that high sales and profits today help the companies to invest in future possibilities (Areskoug 2002)

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3.5.1 The state of the market

The market for different issues regarding users' safety is complex, filled with actors and stakeholders trying to find a balance between responsibilities and costs. It seems as though everyone thinks that it is important but no one seems to be willing to pay for suitable investments. In order to find a commercial potential for the product it is really important to

remember that we need the market for mobile services as such to grow first, so that our solution finds a problem to solve.

For a couple of years the number of non-mobile phones have decreased, and that is a sign that people now see mobile phones as satisfactory. That took 15-20 years from a full-grown market and 2 years from 100% penetration. Compared to this shift, the timescope for looking at the mobile terminal as a satisfactory terminal for most of one´s activities is around five years. For early adopters such as young people it might even go faster. For the large majority of the users, who will constitute a large part of the problem it will probably go slower. (Mårtensson)

It has taken a lot of time for the operators to get the customers to get started on computer services in the phones. In the year 2005 the number of customers who had accessed data through their mobile at least once increased from 1 Million to 2.5 millions. The largest part of the market is in the business sector which grew four times in the level of information transactions. (http://www.n24.se/dynamiskt/it_telekom/did_12873373.asp, 2006-06-08). The number of users who had downloaded applications to their phones was around 4% (not including content such as ring tones, wall papers and such). For Symbian operating system based phones the number was 23%. (Hemant Madan, Director Forum Nokia EMEA, Seminar at Kista Mobile Showcase on October 5th 2006). These numbers are still very low and show the growth potential for the future.

3.5.2 The structure of power among actors.

This section provides a framework for describing the supplier side of the market as well as the respondents' own thoughts on the power structure among the actors.
According to Marchegiani (2004) the supplier side of the market for mobile services can be categorized as follows.

- Network operators
- Content providers
- Manufacturers
- Service providers
- Application providers

So far the network providers have had the largest power over the market. Marchegiani proposes three scenarios regarding shifting positions in the value constellation on the market.

The first possibility is that the network operators maintain their position and control over the value chain. In this case Operators could choose to have an approach where their own portal is configured to deliver controlled brands and applications. A certain portfolio of services would be offered to a user depending on which network provider s/he uses. Of course the network operator could also choose to open their network and provide an open platform where mobile subscribers can access data services.

The second option is that the content providers gain a more powerful position; this can be achieved if network providers set common open platforms which enable transactions directly between content providers and users. This also assumes that the content providers and the operators agree on a pricing model.

The third scenario opens up a possibility that neither the content providers nor the network operators win more strength in the value constellation. One option could in this case be that the device manufacturers make the users dependent on their interfaces and loyal to their solutions.

Christer Areskoug with PTS argues during our interview (2006) that it is the operator's market. With this he means that it is the operators that have the biggest power over the market, both in economical and technical terms.

The question about who is to blame for the fact that the market has not lived up to the expectations is discussed. Different actors seem to blame each other. The phone equipment providers say that it is the service providers that do not provide as many services that are good enough The systems can handle a lot of new services but these applications needs attention and marketing. The companies building the systems are frustrated over this fact and that they could build newer systems and sell even more if the services were better. (Borälv).

3.5.3 Drivers for change

In a report written by Stelacon under assignment from PTS it is stated that the most important prerequisite for the growth on the market for mobile services is that phones, networks and payment solutions have open and standardized interfaces. The consumers should not feel limited to send and receive information and content between users with the same network operator or any other. For a further disussion about open systems, see section 7.5. Other conditions important for the market to grow are: a growing competition in the market, that actors have working business models and that users are well informed about the benefits, costs and risks. An interest from the users is also an important starting point. (Stelacon 2004, p.2)

The report also points out a kind of catch 22. Operators and developers of services do not invest or commit until there is a market and users in turn wait for services to acknowledge and experience good services that lifts their standard or simplifies their everyday lives. In general the knowledge about what can be done is rather low. (Stelacon 2004, p.12).

One of the most important drivers to get the market growing is to make everything simple for the users. The operators must establish this for the consumers so that the traffic will increase in their networks. That it is easy is just one factor though, the most important thing according to Areskoug is the actor's ability to provide attractive applications both in quality, usefulness and entertainment. What do the consumers want among the things that the operators are offering them? It is hard in general for consumers to know what they want

if they don't know it is a possibility. In the end it comes down to: what does the operators want? They are the ones that lets you out on the net, and buys equipment.

