Mobile Services in an Organisational Context

A Study of the Swedish Road Administration

Master thesis, 10 credits within the Systems Analysis programme

Presented: June, 2006

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Size: 90 pages (including appendices)
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Abstract

People have become more and more mobile as a result of advancements in wireless communications technologies. The mobile phone as an enabler of this increased mobility has become an ever more important part of our society but comparatively little research has been done concerning mobile services at the organisational level as opposed to the individual level. With our study we wish to contribute to knowledge about mobile service development and diffusion as seen in an organisational context.

In order to do this we conducted ten semi-structured telephone interviews with employees representing a variety of different roles within the Swedish Road Administration. The empirical data gathered from these interviews was then used together with actor-network theory to describe our case organisation and mobile services within it. This description in combination with diffusion of innovation theory and the innovation development process were then used as the basis for our analysis.

Our study shows the importance of user involvement in the development process of mobile services, and the importance of service usefulness, from a work perspective, for individual adoption. There is also a need to focus on infrastructure for the service in order to ensure that existing services continue to function, but also that future services will be possible. The uncertain relationship between strict organisational governing/control and successful mobile service adoption and diffusion is also illuminated.

Keywords
Mobile services, organisation, actor-network, diffusion of innovation, mobility

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Abbreviations

3G	Third generation technology referring to mobile phones and networks.
ANT	Actor-Network Theory
BaTMan	Bridge and Tunnel Management
GPRS	General Packet Radio Service – a wireless data service.
GPS	Global Positioning System
PDA	Personal Digital Assistant
PIM data	E-mail and calendar information
RAPPA	Report of On-going Productive Work (Rapport Av Pågående Produktivt Arbete)
SRA	Swedish Road Administration
TIC	Traffic Information Centre
TRISS	Traffic Information Support System (Trafikinformationsstödsystem)
VERVA	Swedish Administrative Development Agency (Verket för förvaltningsutveckling)

1 Introduction

In this chapter we introduce our study. We provide a description of the background, the problem area, the purpose of our study and research question. We also discuss the scope of our study and go through important concepts.

1.1 Background

During the past few decades our society has gone through different transformations. Our life styles, for example, have changed as our level of mobility has increased. This has been brought about in part by modern technological developments such as train and airplane systems, which have served to reduce the otherwise limiting factor of geographical distance. This mobility has led to the idea of people in the post-industrial era as "nomads", geographically independent individuals supported by various technologies (Kakihara & Sørensen, 2002). It has been said however that traditional information technologies have offered poor support of this new way of living and working. As a result of this there has been an incentive to create new types of mobile information technology, opening up a new field of research and design (Fällman, 2004). This field of information and communication technologies, particularly mobile communication technologies such as mobile phones and personal digital assistants (PDA), and our use of them contributes to this new way of living and working (Kakihara & Sørensen, 2002).

The rapid spread of mobile computing in information technology is clear. The growth rate of mobile phone subscriptions in Sweden alone is a steady ten percent per year, with almost 10 million such subscriptions by the end of 2004. (PTS-ER-2005:34). Surveys have shown that 91 % of the Swedish population, between the ages of 16 and 75, use mobile phones (PTS-ER-2005:8).

Mobility and mobile services have also become increasingly important in business life. Organisations compete with other organisations not only on the national level but globally, and they can have customers spread across different continents, making mobility a necessary prerequisite in order to succeed (Kristoffersen & Ljungberg, 1999). Successful innovation is also a very important contributor to organisation success. In order to be competitive, organisations simply cannot ignore new technologies, but while one innovation may be highly compatible for one organisation it can be less appropriate for another (Fichman, 2000).

In our search for previous research we found that what has been done on mobile services has focused mainly on individual perceptions/opinion, with relatively little done to investigate the effects of mobile services in relation to organisations. It is this area we are interested in investigating. Considering the enormous sums of money

committed to developing mobile services and the importance for organisations to adopt the right technological innovations, we think it is important to investigate how these kinds of services are incorporated into an organisation. This interest is not only of a personal nature to us as researchers, but we feel that other organisations that have or are currently incorporating mobile services into their IT-infrastructure, and those organisations that develop and sell such services to other organisations could also benefit from such insights.

Our initial area of interest was mobile service diffusion, how mobile service use spreads through an organisation and what factors influence this. In doing research about diffusion of innovation theory we came to the conclusion that a wider view including the steps prior to, and after, diffusion would give greater insight into diffusion itself. This idea of looking at the entire development process led to our final research question.

1.2 Purpose and Research Question

The purpose of our research is to contribute to knowledge and understanding of mobile services in an organisational context by looking at the service development process, and the actors involved. The organisation we have chosen to study is the Swedish Road Administration (SRA or Vägverket in Swedish).

In order to reach this understanding we wish to find out how mobile services are developed in the SRA, who is involved, how the services are adopted and used, which services are used/not used and why, what benefits they bring, and how the organisational structure affects this. Our research question is in other words:

How are mobile services developed and used at the Swedish Road Administration, what actors are influential in this process and what effects do the services have?

In order to gain this understanding, and find an answer to our question, we have chosen to perform an exploratory study of mobile service development. We have used actor network theory as a means to map and describe how the SRA have made use of mobile services within their organisation, and the innovation development process (Rogers, 1995) to analyse this information.

1.3 Mobility and Mobile Services

Our study has had an exploratory nature from the start and with this in mind the task of defining boundaries and limitations for our study was a difficult one. Mobile technology covers a great deal, from physical technologies such as mobile phones, wireless network cards, routers, access points and personal assistant devices (PDAs), to the services used with these devices. It is clear that the field of mobile computing is an extensive one and in order to further illustrate the basis of our research we will introduce the concepts of mobility and mobile services.

1.3.1 Mobility

Mobility is one of those terms that is seemingly self-evident, but covers so broad a range of topics that it can mean completely different things depending on the context in which it is used.

Fällman (2004) examines the issue of mobility in depth in his doctoral thesis about mobile interaction. His opinion is that what mobility really *is* has been neglected in previous research. It has been taken for granted that everyone has a mutual understanding of what mobility is and the focus has instead been turned towards what mobility causes (Fällman, 2004). Fällman is not alone in this view of mobility. Kakihara and Sørensen (2002) argue that being mobile is more than human geographical movement and that it is more important to look at the way people interact with each other in their social life. They say that the new technologies result in various dimensions of mobility and suggest an expansion of the mobility concept to three interrelated dimensions. These three dimensions are spatial, temporal and contextual.

Spatial mobility
The most common way of conceptualising mobility is with spatial mobility which is characterised by corporeal geographical freedom (Fällman, 2004). The quick diffusion of mobile communication technologies has strengthened human geographical movement in many different situations (Kakihara & Sørensen, 2002). Spatial mobility concerns the mobility question of *where* (Fällman, 2004) and the answer is basically that you can be anywhere when you are mobile.

Temporal mobility
Instead of dealing with the question of where, temporal mobility answers the mobility question of *when* (Fällman, 2004). As new technologies are introduced into existing work settings they are often motivated by the desire to speed up the work pace and to save time, and in that way the introduction and use of new technologies influences a variety of aspects of the temporality of our social interaction/activities (Kakihara & Sørensen, 2002). Certain new technologies, for example e-mail or SMS, even make it unnecessary for people or groups to share the same time period in order to interact, and besides that, instant transmission and access across the world has reduced response times (Kakihara & Sørensen, 2002). This leads us to the answer to the when-question which seems to be anytime.

Contextual mobility
Contextual mobility concerns the context in which the action occurs. Mobility questions that are related to context are questions like "*in what way", "in what particular circumstance"* and *"towards which actor(s)"* (Kakihara & Sørensen, 2002). Kakihara & Sørensen (2002) argue that the contexts that people reside in reframe their interaction with others, and that the new technologies/innovations, with their opportunities for people to interact with each other, have made us relatively free from contextual constraints on interaction. They enable us to interact with others in largely different contexts.

Kristoffersen and Ljungberg (1999) have developed a model about different types of mobility that is based on the context in which the technology is used. They have

conceptualised what mobility is by looking at situations that are typical for mobility. In their model they suggest that there are three different categories of mobility; travelling, visiting and wandering. The category of *travelling* includes people who are going from one place to another by driving or being a passenger in a vehicle while people that are spending time in one place for a prolonged period of time before moving to another place are included in the visiting *category*. A person in the *wandering* category spends a lot of time walking around since wandering refers to extensive local mobility within a building or local area.

To summarise; mobility is when people can organise and manage their work independent of geographical, temporal or contextual constraints using stationary and mobile information and communication technology applications (Kakihara & Sørensen, 2002).

1.3.2 Mobile Services

Moving on from our discussion of mobility as a general concept we come to the technologies that enable people to be mobile and work independent of the various constraints discussed in the previous section.

Mobile technologies/devices come in various forms, from full-fledged computing devices that are built to be transported, such as laptop computers, to more function specific devices like the mobile telephone or handheld GPS devices. There are even devices that attempt to combine the various types of device into one, such as the smart phone which is a device combining the functionality of a mobile phone with that of a personal digital assistant (PDA). You could even look at the specific communications technologies built into these devices and which enable them and their users to be mobile. Bluetooth, 802.11g wireless cards, GPS transmitter/receivers, 3G cards and the like are all examples of radio communications devices that are at the heart of mobility from a physical, technological view point. The various radio communications networks and infrastructure that enable mobile communication almost anywhere in the world are yet another aspect of these technologies.

If we shift our view to the more intangible enablers of mobility we come to the services offered via the various mobile device and infrastructure solutions that bring the benefits of being mobile in the first place. The definition of mobile services here is not clear cut. The World Trade Organisation, for example, defines mobile services as *"radio communications services between ships, aircraft, road vehicles, or hand-held terminal stations for use while in motion or between such stations and fixed points on land"* (World Trade Organisation, 2003). This definition focuses mostly on the physical communication and neglects the intangible aspects inherent in the term service. Blazevic, Lievens and Klein (2003, p. 120) have written that "*mobile service innovations are defined as any new services that are delivered with the support of wireless devices*". This more general definition fits better with our view of the term.

Mobile services are as varied as the needs/desires that inspire them, from interpersonal communication via sound, text or video, to accessing e-mail or information on the Internet, to mobile commerce. Considering how many different types of mobile device exist, and the variety of services connected with each, we

decided to limit the scope of our study to mobile services housed in and used with mobile/smart phones and the infrastructure surrounding and enabling the use of these devices and services. By that we mean the phones themselves, and the various networks (such as the high-speed 3G[1] network and GPRS[2] for example) that allow communication with them.

1.4 Thesis Outline

Chapter 2 – Research Method
In this chapter we present our research strategy and the practical methods we have used to collect and process the empirical data. A discussion of scientific quality and ethical considerations is also presented.

Chapter 3 – Theoretical Foundation
The theories we will use to structure and analyse the data we have collected are discussed; actor-network theory as a tool for describing our case, and diffusion of innovation and the innovation development process for analysing the data. The chapter ends with a combination of these two theories forming a single theoretical framework which we later use in our analysis.

Chapter 4 – Case Description
Our case organisation is presented and some background information about what they work with and how they are organised is given. We discuss why this organisation was appropriate for our study and present our interview subjects and how they were selected.

Chapter 5 – Mobile Service Actor-Networks at the SRA
The empirical data is summarised and presented using actor-network theory. The chapter ends with a display of the actor-network describing mobile service development in our case organisation.

Chapter 6 – The Innovation Development Process at the SRA
The actor-network showing mobile service development at the SRA is incorporated into our theoretical framework and the actors and their involvement in the various stages of the innovation development process are established.