Another big problem is the payments. People are afraid to use services if they do not know the price. For many reasons a fixed price strategy seems to be the best for the consumer (Areskoug).

For the market for mobile services to take off a couple of things are needed; the right services that appeal to many consumers, maturity both regarding the technology and the users are two other attributes. Also it is important that some of the things that we have access to on the regular internet find their way out with mobile access. If you are looking on the technology side of this, some of these things are rather trivial. It is not hard to provide wireless networks everywhere for instance. Mobility also means to open up yourself and to outsorce everything you own, bookmarks, pictures, emails and files, in a distributed manner so that you have access to it always and wherever you are. Not everyone are willing to do this and few have taken this step so far. (Borälv)

The drivers behind the evolution of content services are the consumers' demand and the actor's willingness to earn money, as on any other market. The price on mobile services is an important factor for the evolvement of applications and so far many consumers have experienced the price as high. Another problem that emerges in Stelacon´s report is that the users have low knowledge of benefits, usability and technique. (Stelacon, 2004 p.2) According to Stelacon's conclusions the most important drivers to take into account for the future of the market for mobile services is availability, benefits, consumers' trust in services, openness and standards, prices and payment solutions as well as cooperation among the different actors. (Stelacon, 2004, p. 19ff)

It is hard to say whether the market will change incrementally or with big leaps. Some services will easily find their way in a mobile environment but it seems as though the expectations associated with this evolution have been over estimated. Many regular phones can techically handle loads of applications but still most people use them for messaging and calls, and not much else. When the right services come it will be as natural for us to use them in that terminal as it is for us to call wirelessly today. (Borälv)

3.5.4 The future of the market for mobile services

There is a general trend that the cables are on their way out. This trend is observable in many industries and regardless of private or public sector. There are also situations which trigger the removal of the cables such as within the transport industry. (Mårtensson)

When looking at the future possibilities on the mobile market it is noteworthy that there is a high potential not only on the consumer side of the market but also on the business-to-business side. One of the interesting points regarding this is that the users can be educated in their work, when new systems force them to adopt to a technology which they also can use on a personal basis later on. (Areskoug)

When compared to the internet, it took 12 years since the public start in 1994 for Internet to grow and fully penetrate the Swedish market. It is often assumed that technology adoption has something to do with generations but that was not the case with Internet, since now people from all ages use the Internet equally much. The differences are not in how much it is used but rather what it is used for. (Areskoug)

The regular phone will more and more come to look like a computer and a way to access information on the net. This will lead to demands that meet the demands of a laptop. There will always be technical limitations but the phones will more and more look like small pc:s.

It is not yet that obvious that the trust issues are a problem. Right now it is other problems such as lack of good services and restrictions in the terminals. One other inhibator is the way that the consumers use their terminals right now. When the consumption patterns change and people want to do more with their phones, then the awareness in the risks will also increase. We will get another way of looking at the problem as soon as our needs change. The risks will become apperent in the future and if this problem is not solved it will work to inhibit the evolution of the mobile market. (Mårtensson)

There are many different possibilities to succeed in the future mobile environment. If you manage to find your killer application, that idea so obviously great, people just have to adopt to it then this will overcome obstacles as high price or low usability. But there are not many killer applications to be found out there. Most services will trip and fall on some of the obstacles, such as: the lazyness of the users, the intrinsic reverse salients embedded in the technology and problems identifying the needs and beliefs of the users.(Borälv) If the needs ar not met properly then the use of services in general will not take off in the way the market is hoping for. All these parameters must over a treshold value regarding our effectiveness, we do not want to produce more without gaining anything.

3.5.5 Open vs. closed systems.

That the operating systems are closed in the mobile world is a fact that is seen upon from different viewpoints. Some, e.g. Areskoug, means that this is because the operators are not willing to loose the control over their nets. Others say that it is an irregularity in the technology and that it will end in a near future. There is a tradeoff between on the one hand, control and security and on the other hand the technological optimism and the excitement about what can be done and how the artifacts work.

Neither the phone constructors nor the operators would profit from opening up the systems to let third-part suppliers of services in on the market. Not the operators, because they would loose their control over the use of the terminal. Also it is a part of their positioning, to show the consumers that what can be done in their nets, can not be done anywhere else. It can be seen as a competitive advantage towards the other net operators.(Aldén) On the other hand as long as the systems are closed, the big phone constructors such as Nokia or Motorola will have a relative advantage towards the small constructors because the suppliers of services will probably develop applications for the big suppliers of phones in the first case. (Areskoug) If all phones were to have the same operating systems there

would be a more equal opportunity market and it is easy to see that this is something the powerful actors oppose. There are also forces supporting this of course, if all phones were standardized it would be easier to provide services and the whole market, net gear providers, operators and suppliers could possibly profit from this as well as the majority of the consumers. It is doubtful though if the users could speed up the development towards more open systems. Firstly because few things are driven by consumer power in general and secondly because there are statistics showing that things as signals or pictures are downloaded all the time but games for example are mainly downloaded when a person buys a new phone. This decreases the interest for everything to work in all phones.

If everything is standardized then it is easier for the service suppliers and this can lead to the services getting cheaper for the consumers but the use of service is also dependent on the services themselves. It is necessary to create services that are beneficial to many people. Exclusivity though is a driving force in itself, which is the reason that patents and copyrights exist. It is all about knowing that you get returns on your investments. If you want to get new customers non-standardization can be a way to find a position in the market. The impact of standardization on the market is discussed though. (Areskoug.)
One of the respondents discussed an analogy with the KRAV sign. This sign does not really guarantee anything but it tells you that it is probably better than buying something without the sign. In 10-15 years there is probably a high value in having a service that tells me who I can and can not trust. Or at least says that it is better to trust this actor because it is probably better for you, just like in the KRAV-case. The future will definitely need this service. (Areskoug).

That the systems are closed for third-party suppliers of services is a mistake done by the phone providers or the suppliers of services because there is help to be found in the open environment of application development which has been given more and more power in the regular software market. The scarcity of not letting the users decide for themselves what to include in their phones is leading to frustation for many users. (Borälv) The fact that there is different operating systems, that there is no dominant way to certify or install new components is making it even riskier for the users since this means that the users will have to learn over and over if they are changing phones.(Mårtensson) It is a trend that operators get special phones, or special content made for them. For many people in the industry it has been hard to understand why the programs in the phones are so bad. A consensus seems to be that it is left to the third-party service providers to fix this. There might be a great value in letting in the open-source movement into the industry. (Borälv) There is always problems associated with the terminal itself, the screen is to small and it is generally too slow. Incrementally, small but useful services will open the market up for other applications. There is a strong force to appear safe in this world. To have a strong brand is a positive property which is important for most suppliers of services. (Borälv)

3.5.6 Issues regarding different users

Some issues are hard to foresee. The number of different user groups is one of these issues. Below some thoughts and factors are discussed that will give some understanding of what the actors in the market are thinking regarding different users.

The majority constitutes a big part of the problem because early adopters tend to be more interested. They talk to the right people, have a lot of personal connections, read magazines in the area and so on. Therefore they are initially better positioned to handle security and trust issues. The persons in the majority rather do not want to know. (Mårtenson) This, however, does not mean that we do not need to protect all users. Early adopters will still have functionality and entertainment higher on their agenda and they are more willing to try and let their terminals crash. (Mårtensson)

Early adopters seem to be people in the computer business who are interested, who benefit from the solution and also have money. It is a certain type of people who adopt early in the life-cycle of a product. When it comes to security solutions, very few people live as they learn if they do not have bad experiences that reminds them and therefore the early adopters of mobile services in general probably also will need the solution that you provide. It is hard not to worry the consumer by repeating the dangers without having good solutions. (Borälv) Another problem is that it is hard to promote and market security solutions without using scarmongering and in this case this would lead to greater obstacles for the evolution which we need.

One of the most important drivers to get the market growing is to make everything simple for the users. The operators must establish this for the consumers so that the traffic will increase in their networks. That it is easy is just one factor though, the most important thing according to Areskoug is the actor's ability to provide attractive applications both in quality, usefulness or entertainment.

The highest need will probably be in the business-to-business. This is also where the money is, but in order to reach the expectations all users must be found, both professional and private consumers. (Borälv)

3.6 Project participant's views on risk and market issues.

The following sections presents the view of the participating companies in the project on the emerging risk associated with mobile services and the state of the market.