Chapter 7 – Summary
Our framework, displaying the various actors and their connection to the innovation development process, is summarised and commented on.

Chapter 8 – Conclusion
The final chapter contains concluding remarks and a reflection on our study.

[1] More information at http://en.wikipedia.org/wiki/3g
[2] More information at http://www.gsmworld.com/technology/gprs/index.shtml

2 Research Method

In this chapter we present our research strategy and the practical methods we have used to collect and process the empirical data. A discussion of scientific quality and ethical considerations is also presented.

2.1 Research Strategy

In order to answer the questions posed in the purpose and research question section above, we decided that the case-study research strategy was the most suitable approach. Creswell (1998) in his description of five traditions of qualitative inquiry discusses grounded theory which could have been an interesting choice of research strategy. However, we felt it would most likely also exceed the time constraints of the ten week thesis work.

In our study the questions that are of interest are primarily ones that seek to illuminate and describe a certain situation – "how" and "why" questions. Our interest lies in studying mobile service usage as it is today, as opposed to doing a historical study, which would be difficult as the field is relatively new (Fällman, 2004). These aspects of our proposed study fall in line with Yin who states that a case study has a distinct advantage over other approaches when "*a 'how' or 'why' question is being asked about a contemporary set of events, over which the investigator has little or no control*" (Yin, 2003, p. 9).

Yin (2003) divides case studies into two rough categories - single-case and multi-case studies - each with their own strengths and weaknesses. In our study, the choice was between conducting our investigation using a single organisation or performing the same investigation using a few, comparable organisations. We felt that a single-case study where we conduct our investigation within the confines of a single organisation was the most appropriate. The feeling was that we would get more out of focusing on a single organisation and understanding it as fully as possible, rather than risk spreading ourselves too thin by attempting the same with multiple organisations.

The arguments typically heard in opposition of the single-case approach involve matters of generalising eventual results and one can understand them from a quantitative viewpoint. The purpose in qualitative study, however, is not to provide concrete results that can be applied to the larger population and so the issue of generalisation in this regard becomes less important. (Yin, 2003)

The next aspect of the research strategy is that of data collection. In preparing for this stage we considered Yin's (2003) six "*sources of evidence*", documentation, archival records, interviews, direct observations, participant observation and physical artefacts.

We strove to acquire as many such sources as possible, but due to the variety of individuals we interviewed and their different locations around the country, direct observation became impractical. The fact that many of the mobile services we found out about in those interviews were recent implementations or currently under development made it impossible to use archival information and physical artefacts as sources of evidence. In fact, documentation and interviews were our main sources and so we continue our discussion with how we dealt with the interview aspect of our data collection.

2.2 Data Collection

The key to collected data that is both of good quality and easy to analyse is, according to Kvale (1997), to have a good picture of the research area and purpose before the collection is started and to clarify the meaning of the expressions to be used in the interviews. The exploratory nature of our study made this difficult as we had no clear picture of what we would find out. As Kvale (1997) says, an important part of the interview project involves developing a theoretical understanding of the phenomenon/phenomena which are to be investigated. Studying theories and literature dealing with development, adoption and diffusion of innovations gave us enough of a base upon which to build our interview questions. We decided that actor-network theory would be an appropriate choice of method for describing the case and further assisted us in structuring our interviews. A more detailed description of the theoretical framework for the thesis follows in the next chapter.

Our interview guide (appendix 13) and the questions it contains were based on the background literature and theories we had referenced in preparing for our study. Based on these theories we decided to look at diffusion as a concept that is influenced by the entire development process and so formed our questions so as to be able to describe mobile services in terms of this process and the key actors involved. Beyond questions about our interview subjects' work tasks, we also asked about background information on the mobile service development process, functionality, other involved parties, how services are used, why they are used, evaluations and personal impressions, effects of using the services and the existence of policies or guidelines for their use.

We chose to make use of a semi-structured interview guide because our research is explorative and a very structured guide would have been too limiting. A totally unstructured guide would not have been appropriate either, because we are relatively inexperienced at conducting interviews and we needed some structure in order to stay focused and collect relevant data. Our guide also helped us structure the data during the analysis and our careful preparations gave us the ability to, already during the interviews, clarify and verify the information we received. (Kvale, 1997)

Prior to each interview the interviewee was informed of the purpose of the research and how we were going to use the collected data. We explained how the interview was going to be recorded and processed and the interviewee was asked if they accepted that the interview would be recorded. They were also given the opportunity

to ask questions about the research. These points are all advised by Kvale (1997) and, according to him, following them helped us establish good contact with the interviewees and made them feel comfortable in the interview situation. More on the importance of this preparatory work is described in the section on ethical considerations.

In an ideal world, the best interview would be one performed face to face, with both audio and video recordings to capture as much information as possible. Video recording however comes with the potential negative effect of the interviewees not feeling comfortable to express themselves freely in front of a camera. The important thing for our research is what people say and not the way they act or their body language. Visual recording was therefore not necessary and would likely have given us too much information to sort through (Kvale, 1997). Conducting our interviews face to face presented us with a problem because our interviewees were widely spread across the country. Travelling to the various locations in Sweden in order to perform such interviews would have easily exceeded the resources available to us. For these reasons, we decided to perform our interviews over the telephone and record audio.

We conducted eight out of ten interviews during one week with between one and three interviews each day. The interviews lasted from a minimum of 22 minutes to a maximum of 50 minutes. The last two interviews were conducted the following week. After each interview we took a few minutes to reflect over what had been said and how the interview had gone, which gave us important information for later analysis and helped us remember facts that otherwise would have been easy to forget (Kvale, 1997).

2.3 Structuring and Summarising the Empirical Data

The recorded interviews were transcribed before the analysis. Transcription is a time consuming process which requires a great deal of care in order to avoid mistakes (Bryman, 2002). Before doing any transcription we discussed and decided on how this would be conducted in order to ensure, as far as possible, that our individual judgement calls did not diverge from one another too greatly (Kvale, 1997). In cases where there was doubt about the actual content we conferred and came to a decision together. We had also discussed sending each interviewee a copy of their interview transcript as a way of having them verify that we had understood them. The amount of detail chosen to be used in the transcriptions was thus of great importance (Kvale, 1997). Exact transcription of spoken language, including all noises, pauses and repetitions, can often seem incoherent and confusing and if we were to send such unformatted text to the interviewee the risk of them reacting negatively would be quite high and could even lead to a situation where the interviewee doesn't want us to use the interview at all (Kvale, 1997). Therefore, we chose to make less detailed transcripts where "hmm" and "mmm" sounds, and repetitions were excluded and focus was on the content of the sentences rather than the exact word order. However, in the end we decided to summarise (see appendix 14 for summary guide) each interview (appendices 1 through 10) and send that to each interviewee for approval instead of the entire transcript. We did this because we felt it more likely we would get feedback on two or three pages of text rather than almost ten. Also because we had

translated the interview content to English and felt it important that we got comments on potential inaccuracies from the translation itself.

In the early steps of the analysis, after the interviews had been transcribed, we coded the data. We did not wait with the transcription and coding process until all interviews had been completed, but performed these activities in parallel. This was due to the fact that we see data collection as an ongoing/iterative process where transcription and coding aid in further data collection (Bryman, 2002). By beginning the analysis in parallel with data collection, we were able to see if data was missing, or if new patterns and hypotheses appeared which required further studying (Bryman, 2002). If we had finished all the interviews and only then started the transcription and coding, it would have been harder to supplement the data if we found something missing (Miles & Huberman, 1994).

Coding was part of the selection process where we went through our empirical data and determined what information was important and organised it in order to make later and subsequent retrieval easier. Our coding followed a template (appendix 15) which we created in conjunction with the development of the interview guide. Our coding template was based on the interview questions and those theories we chose to make use of for our analysis. It is divided into two main categories, mobile services and the organisation. The mobile service codes refer to all information pertaining to the services, from background to user opinions, and the organisational codes refer to information about how the organisation manages these services and the processes surrounding them. Sub-codes under each category were also included to further specify what aspects of each main code we looked at. The template underwent some changes during the research process as new discoveries were made. Both of us were involved in the coding process. In order to ensure that we had the same understanding of the codes we wished to use and their connection to the research area, we selected a random section of text that each of us coded according to our template. By later comparing the results of our individual coding efforts on the same text we were able to discuss difficulties using and interpreting the template. These comparisons and the subsequent improvement in quality of coding were done in order to bring increased reliability to our analysis work (Miles & Huberman, 1994).

2.4 Scientific Quality

In order to ensure as high a scientific quality as possible in our research, we have followed a few basic procedures.

Validity during data collection is secured using what Yin (2003) describes as the construct validity test. This test is used to establish "*correct operational measures for the concepts being studied*" (Yin, 2003, p. 34). Construct validity is increased by use of, amongst other things, multiple sources of evidence. As we have mentioned, this has been limited in part by the topic and case organisation we have chosen to study. The relative novelty of mobile service usage and the lack of historical documentation or archival records this implies is one such limitation. Also, the difficulties inherent in having interview subjects located in many different parts of the country made direct observation and the potential source of insight and information that this could bring an

unfortunate impossibility for us. Our sources of evidence were then our interviews and some internal documentation of the mobile services we found out about.

We have also endeavoured to be as open as possible in our descriptions. Our intention is that the reader will be able to follow exactly what we have done, including the methods we have selected, the motivations for those decisions and how we have gone about implementing those methods. We wished, in other words, to follow the principle of maintaining a chain of evidence as described by Yin (2003) in order to increase the reliability of our conclusions.

Another thing we have done in order to improve reliability in our results is that both of us have participated in all steps of the research despite the time we would have gained by splitting, for example, the interviews between us. We considered this approach important in order to try to level out the different biases that might affect us as researchers. For example by both being present during the interviews we could take advantage of our individual subjective interpretations and get two perspectives on the same situation. This idea for improving reliability is supported by Kvale (1997) who writes that multiple analysts mitigate the effects of random or one-sided subjectivity that might otherwise be more pronounced with only one person analysing the data.

2.5 Ethical Considerations

With regards to ethical quality of our work, we have made sure to consider the individuals we have been in contact with at the SRA as well as potential implications for ourselves as researchers.

We have tried to be as open as possible in our communication with employees at the SRA. Performing an exploratory study made it difficult to provide specifics in terms of what questions we wanted answered, but despite this we were greeted with openness and provided with access to a number of employees involved in some way or another with mobile services. To ensure them of our intentions we made it clear when we scheduled the interviews, and before each interview began, that participation was entirely voluntary. In conducting interviews or otherwise collecting data through interaction it is ethically warranted to provide some sort of assurance or protection whether it is through signed contracts entered into by both researcher and subject or less formal promises.

With contractual agreements Creswell (1998) details the basic content that could be included - most controversial and difficult to cover entirely is the statement of the risks that may exist by participating in our study. Doing an open study where the results are not clearly understood from the start makes it especially difficult to predict risks in order to provide that information in advance. Given the open attitudes we were greeted with by the people at the SRA we felt that formal contracts were not necessary, especially since they are a government organisation subject to laws granting public access. We opted to send each interview subject a summary of the information we gathered from them as we would use it in the thesis, allowing them to review and authorise its use. This served two purposes: it gave each interviewee a level of control over their contribution and it allowed us a chance to have our

understanding/interpretation verified. We also provided each interviewee with the option of remaining anonymous, to the extent that this is possible, if they so wished. None of them responded that they did and we took this as a positive sign of our conduct in all communications with them. The comments and changes that we were informed of by our interview subjects were incorporated into the final version. These comments indicated spelling mistakes, misunderstandings in meaning of translated words and other such minor points – a good sign that we had understood and could convey each interviewee's story accurately.