3.6.1 Case: Appear Networks

Appear IQ is a wireless communication platform for data, voice and video. Only Appear IQ employs a layer of context-aware intelligence to proactively provide mobile workers with the relevant tools and mission-critical information they need to work faster and more effectively. (www.appearnetworks.com)

Earlier, Appear Networks have only worked with customers in closed systems where it is easy to trust services and information. The company chose to be in the project because it is a part of their strategy to see what happens on the market with public users. If the quality of the services and the security is bad the supplier of infrastructure has to suffer even though it does not really have anything to do with this. The interest for the trust service grew with discussions about what could be done and which innovations are possible. (Diab)

The result of the project was not obvious at the beginning of the project. Only the technological solution, the trust service, does not drive a business of its own, it needs users and a market to see what potential it has. Appear estimates the time to generation of money for the project's results to be 2-3 years. Research and development is an end in itself and the participation in the project has given small steps towards improvements of the platform and focused on an important aspect of the public scenario with open interfaces. Another factor was that the operator, TeliaSonera also participated in EPTMSE. This can lead to useful contacts and synergy effects for the other activities. (Diab)

To find a good cooperation among actors are important for the future. If the whole chain of actors are in a project it is easier because you can work with actual problems and not examples that are banal and to provide real users to the platform. For the future research on this subject it would be good to include suppliers of services into the project as well. This will lead to a better understanding of the demands of the market and that can be included in the already existing technology. (Bergwall)

The vision about individual service providers is understandable and realistic. There is a trend in society that we produce as much information as we use, wikis and blogs are examples of this. It is important for the future that the development tools are evolving; a trend which can be seen and that the user interfaces becomes increasingly dynamic. (Diab)

The power over the market for mobile services is ruled by the operators because they have a monopoly position over the experience of the user. The operators are loosing some control though because many companies build there own networks, and applications. The next step is to spread these applications to other networks and this creates a new competition situation on the market, where the operators are exposed to new competition. Even in the closed networks the question of how to get information to users are being discussed and trust is an important issue for many actors. The operators have full control over the environment of the customer (Bergwall). The problem is that they are not that innovative. It will become apparent for the operators that if they open up their systems the traffic in their networks will increase. The operators will also have increasingly bigger problems with VoIP this implies that they have to focus on other business areas and perhaps supplying services is the next thing. Which value can they add to their networks? Maybe the big investments can't be met only by increased computer traffic in the networks. (Bergwall) maybe it is just a question about who will go first and the rest of the market will follow. Many investments with the operators stay on an RnD-level and are never being commercialized. If the operators are not being innovative in themselves it is important to find innovations outside the organization. Therefore it is important for all actors to keep up with what is technologically possible. (Diab)

A prerequisite for the growth on the market for mobile solutions is better devices; these must be open to different clients and programs. These phones are already here but in a very little segment of the market. This will follow when the capacity of the chips increases. Services now have very few users and the impact of a new innovative service is not as big as it could be. The market needs to help the users to adapt to using many services. A fixed pricing strategy might make it easier on the consumer. Users are more willing to try different applications if they know the price. (Diab)

Bergwall argues that a problem is the lack of an open-solutions approach. Mobile services are often seen as free from what users do on the public internet. A lot can be done in the area so that the phone is merely seen as a terminal that works as an extension of your desktop. There is much to be gained from integrating with other solutions.

When questioning how it is possible to pursue the operators into opening their systems the answer is that that should be the responsibility of the service suppliers.

The biggest asset of the project is the mixture of people and persons connected to it. To find joint operations and strategies among large companies, small ventures and research institutes is a big potential within the project. (Diab)

Another big asset is the work that has already been conducted, such as identifying trust mechanisms and the framework around that. This has given a good, solid base to work from and the project has also shown that these definitions can be translated into functions. The early project report can be seen as a demand specification. For Appear, the participation in the project has also led to an acknowledgement of a flexible platform on their side. (Bergwall)

Appear started the project with a strategy to see what is happening in a public, open system. This strategy has gained more authority during the work with the project. Appear estimates the trend of openness to become more and more important. In many of the company's projects they observe that operators want to deliver information to public users. Appear Networks sees this as a market with big potential and wants to observe and influence it.

3.6.2 Case: TeliaSonera

Telia is offering a complete range of telecommunication services in Sweden. The customers are businesses, consumers and organizations. Examples of product areas are mobile communication, phone solutions, broadband and data communication.