Another ethical/quality consideration was our choice of interview subjects. In order to have as open a dialogue as possible, we attempted to select individuals separate from each other within the organisational hierarchy. In other words, we tried not to interview a person and his/her supervisor in order to minimise the risk of that person feeling less inclined to express their true opinions because of potential repercussions from above.

Finally, in referencing existing research in order to form a theoretical and contextual understanding of the field we have been mindful of the possibility that what we read was written by people with vested interests (e.g. Ericsson, Nokia or other mobile phone/service providers). This was not really an issue for us, but was nevertheless something we considered in order to make sure that conclusions we drew reflected as unbiased a view of the field as possible.

3 Theoretical Foundation

In this section we will introduce the theoretical foundation of our thesis. We present the little research that we found on the field. This is followed by a discussion of actor-network theory (ANT), our descriptive tool for gathering and structuring information about the case organisation. We also present diffusion of innovation theory and the innovation development process, which we then combine with ANT to form a combined framework for our later analysis.

3.1 Previous Research

In January 2006 a bachelor thesis about the use of SMS and MMS in large Swedish companies was presented at the department of informatics at Lund University (Berntsson & Johansson, 2006). The thesis is based on interviews with 20 representatives from 50 of the largest Swedish companies about how and why they use or do not use SMS and MMS in their business and what their plans, within the field, are for the future. Berntsson & Johansson (2006) found eight fields of application for SMS and MMS. They found that there were great differences in the way the interviewed companies used the services and saw that the reason for some companies not to use the services could be either complexity or lack of information about the services. Besides this they also found that the user him/herself can take active part in further development by pointing out new possibilities and needs. They also discuss how the characteristics of technologies should be adjusted to the organisations' business activities in order to get the best power of penetration.

A Finnish study regarding adoption and use of mobile services was presented by Aarnio, Enkenberg, Heikkila and Hirvola in 2002. Their study was based on a survey of 1553 respondents between the ages 9 and 34 years. They clustered the respondents into five different groups of users based on used channels for mobile services, and used mobile and Internet services. Their study showed that different groups of users use Internet and mobile services very differently. Entertainment services were clearly the most popular services and the rest of the services were only for innovating opinion leaders and early adopting change agents. Among other things they found that mobile services mostly are used by those whose charges are paid by their employer. Aarnio et al. (2002) argue that we are stuck in a trap of highly priced, not-so-desired services and they suggest that new services that are launched should be lower in price, integrated with Internet services and better marketed. Or that the services are developed for special purposes and focused groups of users.

A great variety of mobile phone services have been developed and, to varying degrees, adopted in our society. A survey from the PTS, about mobile content services, shows that mobile users have for several years now demanded mobile

services that are more task-oriented or useful, while the market mainly offers entertainment services. Moreover, their survey of individuals also shows that 40% of people in the age group 51 to 75 years know that these mobile services do exist but they choose not use them (PTS-ER-2005:8).

Another study about mobile services by Heikkinen and Still (2005) discusses the way mobile services are developed. They say that in today's competitive environment the amount of resources and knowledge needed to develop new mobiles services has become overwhelming for a single organisation. And they present a view on development of mobile services that is based on network thinking and attention to collaborative actions. With their case they argue that a combination of resources from different actors is the cornerstone of new mobile service development and that clear goals and tasks for these actors are a success factor for the mobile service development process. They also argue that further research on new mobile service development networks needs to be done.

An example of a study in the mobiles service field that has used actor network theory is the work of Yoo, Lyytinen and Yang (2005). They explored innovation in broadband mobile services and the role of standards in particular, in South Korea. Yoo et al. (2005) used actor network theory because they see innovations as collective achievements by many actors and because the theory integrates and considers technological, political and institutional factors.

3.2 Actor-Network Theory

Technology forms an integral part of our society and as such it is clear that there is a relationship between technological advances and societal change. What is unclear and remains a subject of debate is just how the two are related. There are those who see technology as the driving force behind societal change. The extreme in this area is the idea of technological determinism which sees technology and technology alone as the shaper of society. On the other end of the spectrum we have those who believe in social determinism. Technology is seen as a social construct, deriving importance and meaning only as a result of the social environment within which it exists/is used. There is a third perspective that stands between these two extremes. Here the technological and the social are seen as equally important parts of the same whole. An approach for studying social change that follows this third perspective is actor-network theory (ANT). It was developed primarily by Bruno Latour and Michel Callon in the 1980s, and has been developed and extended by its proponents over the years.

"The ANT perspective attempts to explain and interpret social and technological evolution using neither technical-material nor social reductionism, but rather it incorporates a 'principle of generalized symmetry', that is what is human and non-human should be integrated into the same conceptual framework." (ISCID, 2001-2005).

Using ANT, the world is described in terms of networks of actors. These actors can be anything that plays a role in the functioning of the network. Actors can be human

(people) or non-human (physical objects) – the lack of distinction between the social and the technological is made clear here. An actor (or actant) in ANT is "*something that acts or to which activity is granted by others. It implies no special motivation of human individual actors or of humans in general. An actor can literally be anything provided it is granted to be the source of an action.*" (Latour, 1998)

The network part of actor-network concerns the relationships between the actors. When thinking of networks one is dealing with two interconnected systems. On the one hand we have the people who are involved in inventing, constructing, implementing and using objects. And on the other hand we have all the individual objects that are necessary to connect the people. Actors and networks rely on and derive meaning from each other – one cannot exist without the other (Stalder, 1997). Whilst no distinction is made between a person and a stapler, to give an exaggerated example, there are differences in relative importance amongst actors based on the size of network(s) they can bring into place, or the number of other actors that single actor can align (Stalder, 1997).

When dealing with the construction or configuring of networks a process of translation is spoken of. Translation is the effective persuasion of actors that it is in their interest to use the technology in the manner prescribed and that the technology is the answer to their problems (Howcroft, Mitev & Wilson, 2004). The concept of translation in ANT was defined by Callon (1986) in a study of three researchers in their attempt to restock the St Brieuc bay with scallops. It is divided into four stages: problematisation, interessement, enrolment and mobilisation.

In problematisation, as the name indicates, the problem is defined and relevant actors are identified. Since there can be great numbers of each type of actor, representatives for each group are identified and contact is limited to them. A primary actor then seeks to render itself indispensable in the network (Callon, 1986). This is done by establishing obligatory passage points (OPP). In the St. Brieuc bay case, the researchers (primary actors) established themselves as OPPs by showing and convincing the other relevant actors that their research programme was the best option to bring benefit to them all.

The next step, interessement is "*the group of actions by which an entity attempts to impose and stabilize the identity of the other actors it defines through its problematisation*" (Callon, 1986, pp. 207-208). In the problematisation phase the other relevant actors have been identified and brought together to achieve some goal. The problem here is that these actors do no exist in a vacuum but can be members of other networks which assign different, perhaps conflicting, identities to the actors. The interessement stage seeks therefore to cut the actors involved from all other entities who want to define their identities otherwise (Callon, 1986).

In enrolment the actors involved are convinced to accept their roles as defined in the previous stages and actually form the actor-network. Callon (1986, p. 211) describes it as "*the group of multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed.*"

Mobilisation has to do with ensuring that the spokespeople that were identified in problematisation properly represent the collective. If there they are truly

representative, and there is consensus, each actor's role in the network will solidify and at the end of these four steps, a constraining network of relationships will have been built (Callon, 1986).

We have chosen to use ANT as a descriptive tool to identify the various actors involved in mobile service use at the SRA. Considering the fact that we have conducted an exploratory study and also the closely interrelated nature of mobile service technology and the people that use it, ANT seemed to be an ideal tool to structure our investigation. This is not to say that ANT is a flawless concept. Latour himself, one of the progenitors of ANT, has criticised it, though mainly due to the fact that the wording of actor-network theory has led to such confusion and misinterpretation of the idea (Latour, 1997). Other criticism regards the tendency to focus on micro-studies leading to a lack of consideration of wider social structures (Howcroft et al., 2004). ANT has also been said to have a lack of ability to explain (Howcroft et al., 2004). ANT and the sociology of translation are useful tools for describing and detailing relationships between actors, but not so useful when it comes to analysis. For this reason we have decided to limit our use of ANT to describing our case organisation, and have opted to analyse the actor-network(s) we have identified based on diffusion of innovation theory and the innovation development process.

3.3 Development and Diffusion of Innovations

During our exploration of what is involved in the process of adoption, diffusion and use of mobile services we came to understand that they are part of a larger process - a process which also includes an initial perceived need, a research and development phase followed by diffusion and consequences. These are all aspects that, according to Rogers (1995), are parts of the diffusion of innovation process. An innovation presents an individual or an organisation with a new alternative or alternatives, with means of solving problems. Rogers defines it as follows:

> *"An innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption."*
>
> Rogers (1995, p. 11)

According to Rogers (1995), diffusion of innovation is based on four main elements; innovation, communication channels, time and the social system. These four elements are also reflected in his definition of diffusion.

> *"Diffusion is the process by which an **innovation** is **communicated** through certain **channels** over **time** among the members of a **social system**. It is a special type of communication, in that the messages are concerned with new ideas."*
>
> Rogers (1995, p. 5, emphasis added)

The four main elements of the diffusion of innovation theory support the view we have of diffusion as something not just affected by the technology itself but also by other types of actors. Diffusion of innovation theory has developed over the years and most of the innovations that have been researched are technological in nature (Rogers, 1995). It is a multidisciplinary field to which sociology, communications,

organisational and IT researchers all have contributed (Fichman, 2000). There is no single theory of innovation diffusion, but Roger's model of diffusion is one that is widely accepted in research on technology innovations today (Fichman, 2000).

Since the classical diffusion of innovation model is mostly based on research about adoption of innovations by autonomous individuals it has been subject to criticism about being less applicable to technologies adopted in and by organisations (Fichman, 2000). We are therefore going to focus on what Rogers (1995) calls the innovation development process and the parts of the theory that deal with innovation in organisations.

3.3.1 The Innovation Development Process

The innovation development process contains six different phases: 1) Recognising a problem or need, 2) basic and applied research, 3) development, 4) commercialisation, 5) diffusion and adoption, and 6) consequences. Rogers (1995) points out that a lot of past research on diffusion often overlooks the fact that diffusion is part of a larger process. He says that this deficiency needs to be overcome and he recommends researchers to take a broader view, where diffusion is just a part of the innovation development process. In the next sections we will describe the six phases. What is important to remember is that the six phases do not always occur in a linear sequence and that some phases might not be applicable for certain innovations (Rogers, 1995).

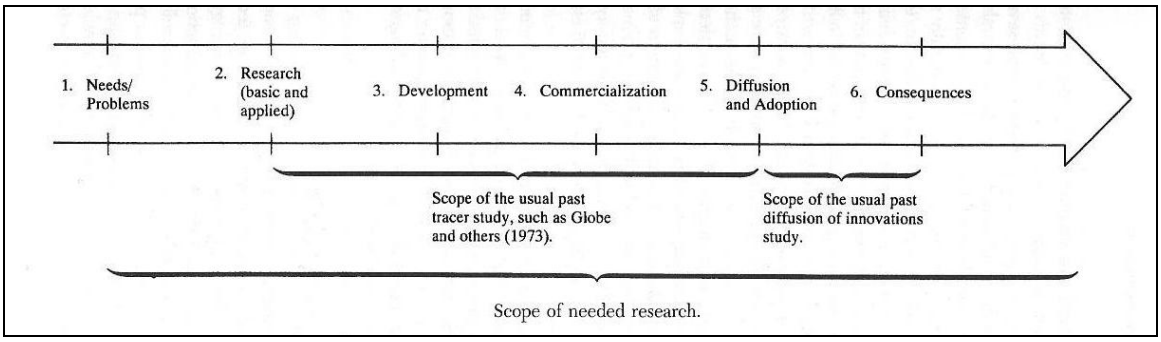

Figure 3-1. The Innovation Development Process (Rogers, 1995, p. 133)

Recognising a Problem or Need
The innovation development process often starts by recognition of a problem or a need. This recognition can take place in many different ways. Sometimes the problem can be predicted and research starts before the problem has arisen. Other scenarios can be that certain problems or needs can develop from scientific research or political processes. (Rogers, 1995)

Basic and Applied Research
The research phase is started after it is understood that there is a problem or need. This phase aims to develop and create an innovation that can solve the identified problem or need. There are two different types of research that are important in the research phase; basic and applied. Basic research is where the knowledge base for the innovation is founded. It is defined by Rogers (1995, p. 135) as *"original*

investigations for the advancement of scientific knowledge that do not have the specific objective of applying this knowledge to practical problems". The applied research is the opposite and puts the scientific knowledge into practice to solve a practical problem with an innovation. In order to do this, the applied researchers often use basic research (Rogers, 1995).

Development
The next phase, the development phase, is hard to separate from the preceding phase. Research and development often go hand in hand, with development based on research. Despite this, Rogers (1995) divides them into two phases. The development of an innovation is where the innovation is put together in a form, based on the new idea. The developed innovation is expected to solve the problem or meet the needs of the potential adopters.

Commercialisation
When the innovation is developed it is ready to be adopted by the supposed users. The next phase, the commercialisation, is when the innovation is produced, manufactured, packaged, marketed and distributed. (Rogers, 1995) To facilitate diffusion of innovations two or more interrelated innovations are often commercialised together according to Rogers.

Diffusion and Adoption
In this phase one of the most important decisions has to be made and that is about when to start the diffusion of the innovation to the potential adopters. It is a question which needs careful weighing of consequences between diffusing as soon as possible in order to solve the problem or need, and quality control where it is made sure that the innovation will have beneficial consequences for the adopters. One problem that can occur in organisational relationships is that one organisation recommends one innovation and another organisation recommends another. (Rogers, 1995)

Consequences
When the innovation is diffused and adopted the final phase, consequences, is entered. This phase is where the initial problem or need is solved by the innovation or not. Consequences are the changes that occur to the adopters as a result of adoption or rejection of an innovation. All innovations produce reactions, both social and economical. It is not unusual that the innovation itself causes a new problem or need that starts a new innovation development process. (Rogers, 1995)

3.3.2 Innovation and Organisation

Rogers points out that the innovation process is different for organisations compared with for individuals. According to Rogers, the innovation process is much more difficult in organisations. Innovation is a process that is ongoing all the time in most organisations. (Rogers, 1995)

In many cases an individual in an organisation cannot adopt an innovation before the organisation has adopted the innovation. Rogers (1995) defines four different types of innovation decisions where *contingent innovation-decisions* are those which can be

made only after a prior innovation decision. A contingent innovation-decision is a combination of two of the other three types of innovation decisions which are: *Optional innovation-decisions*, where the individual independently makes the decision; *Collective innovation-decisions*, where the choice is made by consensus among all members; *Authority innovation-decisions*, where the choices are made by a few individuals with power, status or technical expertise. The organisational contingent decisions are often composed of collective and authority innovation-decisions. (Rogers, 1995) This is also something that Fichman (2000) brings up in his article. He calls it a "*two-part adoption decision*" (Fichman, 2000, p. 120), meaning that adoption of IT innovations often includes an initial decision from the organisation to make the innovation available throughout the organisation, followed by a local adoption decision by the departments, work groups, projects or individuals.

In his article Fichman (2000) describes three different factors that affect diffusion and assimilation of innovations. The three factors are selected based on what is generalisable and well-established in the research field. What characterises these factors is that they don't deal with innovation or organisation but with describing a particular innovation-organisation combination. This view stems from the idea that one innovation can suit one organisation very well but not be compatible with another. This is why these three factors are so interesting for our research which deals with a particular organisation and its mobile service innovations. The factors are: (1) organisation-innovation fit, (2) innovation perceptions and social influence and (3) innovation delivery system.

Organisation-Innovation Fit

The fit between innovation and organisation is an important factor affecting the diffusion of an innovation. The innovativeness of an organisation does not entirely determine the adoption of an innovation. A normally innovative organisation can be very slow in adoption of certain innovations just as a generally less innovative organisation can be an early adopter of some innovations. This slow/early adoption is often determined by how well the innovation fits with the organisational needs, strategies, resources or capabilities. From this theory, Fichman (2000) suggests five organisational characteristics that can be used to investigate the fit between organisation and innovation.

- Absorptive capacity
- Related knowledge
- Diversity of knowledge
- Task-technology compatibility
- Wealth

Innovation Perceptions and Social Influence

A key determinant for adoption is how the potential adopters perceive the innovation. These perceptions can vary between adopters and innovations, and Fichman (2000) divides the perceptions in an organisation into two levels. The first is about the formal organisational decision to adopt a certain innovation. In this case it is the perception of key decision makers and leaders that is important. Factors affecting this perception are:

- Relative advantage
- Compatibility
- Complexity

- Trial-ability
- Observe-ability

The second level concerns the individuals in the organisation and their decision to adopt or reject a formally adopted innovation. The innovation success is often dependent on acceptance among the intended users, which makes individual perception important. Most research about individual perception has focused on two factors from the technology acceptance model (TAM), namely usefulness and perceived ease of use. (Fichman, 2000)

Another determining factor is how these perceptions are formed. Fichman (2000) argues for the fact that it is not only the objective factors of the innovation that forms that perception but also social factors. Innovation/technology perception is formed by the individual's observation of others. Therefore he suggests four more factors that socially affect the perception of an innovation. These factors are based on the work of different researchers where Rogers is one among them.

- Group norms
- Co-worker attitudes and behaviours
- Opinion leaders
- Change agents

Innovation Delivery System
The delivery system for an innovation is the means by which the implementation process is managed and supported. According to Fichman (2000) a lot of research has been done to try to identify the characteristics of an effective delivery system. He summarises the research in the field and suggests four factors of an effective delivery system.

- The degree of top management support.
- The degree of technology championship.
- The level of training and other resources invested in organisational learning.
- Links to propagating organisations. Positive effects of standardisation, subsidies, and consulting services for those organisations that prefer these factors.

3.4 Innovation Development Process with Actors

ANT offers the benefit of providing a clear and structured way of describing our case, but is not as well suited to analysing the data collected. For this reason, we have decided to combine the two theories, ANT and the innovation development process, into a common framework which we have used as our analysis tool, illustrated in figure 3-2 below.

We have drawn the model for our framework to indicate that individual actors can affect one or more of the different steps simultaneously. Actors can affect one another and also the various steps in the innovation development process. We have also removed the arrow in the development process steps in line with Roger's statement

that the different stages can be of varying importance and need not necessarily follow each other in a strictly linear fashion.

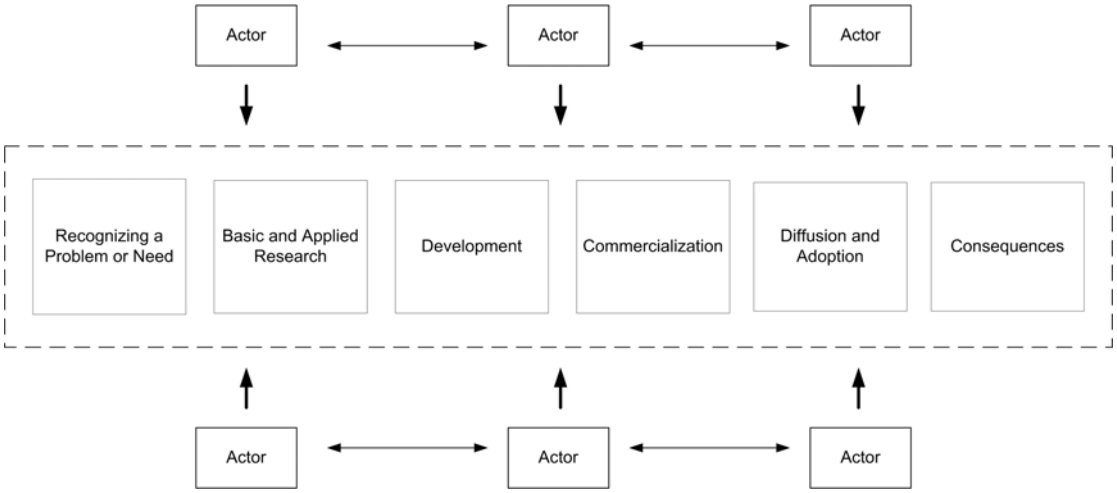

Figure 3-2. ANT and the Innovation Development Process Combined

In chapter five we will use ANT to identify the various actors and their relationships in order to describe mobile services and mobile service development at the SRA. These actors and the relationships between them are then presented in our combined analysis framework in the beginning of chapter six. After analysing the various stages of the innovation development process in terms of these actors and their roles we present the final view of our framework showing which steps of the process each actor is involved in. Before that though, we continue to the next chapter and present our case organisation, the Swedish Road Administration.

4 Case Description

This chapter presents our case organisation and some background information about what they work with and how they are organised. We discuss why the organisation was appropriate for our study and present our interview subjects and how they were selected.

4.1 The Swedish Road Administration

The Swedish Road Administration is the national authority assigned overall responsibility for the entire road transport system in Sweden. The SRA was founded in 1841 as a result of the increased importance of transportation (Vägverket [VV], 2004a). Today the organisation has around 6500 employees and a business volume of 22.2 billion Swedish crowns (VV, 2006:21). The SRA's task is, on commission from the Swedish government and parliament, to create a safe, environmentally sound, accessible and gender-equal road transport system that contributes to regional development and offers individuals and the business community easy accessibility and high transport quality (VV, 2004b).

SRA is responsible for the planning, construction, operation and maintenance of state roads. Its responsibilities also include driving licences, intelligent transport systems, public transport, adaptations for disabled persons, commercial traffic, applied research and development and demonstration activities in the road transport system. The SRA's improvement initiatives are characterised by three distinguishing features: customer orientation, a holistic approach and efficiency. (VV, 2005a) It is the Swedish government that draws up the budget and lays down the general outline and goals for the SRA's activities (Näringsdepartementet, 2006).

The SRA has a vision for their business: *We make the good journey possible. (*The Swedish Road Administration [SRA], 2005:35E, p. 4)

4.1.1 Organisation

The SRA is managed by a board of directors which is appointed by the Swedish Government. Chairman of the board is Kenneth Kvist (VV, 2006:21). The board is responsible for the activities and the director-general, Ingemar Skogö (VV, 2006:21), is head of operations in accordance with the guidelines and directives set by the board. The SRA is divided into a head office, two national support- and development divisions, seven regions, three profit centres and three business divisions. (VV, 2005b)

The seven regions are responsible for the regional activities and are obligated to contribute to SRA's collective result (VV, 2005c).