Telia owns and is responsible for operating networks all over Sweden and the number of mobile and IP-based services is increasing. A parallel development is that many combination offers have been supplied to the market. To make the cost structure as easy as possible for the consumers to understand the number of offers with fixed prices has increased. (http://www.teliasonera.se/articlewide/0,2859,l-se_h-16229,00.html, translated by the author.)

There are different opinions about the openness of systems within different units and groups in Telia; perhaps this was one of the reasons for joining the project.

TeliaSonera does not think that micro services will be more than a small niche market in the future and does not think that it will generate big income for the operator. But everything that creates increased traffic in the networks is appreciated and interesting, f it will generate traffic and also work as a driver for mobile broadband and this can be positive for TeliaSonera. Telia are a bit cautious with predicting what is going to be successful in the future though. Many services have not yet come in the way that was expected.

When discussing the power over the mobile market Aldén is saying that the operator can be said to have power over the closed systems in the mobile arena. But EPTMSE are striving for a distributed system and thus no authorities.

We are slowly evolving towards open systems and there are a couple of causes for this. Positioning for example, the act of locating the user geographically using network signals, is not done entirely by Telia. But to be able to position anybody you will need an agreement with Telia.

The demands on the services delivered are very high. Reliability is highly ranked and is associated with Telia's brand. For a company with TeliaSonera, who has a heavy history and being the state-owned company it is really important that everything works well.

The protocols need to be able to communicate and work with each other. The nets are complex and have been built for 50-100 years. There are always build-in structures that are hard to change. There are also different opinions within the company that the systems should be more open. But sometimes it is important to defend one's position as well. Sometimes it is internal politics and sometimes it is technical reality.

Telia has had position based services for some time. The popularity of position based services is not yet that high and it does not generate that much income. Some people want to have higher accuracy and some are worried about the integrity issues. People do not want to be positioned and that is inhibiting the development of these services. When it comes to the corporate side, the market is growing rather quickly, this is probably because the integrity issues are not as big due to the fact that it is units or transports that are being positioned and not persons. Another problem has been that these services are not that easy to use.

What is true is that there exists an insight within Telia that many services should be better if more people had the chance to make them. There are already third-part suppliers who deliver the services and where the revenues are shared. This is a growing trend but it goes fairly slowly. A problem with third-hand suppliers of services is that they have to be controlled for quality and this can only be done with a few because it is a process which is time-consuming and expensive. A company like Telia needs to have good services which creates high amounts of traffic in the network and high revenues. TeliaSonera works with an aggregator which is scanning different third-part suppliers and sieves the good from the bad. It is not easy for a company to know which services are interesting and working properly, which suppliers are worth having contacts with and who is trustworthy. TeliaSonera feels that they have a responsibility because the user often argues with Telia if the services do not work properly.

The security for the users is heavily discussed within TeliaSonera. All new services are being checked for security. The information flow and the sensitivity of the information are pointers to which security class the service should belong to. If user data is being sent then it is rather high security. Security can also be seen as restraining for those who want to create new services because it is time- and money consuming.

There is a trend of increased focus on security on the mobile market. The new problems have arisen because the phones are becoming increasingly advanced, in operative systems. There are also both viruses and Trojans that can be spread through Bluetooth. Another security issue which is highly discussed is the possibility of having mobile certificates for payments solutions. A couple of questions to determine the level of security can be; what does the solution look like? What kind of connection are they using? Is it ciphered or not? Which technology is being used? How does the user identify them selves? Thereafter it is easier to make a judgment, how safe is the connection in relation to the value of the information that is being sent through that connection.

In a distributed system as EPTMSE the demands on the user are heavy. It could be stated that it is the role of the operator to keep things safe. The mobile network is safer than the regular net because the sim-cards work as an identifier and a more honest one than the IP-addresses on the internet.

The project is a cooperation where the research lets TeliaSonera know what is happening at the edge of technology and TeliaSonera gives credibility to the research performed. A future role for TeliaSonera could be that the client or service are being packaged and sold by TeliaSonera and thereby gets to work under Telia's brand. For the persons who do not want to think for themselves, this can be a good solution. The value for the project would be that the solution would profit from a wider diffusion. Everything that increases the traffic in the networks is positive for Telia, and also everything that makes the mobile experience better.