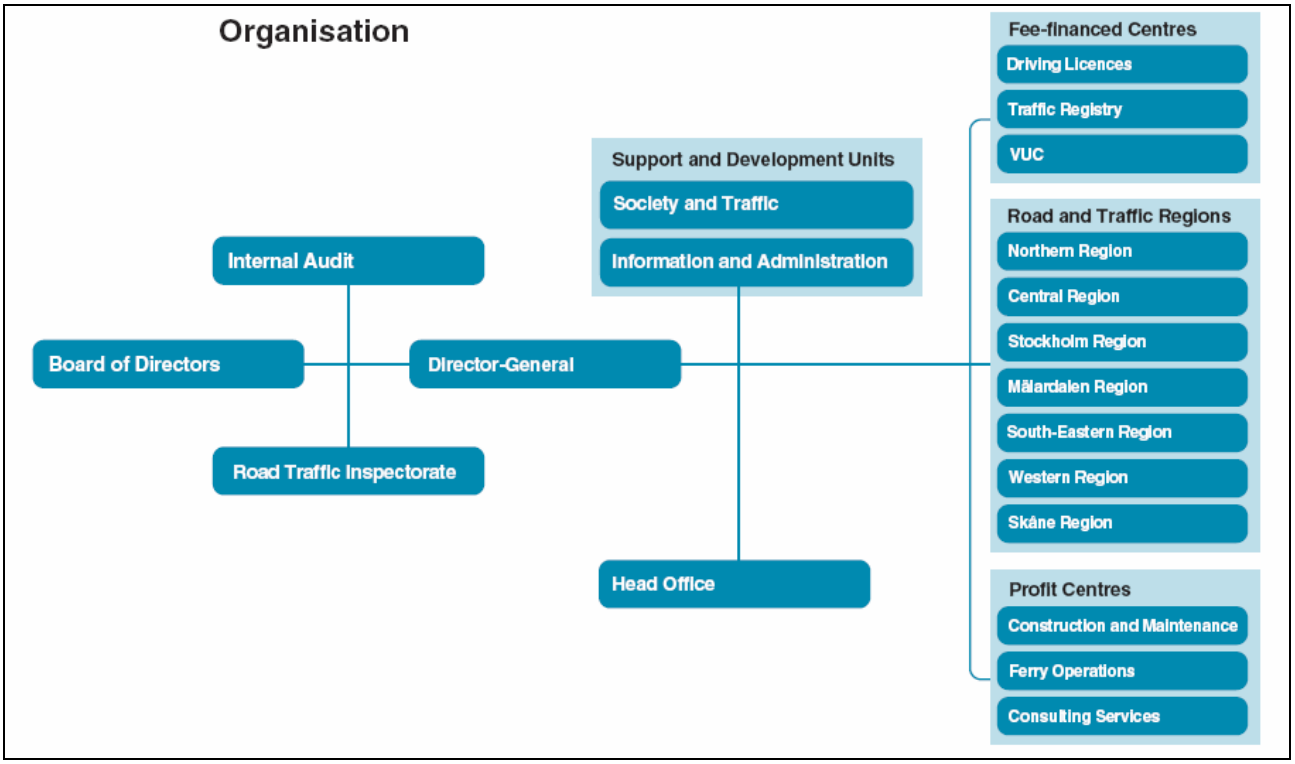

Figure 4-1. The SRA Organisational Structure (SRA, 2005:35E, p. 40).

4.1.2 The SRA and IT

The SRA understood early on that IT is a very powerful tool for development and efficiency in an organisation and in 1998 they developed ten basic principles for IT. The intention with these principles was to establish a common approach in order to secure accessibility, quality, efficiency and flexibility and to serve as strategic support and guidance for IT in the SRA. This is in line with the drive within the Swedish government to use modern IT to develop the country's public/government services. The principles are as follows, (VV, 1998, translated)

1. We shall in a goal-oriented and systematic way use IT to increase efficiency, develop and renew both our organisation and the road-transport system.
2. The prerequisites of the profit centres shall be taken into consideration when making use of IT.
3. One should feel secure with regard to legal security and personal integrity when using IT-assistance.
4. IT-assistance shall be easily adjustable to changes in the organisation and the environment.
5. The Swedish Road Administration's action within the IT field shall be marked by openness to other interested parties.
6. Roles and processes within the IT field shall be clearly demonstrated and established.

7. IT shall be considered production-critical assistance for the carrying out of the Swedish Road Administration's tasks.
8. A common IT-infrastructure shall exist as a foundation for the Swedish Road Administration's IT-assistance.
9. Acquisition shall occur with a holistic view of the organisations and the road transport sector's needs and the possibilities IT offers, as well as of certain common principles.
10. We shall constantly strive towards positive effects and possible synergy effects in IT use.

The SRA is also participating in different, both national and international, development projects of IT-assistance that can help make being mobile a lot easier. For example services to help drivers stay within the speed limits, or getting directions and information about the traffic situation, queues, accidents or other traffic obstacles. (VV, 2006)

4.2 Why the Swedish Road Administration?

In order to carry out our study in the way we intended, we needed to come in contact with a relatively large organisation that provided a variety of users that could be studied and compared. Furthermore, the organisation we chose had to draw some kind of benefit from the use of mobile services. Since we wanted to expose multiple and varied perspectives to mobile service usage within the organisation it was also important that the organisation we chose was clearly divided both horizontally (departmentally) and vertically (hierarchically). This prerequisite was based on the hope that it would assist in identifying individual subjects that represented a variety of different roles within the organisation.

After some research and discussion we came to the conclusion that the SRA would suit our needs nicely. The SRA satisfied our organisational requirements with many different types of work roles and users, from snow plough drivers to administrators and IT developers. Since it is a government agency we could also expect that the information that was important to us would be more accessible than it might be with a private business due to the principle of public access to official records and the fact that one of their principles for IT, as stated above, is to be open about their actions within the IT field to other interested parties. After initial contact with employees at the SRA we also understood that mobile services play an important part in the organisational strategy of customer orientation and efficiency. The SRA also seem to have a definite interest in adopting mobile services and technologies, both purchased and developed in-house. The SRA was also mentioned as a highly technical and pioneering organisation at the Telia website (TeliaSonera, 2005). In other words, the SRA cover a pretty broad range of users and uses of mobility and actively seek out new technical solutions, the kind of organisation we were looking for.

4.3 Interview Subject Selection

Given the nature of our study, our selection process for interview subjects at the SRA was not something we controlled directly. Since we did not know what services the SRA used, or even what relationship they had to mobile services as a concept before hand, we had to rely on their help to get in touch with the right people. To this end we started our "selection" by contacting someone at the information department and presented the idea for our thesis to them in the hopes that they could put us in touch with the right people. The tactic worked and we were given a list of names of people who in some way or another were involved with various mobile service solutions. We then proceeded to contact each of the people on that list, presenting the idea behind our study and through this communication were put into touch with further individuals who could be of interest. The technique we used for our selection of interviewees is called snowball selection (Bryman, 2002). This is not a selection criterion that gives us a representative selection, but we do not find that a problem since our research is not focused on statistical analysis (Bryman, 2002). Our goal was to interview people who represented both sides of the coin; mobile service development on the one side, and mobile service use on the other. The selection technique gave us ten interviewees and the individuals we interviewed could be said to be more on the development/administration side of things, but not exclusively so, and therefore could also provide insight into the user perspective. A summary of our interviewees is in table 4-1 and each interview transcript has been summarised according to a guide (appendix 14) and can be found in appendices 1 through 10.

Table 4-1. Summary Information of Interview Subjects

Name	Title	Department	Location
Ellen Brubråten	Responsible for the coordinated telephony commission.	Information and office service (VSikk)	Borlänge
Martin Collin	IT-technician in mobility.	SRA IT	Västerås
Per-Anders Fredriksson	OneBridge administrator.	SRA IT	Kristianstad
Gunilla Kleiven	Bridge engineer.	Road-user service	Göteborg
Gun Landén-Slars	Communications strategist and administrator of the communications platform.	SRA IT	Borlänge
Martin Lindén	Consultant involved in development and implementation of BaTMan.	Consultant at SRA IT	Borlänge
Malou Lubell	Expert in telephony systems.	Traffic Registry	Örebro
Adriano Maglica	Coordinator for maintenance of bridges in the South-East region.	Road and Traffic (South East)	Jönköping
Thomas Mannerhagen	Responsible for telephony contracts, both landlines and mobiles.	SRA IT	Borlänge
Anders Taberman	Responsible for the regional support process IT and data management.	Strategy and Finances (South East)	Jönköping

5 Mobile Service Actor-Networks at the SRA

In this section we present a summary of the interviews we conducted, using actor-network theory to describe the various mobile services we found out about. Through these interviews we were introduced to a variety of different mobile systems and services in place at the SRA. Some of them are fully developed and in use, and others not yet in use but under various phases of development. The mobile services/systems we found out about were:

- The OneBridge platform, a synchronisation and gateway application.
- The "who owns the vehicle" SMS service offered to and used by the general public to get registration information for vehicles.
- The BaTMan system for administration of road constructions.
- Fotodestinator/Tom Tom, a system under development with the goal of integrating as much functionality into a single device as possible
- The national mobile service offered by Telia as a way to only have a mobile phone instead of having both a mobile and a land line.
- The traffic information centre (TIC) warning SMSes sent out to concerned parties when conditions on the roads that can affect them are reported in.
- RAPPA, a system for reporting ongoing work, to be used, for example, by snow plough drivers.
- The system for registering driver's license test information using an Anoto pen and digital paper form.

We can't say that the services are successful or not yet since they are all relatively new and have yet to be fully established. But the impression we have been given of them from our interview subjects indicates a strong likelihood that they are and will continue to bring benefit to the SRA and its customers and employees.

We have taken the information we gathered through our interviews and describe the mobile services used at the SRA using actor-network theory. ANT is used only as a way to structure the information we gathered, and to describe the services and the various actors involved in their development within the SRA. The various individual service networks come together to form a more general network that describes mobile service development at the SRA.

The mobile services we have chosen to describe in further detail are limited to those that the SRA have developed or participated in development themselves. The national mobile service, for example, that was mentioned by a number of different interviewees is not taken up here. Systems such as RAPPA (appendix 2) and Tom Tom (appendix 10), whilst interesting, we did not feel we could use in our investigation. As they are still under development, mapping them out using ANT and the translation process would be difficult and most likely provide very little useful

information/insights. Tom Tom, for example, is so early on in its development that one could say that it is still in the problematisation phase.

5.1 Service Contract Administration

Those services already in place and in use at the SRA are regulated by contracts with the various service and infrastructure providers (appendix 5). In the case of mobile services in particular, Telia and their product line and infrastructure are the major actor. Their subcontractor, SYSteam, provides a subset of the product line in the form of the OneBridge platform as described by, amongst others, Thomas (appendix 9) and Anders (appendix 10). So in order for Gun and others involved with drawing up and administering service contracts, Telia or other service providers must be negotiated with (appendix 5). The network in figure 5-1 shows Telia as a single actor since this is true for the SRA at the moment, but it could easily be any other mobile phone service provider in Sweden.

Another of the actors involved in this aspect of mobile service use is the Swedish Administrative Development Agency because of the blanket agreement that the SRA is using in its contracts with service providers (appendix 5).

The mobile services that are currently available and those that are under development or planned for in future are also of importance to contract administration as they determine which needs the contracts must cover for their continued and future use (appendix 5).

Users of the mobile services and the user council representing the entire SRA organisation also play important roles in guiding the content of these contracts. Their current use and future needs must be secured, and issues such as user concern about the amount of radiation emitted from mobile phones need to be taken into consideration when drawing up contracts with mobile phone suppliers and deciding which phones should be purchased (appendix 5). The mobile phones, and by association the companies that provide them are thus also actors involved in this network.

There are existing specifications of requirements that are also taken into consideration, either in order to ensure that they are upheld, or in order that they can be revised to reflect current or future needs. All of these together form the actor-network shown in figure 5-1.