If there would be a proper way of defining the level of trust in these services, the customer could feel trust because s/he knows what is going on. That can be good when competing with other operators in the market, to be able to say this service is safe, or at least we know the value of its safety. This can be widely used as a recommendation system for what to use and not to use. This also gives opportunities to differentiate and find position against competitors, to supply something that no one else does usually attracts customers.

After going through different ways of describing the facts around the project; the technology, the risks and the state of the market we look into the analysis of the business model given and the empirical facts described.

4 Analysis

So what does all this boil down to? Well, there is a technical solution, drifting into the world of open source and leading the way into a discussion about user security and the concept of knowing who to trust and why. Who has time to care about this? For whom is this important? This section of this report will return to the business model framework presented in the theory section and try to concretize what the commercial potential of this project really is. The business model is thoroughly investigated and the different factors and its relation to the project are discussed. Thereafter conclusions and suggestions for future work with the technical implementation are presented.

4.1 Applying Morris' Business model on the EPTMSE project.

There are a few alternatives on how to commercialize this product and this section will analyze the project's possibilities. Remember, this is the business model concept to work with: What does this imply for the solution we are discussing?

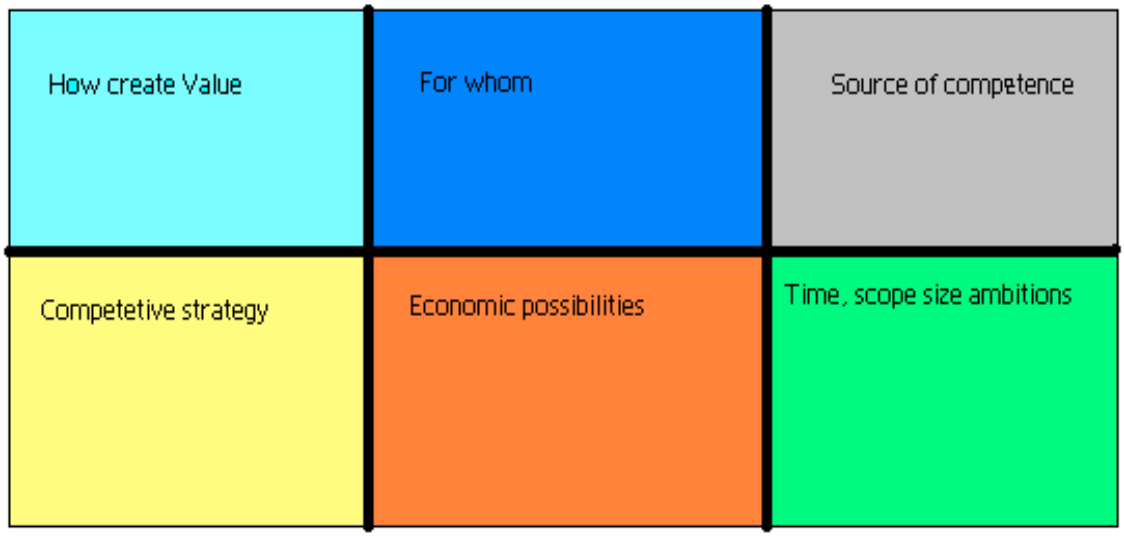

Figure 8 – Morris´ business model revisited.

4.1.1 How to create value

Since the technical system is distributed and open source the service of providing trust must be flexible but there is no authority who can decide on the level of customization in every case. The level of customization must be agreed upon by the stakeholders affecting the technology. This is an attribute within the technology which the business model can capitalize on by focusing on the consumer side of the market. My opinion is that a scenario where the service is bought a month at a time and where the trust service is called every time that the user wants to download something would be easier to promote to customers when compared to trying to teach them when to use the service. Since the services are always bought together, complementaries can occur. I do believe that having our solution in a basket of goods provides more value to the consumer than having the other service alone. But then how do we get them to include this in their basket? Perhaps this is an argument for trying to find collaboration with suppliers of services. This might lead to consumers feeling more secure on the market for electronic services and thus using more services. This will lead to higher use of the project's solution and created value.

4.1.2 For whom

Who is interested in a solution to provide trust in micro service environments? There are several actors that have a stake to hold in this developing business. Below is a list of actors, how they can be involved in the value chain and what the possible outcome is.

Actor	Possible outcome
USER	Higher Customer value
SUPPLIER OF SERVICE	Comparative advantage
INFRASTRUCTURE SUPPLIER	Better service for customer
TRUST COMMUNITY	Network externalities
COMPETITORS	Market changes
TECHNICAL DEVELOPERS	Incentive to work for community, network externalities

Figure 9 – Table of stakeholders.

Hopefully whenever a user gives input into the trust system this can be seen as legitimizing the innovation and this will perhaps help the spreading and the diffusion. I think that the theory and the empiric description together points out that it is important to get the critical mass of users quickly. Both because that increases the marketing possibilities and the quality of the product. The quickest way to get many users would be to find suitable collaboration partners perhaps within the operators sector of the market. A problem with this would be that is would sustain the power structure of the market which perhaps would work inhibiting for the evolution towards the vision of the project. But since many actors point out that the operators have the power over the market it would be difficult to find ways out on the market without their involvement.

Another issue to discuss regarding different users is that it is a big leap in competence between the early adopters and majority of the users. It might be important to further think about how to get many users to try the solution early on. A collaboration with Telia would probably lead to connections with more users from the majority class, but then again the market for Appear Networks platform seems like a good segment to find early adopters.

A few of the respondents of the interviews have pointed out that the Business-2-Business market is an interesting way to teach the users the appropriate level of technology when it comes to mobile services. If users are forced to learn the new technology on their job the step over to using it privately might not be that big. In order to speed up the rate of adoption this can be a useful strategy. If trying to use this strategy one must find suitable industries to start working with.

It is hard not to focus too much on early adopters because on the one hand, they deserve focus in order to get them to try, on the other hand, they are a more homogenous group than the rest of the market and focusing to hard on them may create a product that is too narrow or hard to understand for other groups of users.

4.1.3 Source of competence

The greatest asset for this project and the solution is that all market actors seem to agree that the open micro service world is coming, rather slowly perhaps, but it is in fact emerging. The biggest asset within the project is the flexibility that the open source platform gives. This means that a lot of different stakeholders can take part in the

development of new trust mechanisms and new applications handling those mechanisms. The fact that the solution is open source can also be good if it creates a buzz among people in the business and it can help market the solution further.

Also the fact that the users are a source of input is a good way for the marketing to act on its own. This is because if you are a user, the quality of your service will be better if the total number of users increases. This law of Metcalfe can work to the projects advantage.
That the solution is a distributed system is interesting also in the context of power among actors in the market. To find ways to let all of the control go for different actors is a hard task and appropriate incentives must be found to trigger this development.

4.1.4 Competitive strategy

In the interviews there has been agreement upon that all actors seems to be aware of security problems and seem to have the security of their users high on the agenda. The question is still. Is this all talk and no action? When discussing the power structure all actors seem to think that they are the underdog and not to blame for the fact that the market for mobile services has not evolved in the way that was estimated a couple of years ago. This asks questions about who to choose for collaboration and who to compete with.

A big issue is whether or not to use the scaremongering tactic. We need the users to worry about the trust issues enough to use and pay for our solution but we do not want them to become too scared, because that perhaps would make the evolution of the market for mobile services go slower. In the theory section Allen talked about that it was important to find the greatest performance criteria for a new technology. It is my opinion that accuracy and ease of use are the two most crucial things to consider.

Another factor to consider mentioned in the theory section is the fact that it is important to know which priority the need that you are trying to solve has in the market. I think that it is interesting because our solution can be argued to solve different problems. Firstly of course the concrete trust case but this can also be seen as being a sub solution to all problems solved by mobile services, because without our solution the consumers would perhaps not let the other applications solve their problems at all. It would be a good strategy to communicate this to the users.

So what strategy can be used for becoming a standard in the open, public scenario? The argument was raised in the empirical description that a lack of standards brings forward parallel developing paths which can be time consuming and pricy. I think that the fact that there does not exist such a standard yet is a huge opportunity for this project to explore. The experiences made by MySQL and other open source based companies teach us that it is all about letting go of the control and also all about timing.

Does the EPTMSE solution have a *relative advantage*? It is hard to find solutions on the market that offers the same focus on trust. There are a lot of security solutions out there but none of the respondents had heard of a solution that focused on trust issues.