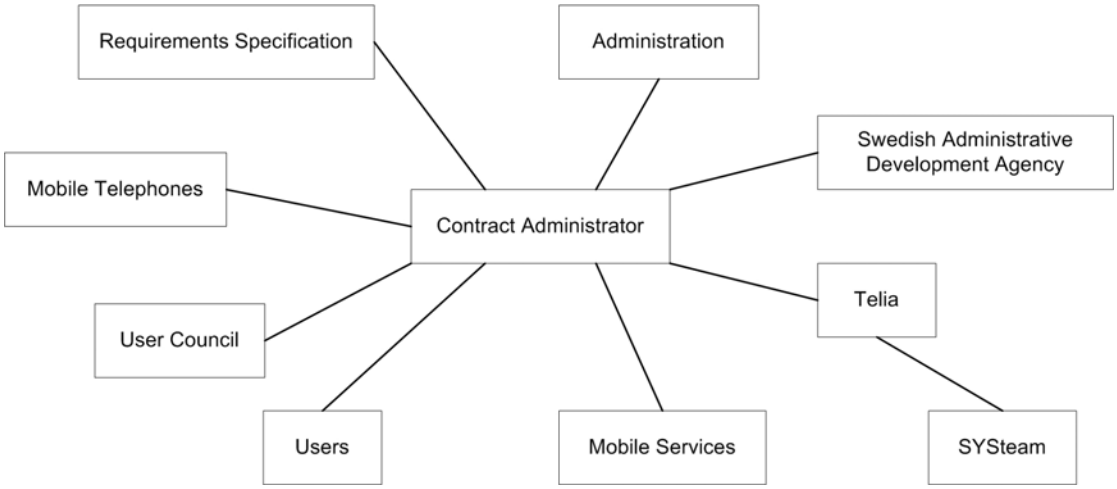

Figure 5-1. Mobile Service Contract Administration.

In terms of the translation process in ANT, the network we see is a well established one that regularly shifts between problematisation and mobilisation. The actors involved do not seem to change much over time in that they are representative of those people or things that are important for the network to function. Really, the process of contract administration is one of minor adjustment of the specifics that underlie the various actors. Requirements specifications, for example, may change in content, but do not change in their importance as an actor within the network as a whole.

5.2 Mobile Service/Device Selection

Ellen was our main source of information for the process of selecting mobile services or telephones within the SRA (appendix 1). Actually, she is involved in defining recommendations that could help guide employees or management when selecting which phone or service is appropriate for their needs. Here the employees themselves, and the information requirements that their work roles entail, are an actor. Administrators such as Ellen, taking into account which mobile phones and services are available via the SRA IT-shops (where phones and services can be ordered, see appendix 10) then make a recommendation of which phone and services are best suited to that employee's needs.

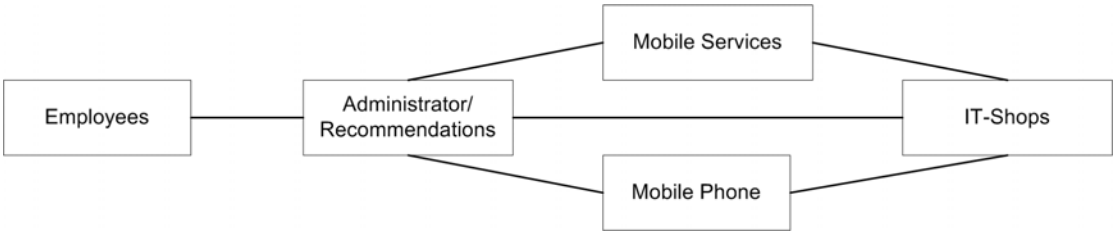

Figure 5-2. Mobile Phone/Service Selection Recommendations.

These are still only recommendations and it is up to each region, department or unit of the SRA to decide how strictly to follow them. A few of our interviewees admitted that they did not follow these recommendations. Anders for example said that he has

both a Sony Ericsson and a Qtek phone despite the fact that you should only have one phone that covers your needs (appendix 10). As Ellen put it, there will always be those who have and use a phone outside of the recommendations.

The translation process does not really apply to this network either. It is established in that the actors involved are set (mobilised), but the weight of the network in terms of the influence it has in a larger context cannot be said to be great. It is interesting as an aspect of SRA policy implementation.

5.3 Traffic Information Centre Warning Service

Ellen in her administrative role coordinating telephony described an SMS-service that she finds very useful. In it, traffic information centres gather information about the roads from various external customers such as the SMHI weather service, or police or ambulances out on the roads and based on this, send out warning messages to individuals within the SRA that can be affected. In Ellen's case, the warning messages can be related specifically to the switchboard (in the case of anticipated increases in load). (appendix 1)

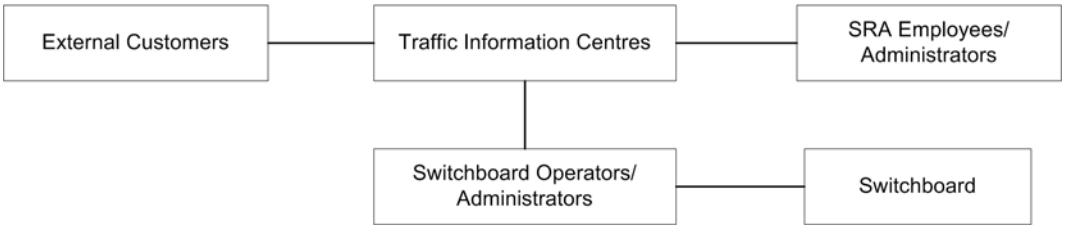

Figure 5-3. TIC Warning SMS Service.

When looking at this network in terms of translation there is, again, little to be said. The system is established and those involved use it and derive benefit from it. As Ellen put it, the SMS-service is "very practical" (appendix 1). So again, the actors and network can be said to be mobilised in that the actors are truly representative and the network is, at least for now, solid.

5.4 BaTMan

Gunilla (appendix 4) and Adriano (appendix 8) described a system that they each use called BaTMan (bridge and tunnel management). With this system, road constructions such as bridges, tunnels and support walls are kept track of, from the beginning of their life until the day they are torn down (appendix 4). The system is a development of an older system called SAFEBRO (safe, functional and economical bridges).

The initial information we received about BaTMan gave us the impression that it was a mobile service that fit well with the types of service we wanted to look at. We realised however, after the first interview with a BaTMan developer (appendix 6), that the system if fact does not fall entirely within the definition we had established for our

study. It is used with a laptop computer and not a smart phone or other mobile phone solution as we had thought, but does make use of the 3G network and so in terms of communications infrastructure it could still be of interest. Also, the service, in terms of mobility and the functionality that it provides, is comparable to some of the other services we had found out about and which do fit within the scope of our study. For these reasons, and the fact that we had access to a greater variety of users of the same system (a developer, administrator and an end user) we chose to include it.

As a central actor then we have the BaTMan system itself. This system is constructed such that it is accessible to anyone who has permission to use it via an internet connection. Information about the various road constructions are stored here and available to those who need to reference that information, or update it. (appendix 4)

If we look at the development side of the system we see the SRA IT department as an actor, and consultants (such as Martin L., appendix 6) hired in to work on the project. There is also a user/reference group which consists of representatives from the various regions and units within the SRA, and other interested parties external to the SRA such as Banverket and Gothenburg harbour (appendix 6). These three main actors all contributed to the project in terms of requirements specification, user testing and product development.

On the use side of things we have two categories of inspector. The internal inspectors are employees of the SRA, members of the organisation. The external inspectors can be private enterprises, hired in to do the work, but not belonging to the SRA organisation otherwise. These two groups do the actual inspection work, going out to the various constructions and reporting on their status. The mobile aspect of BaTMan of interest to us lies in the use of 3G cards in combination with laptops in order to reference and update the construction information in the BaTMan system on location. Another actor involved in use of BaTMan coves the role of administrators such as Gunilla (appendix 4). Their responsibilities involve keeping track of all of the constructions in the BaTMan system and seeing to it that inspections are conducted in a timely fashion.

Together, all of these actors form the network shown in figure 5-4 below.

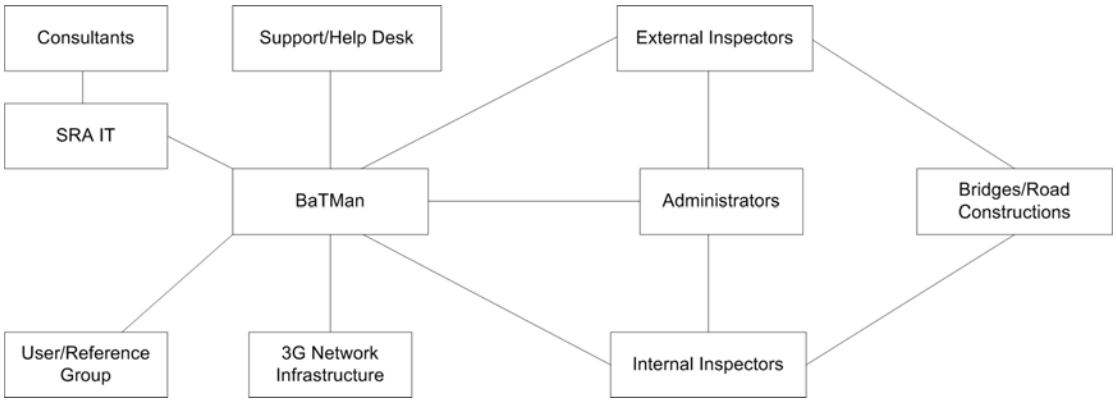

Figure 5-4. The BaTMan Road Construction Administration System.

The BaTMan system is not only established, but is based on the older SAFEBRO system meaning that the actors involved in the network have firm identities that have

not and are not likely to change suddenly. Translation therefore provides little new insight.

5.5 The "Who Owns the Vehicle" Service

Another of the mobile services we found out about regards vehicle registration information, the "who owns the vehicle" SMS-service (appendix 7). In this system, the vehicle in question, customers who are interested in registration information for it, the SMS-service itself (incorporated into OneBridge), the traffic registry (which administrates and has the information that the service provides) and the laws and regulations that limit how the service functions and what information can be used, are all actors. Customers in this case are external to the SRA, such as the general public, police or security guards. (appendix 7)

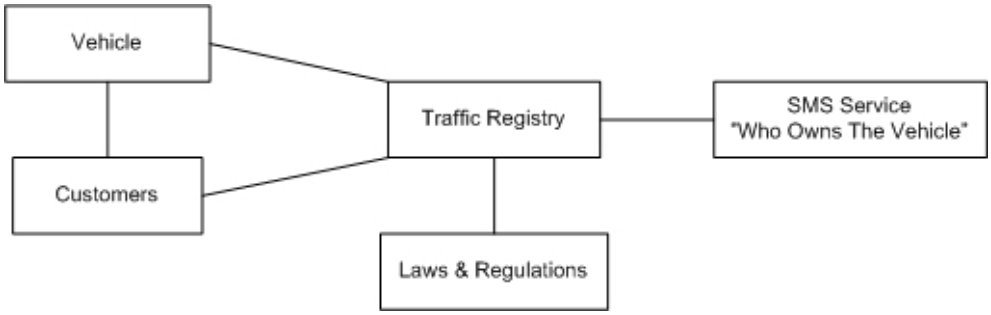

Figure 5-5. The "Who Owns the Vehicle" SMS Service.