I would absolutely describe the EPTMSE solution as having a high degree of *Compability* because there seems to be a consensus on the market that the security issues needs a lot of

attention. *Complexity* on the other hand is an issue that could speak against the solution if the visualization of the application is not treated with enough concern. If the trust service is packaged together with other services so that it is called whenever another service is called it would probably be easier. Then one could educate the consumer once and for all, and not have to focus on which scenarios is the most distrustful. *Trialability* is an interesting factor since we are discussing open source software. The problem is that we would want them to try it when it is needed but that is of course impossible to know in advance. One might assume that the first time they try our service; they would want to try it in an environment they already know. This is a problem because we have more to loose than to gain. If the service works alright, they will perhaps try it again if the incentive to protect one self is big enough, but the fear is small enough to be overcome. If anything happens though that makes the experience slower or bad in any way they will probably not try it again. It is crucial then that the positive results of every try are *observable* by others. For example by encouraging them to leave user input. I believe that users think that high degree of interactivity increases the quality of the product.

What is really interesting though is the following, consider the four possible cases:

1) We correctly describe a service to be trustworthy.
2) We correctly describe a service to be un-trustworthy.
3) We falsely describe a service to be trustworthy.
4) We falsely describe a service to be un-trustworthy.

Out of these four cases the only time when the user will actually notice what is happening is case number (3) and this is also the only case that makes real harm. What is important here is that we need to find ways to make sure that the other three cases are also noticeable for the user. This means that the visualization of the trust results is really important. No one wants to pay for a service if they can not see what this service is doing for them. This means that we have to market the status quo mode of saying yes to trustworthy services as a big deal.

4.1.5 Economic possibilities

As stated earlier, this part of the discussion is rather hypothetical but listed below are a couple of suggestions on how to construct a money flow that the actors could take part of.

Sell everything to the operators

Charge the user every time a service is looked up by the trust service.

Pre-charge the user, that is make the consumer pay an amount every month through their operator. This would be a “every time I download something check with trust service first”- solution.

Sell the solution to the third hand solution providers so that they can manage it and use it to position themselves on the market for services.

So far the discussing has focused on the biggest advantages with the technology, but aren’t there problems as well? Can solving the problems be a better way of finding new

improvements with the solution? As I see it some of the problems with the solution are getting enough people to care about giving input. This part of the system must be very simple and efficient.

5 Conclusions and future work with the technical implementation

This section points out some recommendations for the future work with the technology to take a step into the commercialization phase.

As I already stated it is important to find ways to make the user feel that our solution provides the trust information, both for trustworthy and untrustworthy services.

Another possible trust mechanism might include statistics of how many persons tried a service and kept on using it. This "Used more than once"-mechanism probably says a great deal about the trustworthiness of the service. It does not matter if thousands of persons tried and used a service. If a very low percentage chose to use it again, then it is probably of very low quality or insecure.

Another issue that has not been so thoroughly discussed is the question: in what way should different trust mechanisms be compared with each other. Is an aggregated value of different mechanisms always better than the value from a single mechanism? How should that aggregation be made? Which weights should be considered for the different trust mechanism in order to get the absolutely best value? All these question need to be considered if the accuracy of the trust information should be as high as is needed for the product to be widely used.

Noteworthy also is how the visualization of services that do not have a value in our system should be done. This because in the beginning, the percentage of services that we include might not be that high. Users are probably not willing to pay to get the same error report stating that there is no information available over and over.

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Definition of open source software – Appendix 1

1. Free Redistribution

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

2. Source Code

2. Source Code

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

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*10. License Must Be Technology-Neutral

No provision of the license may be predicated on any individual technology or style of interface.

Origins: Bruce Perens wrote the first draft of this document as "The Debian Free Software Guidelines", and refined it using the comments of the Debian developers in a month-long e-mail conference in June, 1997. He removed the Debian-specific references from the document to create the "Open Source Definition."

Appendix 2 Examples of questions asked during the interviews.
Why did Appear Networks choose to be in this project?

What do you think you will gain from being in this project?

As a supplier of infrastructure would you say that the operators or the suppliers of services have
the biggest power over the market.

Of you were to include another partner in to the project, who would that be
and why?

How do you see the future for mobile services?

Who do you think will be the early adopters of this technology?

What is the biggest obstacle on the market for mobile services?

Would you agree that the market for mobile services is moving towards open interfaces and standards? If so, of what reasons?

Which actors will support this movement the most and who will try to hinder the development?

In what way has being a part of the EPTMSE-project changed your view on your own business or strategy?

Can your experiences on getting technology out on a market be applied to our project?