We are yet again dealing with an actor-network that is well established and used (half a million questions asked each month) and so the process of translation is past mobilisation. It is only if there were to be a fundamental change in one of the actors that the translation process would become interesting again. For example, if the laws governing how registration information can be distributed were to change dramatically then the network might take on a different form, but as it is now, the network seems to be quite stable. If anything, other services based on the same network model are planned and sought after in order to relieve the pressure on customer service that Malou described (appendix 7).

5.6 The OneBridge Platform

So far we have looked at aspects of mobile service administration (contract specification and service/device recommendations), mobile services used by employees of the SRA, and a mobile service that is offered to the general public by the SRA. A number of other services were mentioned (many of which are currently under development), but common to many of them has been the OneBridge platform. So to move our focus up from individual services we look at the platform that allows them to be used at all, and the actors that make up that network.

Firstly, and unsurprisingly, we have the OneBridge application itself, which is a gateway application allowing data traffic into and out of the SRA's various sub-systems (appendix 2, 3 and 10). Many of the various other mobile service applications work then in conjunction with OneBridge. The ability to "sync" e-mail, calendar information (so called PIM data, see appendix 3) is the main area of use, and planned services such as Tom Tom are extensions of this functionality. In order to use it, a smart phone (mobile phone and PDA incorporated into one) is a necessity, and since it is a part of Telias product line, and was purchased from them, via their subcontractor SYSteam, we see a few more of the relevant actors in this network (appendix 9 and 10). The OneBridge system is under constant development and so there are administrators and developers from SRA IT involved in the network as well (appendix 3 and 10). When developing new functionality, the user council is referenced for insight into what users of the system think and feel that they need, or would like to see in future (appendix 10). Based on these various actors we have drawn up the network below, which demonstrates the various actors involved in use, maintenance and development of the OneBridge platform.

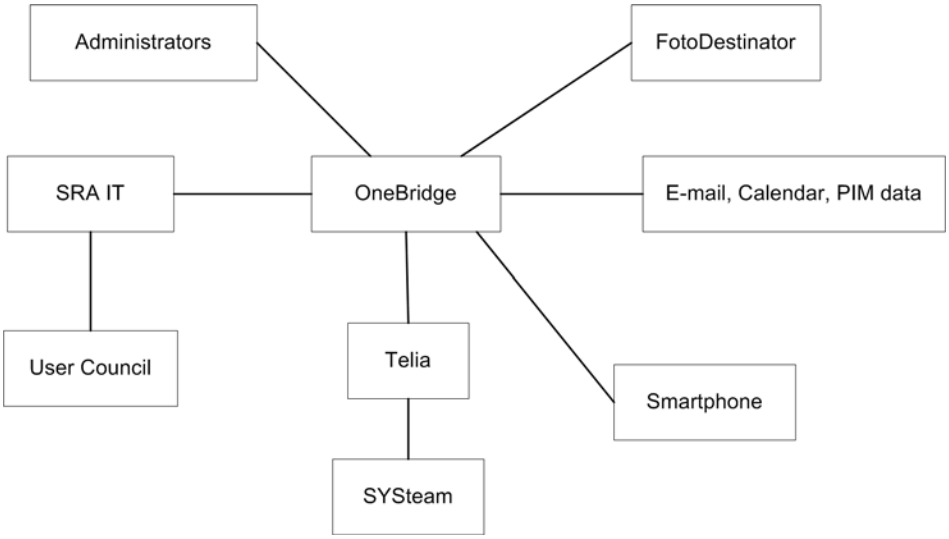

Figure 5-6. The OneBridge Platform.

Because this network covers use, maintenance and development the translation process is different depending on what perspective you have. The different perspectives do not offer much to discuss when it comes to translation however.

In the case of use, there is little to be said. The core of the network is established and its usefulness is not really questioned by those 600 people who use OneBridge (appendix 3). They derive benefit from using it and so continue to do so as long as it is available to them. One could say that the network is mobilised in terms of those actors involved in services currently used with OneBridge.

Looking at the network from the point of view of development of OneBridge, again there is little to be said of the translation process. The actors involved are well established and there is little doubt about their roles and identities.

The maintenance view is similarly stable. The actors involved have set roles and identities, and it is only if there were to be some fundamental change in the nature of the OneBridge product that we would have reason to discuss the translation process.

5.7 External Actors Involved in Mobile Service Development at the SRA

Taking yet another step back to look at mobile service development at the SRA as a whole we get the network displayed in figure 5-7. Central to everything we have the SRA and all its requirements in terms of mobile services. Outside of the SRA we have the government which through various legislation influences the SRA's organisational view of innovations and development of new services (appendix 5 and 7). The governmental push towards the 24 hour agency is an example of the influence that is exerted on the SRA in terms of how much energy is devoted to research and development (appendix 7). External customers are also of importance in that they determine whether certain mobile services are successful or not, or even if they are required. The pressure on the traffic registry customer service desk is an example of this source of influence (appendix 7). And then when it comes to the actual development process we have consultant companies which are hired to do the work in conjunction with SRA IT, and the SRA's main provider of mobile services, Telia and their subcontractor SYSteam (appendix 5). These six actors together make up the network that describes external influences on mobile service development as we have come to understand it at the SRA.

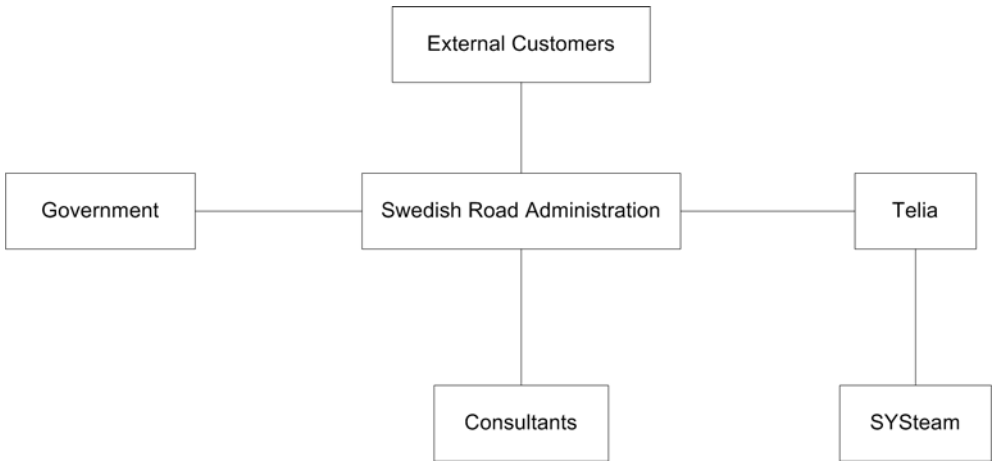

Figure 5-7. External Actors in Mobile Service Development at the SRA.

Yet again we have a rather well-established network with representative actors and defined and accepted identities. The translation process is in other words not of much use in describing the network.

5.8 Mobile Service Development at the SRA

Taking each of the different networks we have looked at thus far, and zooming back in again from the previous network to only look at the SRA we have drawn up the actor-network shown in figure 5-8 to represent mobile service development at the SRA. This network covers all of the actors we see as influential in the process of development within the organisation.

The various services in place, under development or simply planned for are covered by the mobile services actor. The government actor represents the legislative influence on the development process. A determining factor for the continued and future existence of these services is the contracts that are drawn up by the contract administrators (described in section 5.1 above). The mobile telephones available to the SRA also play an influential role as they determine what is possible both for currently used services but also for future endeavours. Telia and SYSteam and their importance has already been established, in part because Telia is the main provider of mobile service infrastructure for the SRA, and also because SYSteam works in conjunction with the SRA staff maintaining, developing and even supporting the OneBridge platform. Further development of existing services or of completely new services is handled primarily by SRA IT with consultants hired in as support. In this development, the user council and pilot test groups come into play as representatives for the various users in the SRA who will or currently do use the services provided. This now leaves the matter of spreading these services to the various departments/units that make up the SRA. In this role there are individuals like Anders (appendix 10) who are in charge of ordering IT solutions, and putting forth requirements for these services. Looking at individuals and how they come to use the devices/services made available to them we see the role of recommendations as put forth by, for example, Ellen. The mobile service actor in this case also represents the various channels through which information about the services can be found. The IT shops found on the SRA intranet are one example, and the internet through which the "who owns the vehicle" service could be discovered is another.

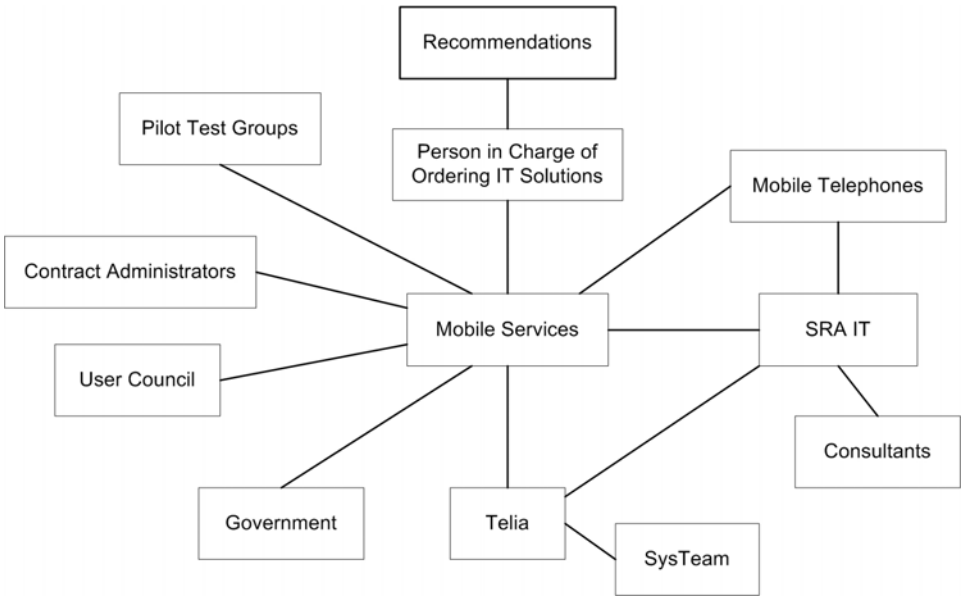

Figure 5-8. Mobile Service Development at the SRA.

If we look at the translation process in this case we again see that there is little to be said. Since this network is basically the various other networks combined, it is not surprising that the translation process yields little of use to us. The analytical limitations of using ANT for our study are made clear here and so we proceed to the next chapter which takes the view we have established here, of mobile service development at the SRA, and continues with a discussion of the innovation development process.

6 The Innovation Development Process at the SRA

In this chapter we will go through the innovation development process, looking at each step in relation to the empirical data we collected in our interviews with employees at the SRA. In the presentation and discussion we will also integrate earlier discussed theories that are relevant to that specific step of the innovation development process. Our focus in this chapter is to present and discuss the general innovation development process within the SRA rather than following one particular product from recognition of a problem or need to the consequences after it has been adopted. By doing this we aim to achieve a more general description of the innovation development process and also see the differences between certain mobile services if any.

6.1 Actors in the Mobile Service Development Process

So far we have used ANT to map out the various actors involved in individual mobile services and mobile service administration. These individual actor-networks then came together to form a more general network describing those parties involved in development of mobile services (see figure 5-8). We continue in our analysis by using this final network in combination with the innovation development process according to the combined framework we described in chapter three.

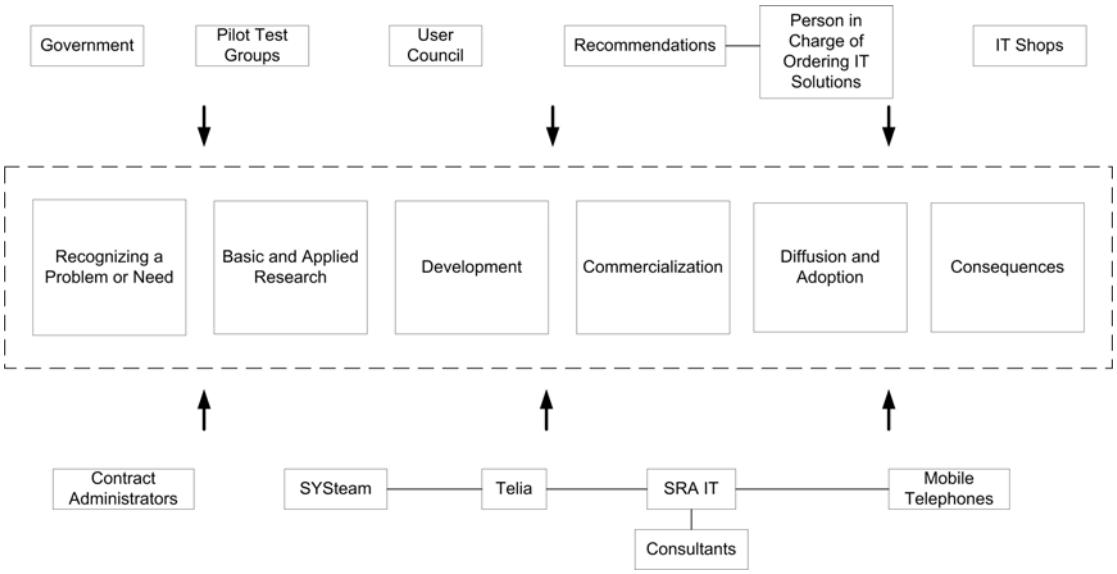

Figure 6-1. Actors in the Mobile Service Development Process

In terms of the actor-network in figure 5-8, the actor labelled “mobile services” is represented in our combined framework by the innovation development process and its six phases. The relationships between individual actors remain, but the connection

each actor has to the development process remains to be established. We continue in this section by going through each phase of the development process in order to establish the roles each actor plays in the process.

6.1.1 Recognising a Problem or Need

As stated before, the first phase is about recognising a problem or need (Rogers, 1995). This phase occurs in different ways when we are talking about mobile services within the SRA. The need can come from internal customers, for example a certain region, like in the case of the RAPPA-service Martin C. described, where the customer need was that positioning could be done digitally every 15 minutes (appendix 2). A need can also be recognised by people that are actively interested in the field of mobility. An example of this is OneBridge, which was introduced by employees that had heard about the service and thought it might be interesting for the SRA (Per-Anders, appendix 3). According to Ellen, the SRA also keeps an eye on new innovations and phones from the mobile phone providers in order to see what new functionality is being offered and if they offer possibilities for new services that can be used by the SRA (appendix 1). Yet another type of need was described by Martin L. who told us about the start of the BaTMan project. When we asked why BaTMan was developed he answered that the SRA wanted to switch technical platforms from one that had been used since the 80s to the more modern Microsoft .NET environment in order to lower administrative costs by not having to maintain two different systems (the older VAX and the newer .NET) simultaneously (appendix 6). New needs or problems can also be recognised as a result of contact with external customers such as the general public or users of the roads. Malou explained that the expectations for service availability beyond office hours and the enormous amount of questions posed to customer service has made them understand that this is a problem, and that they have a need for services that can help the public solve some of their problems on their own (appendix 7). Finally, needs can be recognised as a result of demands from the Swedish government which draws up guidelines for the business activities in the SRA. One example of a governmental policy that has caused needs for new mobile services is the 24-hour governmental agency (appendix 7).

According to Thomas there are well established routines for the process of identifying needs and problems that need technical solutions like mobile services. Thomas himself, in his responsibility for telephony contracts, works with analysing needs that the employees have. In order to understand these needs he has a lot of contact with people representing different roles in the organisation. This contact includes meetings with the different user groups (appendix 9). Part of Gun’s role, working on the contracts that cover the services that the SRA requires for communication, also contains processes for identifying needs and specifying requirements. This involves interviews and information collection from the employees through user councils where representatives for the SRA as a whole sit (appendix 5).

Anders represents the customer side of the customer-supplier relationship and mentioned these user councils as a forum for him, as an organisational representative, to place demands on the IT organisation which develops the solutions that will eventually meet the needs found within the organisation (appendix 10). Malou also

mentioned these user councils as a channel for SRA employees to voice their opinions and make requests (appendix 7).

It is obvious that the SRA is open to new ideas and that they have an organised way of searching for and identifying needs and problems that need solutions. None of the persons we interviewed stated that they felt it is a problem to gain a hearing for their needs, problems or ideas. That this is an important issue for the SRA is also reflected in their first principle for IT use: "we shall in a goal-oriented and systematic way use IT to increase efficiency, develop and renew both our organisation and the road-transport system".

6.1.2 Basic and Applied Research

When a problem or need is recognised the research phase follows (Rogers, 1995). Thomas explained that when certain needs are identified for one user group, within the SRA it is important to find more people that might have the same need in order to find enough employees that are interested in a solution to this problem (appendix 9). If there are not enough interested parties the development phase might be hard to enter. Thomas also explained that after a need is identified, all thoughts and ideas around that need or problem are collected and a task description is developed. The task description includes the problem, how they want to solve it, who might be interested, usefulness, required resources and estimated costs. This focus on specific users and their needs is in line with what Aarnio et al. (2002) suggested for development of mobile services.

Thomas' explanation of the research stage was backed up by Martin C. who told us about the research that preceded the development of the RAPPA-service. He added that the project group, in addition to the list of demands/task description, also collected information from experts working in the construction and maintenance unit (appendix 2). Malou also emphasised the importance of the research stage when they were developing the SMS-service she is involved in, and she explained that a part of the analysis done here is to evaluate if a planned system is feasible within the confines of Swedish law and regulations (appendix 7). Since she mainly works with services used by the public she also has concerns about the communications device itself, which she feels can be a limiting factor for certain groups of individuals.

Per-Anders added further information about the research phase when he told us about the development of new services connected to the OneBridge platform. He said that there is a policy that says that the development team should investigate whether one of the existing technologies (within the SRA) can be used to solve the newly identified problem or need. This is a way to render work more effective and avoids development of multiple similar services (appendix 3).

It was hard to find examples of what kind of basic research that is used and how this basic research is used within the SRA. It seems like applied research is more important or more interesting to the employees since only that kind of research was mentioned in the interviews. The way that the SRA, already in the research phase, include investigations on who might be interested in adopting these services, and with

what effect, is very interesting. One might see this as a key to the success they have had with diffusion and adoption of the services they have developed.

6.1.3 Development

The next phase is the development phase which is when the innovation is put together to meet the needs or solve the problems of the adopters. Thomas, told us that the changeover from the research phase to the development phase occurs as the customer accepts the task description (appendix 9), developed in the research phase, which means that a project for development and realisation is started.

It is clear that the development phase in the SRA is often carried through in cooperation with consultants, since this was mentioned by Thomas (appendix 9), Per-Anders (appendix 3), Martin C. (appendix 2) and of course also by Martin L. (appendix 6) who is a consultant himself. Thomas also explained that IT projects are often carried through together with their telecommunications provider, Telia, and their subcontractor SYSteam.

Martin C. told us that the concept of usability is very important in the development of the RAPPA-service (appendix 2). The service is being developed with the aim of minimizing handling while driving. The interaction between the user and the application, while driving, consists of a start and stop button and information as to whether the service is functioning as it is supposed to. Thomas has experienced that in order to develop a service that will be adopted by the intended users it is important to make it “good enough” (appendix 9). He said that it is hard to know what “good enough” is and that they do not have documented routines to help them achieve this, but that they place great demands on accessibility and security and that the services are useful, user-friendly and not too expensive. Thomas also explained that reference groups and pilot groups are involved in the development process. They are brought into the development as soon as the new service is ready for testing.

The development of BaTMan, which was/is done in-house by SRA employees with help from consultants like Martin L., also shows that the users’ needs are a priority. Martin told us that the system requirements had been established in cooperation with its users, through interviews and meetings with reference groups. Adriano is one of the users that have been involved in the development of BaTMan. He has been part of the small project group and also a member of the reference group. Gunilla also told us about the reference group and that she was the representative for the Western region in that group (appendix 4). Adriano said that a large part of his contribution has been testing, designing and telling the developers about functional requirements. The project group developed a set of (50-100) user cases and Adriano evaluated and commented on them throughout the development phase.

Thomas also explained that it is important that development is a continuous, ongoing process. This is important to the SRA because they have seen that their employees and customers have become more and more mobile and have increased needs of being able to work where they are (appendix 9).

Another aspect of the development phase includes the construction and administration of contracts that can support the mobile services once they are developed. Gun explained that a guiding principle is to buy ready made services and not develop and maintain their own because it becomes too costly in the long run (appendix 5). In these cases the contracts pertaining to the services are very important. Malou is also involved in the administration of some telephony contracts and she also explained that the SRA have contracts specifying functionality, meaning that mobile services are purchased and that technical infrastructure is not something that the SRA is responsible for (appendix 7). Instead they have contracts that specify service levels and accessibility, or in other words quality of service.

As a summary of the development phase in the SRA it can be said that cooperation with other companies, consultants and service providers is very important to the SRA. This fits well with Heikkinen and Still (2005) and their findings about the importance of network collaboration when developing mobile services. Another important factor in the development phase seems to be the user. The services are developed with the goal of making the users interested in adopting them. The SRA develop some of their mobile services themselves and they buy other services from suppliers. The reason for purchasing ready made services is that they find it too costly to develop the services themselves, but even those services that are purchased, such as OneBridge for example, are customised and further developed to suite the SRA and their particular needs. No matter who develops the service it seems that the contracts backing up the service are of great importance.

6.1.4 Commercialisation

The commercialisation phase is defined by Rogers (1995) as the production, manufacturing, packaging, marketing and distribution of an innovation. Since our research concerns mobile services, production, manufacturing and packaging of the innovation are not really applicable. Instead it is marketing and distribution of the services that are of interest.

Anders explained that when a service is ready to be used it is marketed and made available to all at the SRA via so called IT-shops on the intranet (appendix 10). Through these shops employees can see what products are available and they can place orders for the services they want. Before being made available via an IT-shop the service must be ready both from a use perspective and a technology perspective and their IT organisation must be well equipped to handle the support needs that will follow when employees start using the services (appendix 10).

Malou, who works with a service with users/customers external to the SRA, told us that they marketed and made their SMS-service available to the public just by launching it on the SRA website (appendix 7). No further marketing was done and yet the SMS-service, as she put it, “spread like wildfire”, and they currently answer half a million SMS questions from this service each month.

Thomas is also involved in commercialisation of the mobile services at the SRA. He told us that it is part of his job to market all the services that the IT department offers by making them “good enough” (appendix 9) so that they spread by themselves. He

actually used the same wording as Malou and said that if the services are good enough they will "spread like wildfire". He also mentioned that other marketing efforts are made and that the services are presented on the intranet, presumably referring to the IT-shops mentioned by Anders. Thomas also sends informative e-mails, and conducts phone and personal meetings with representatives from the various units. Per-Anders further strengthened our understanding that the intranet is the main way of commercialising the new services when he told us that their intranet is used as a tool for guiding the users and that it contains a lot of information on what needs can be satisfied with which types of services (appendix 3).

We came to understand that one part of commercialisation in the SRA that is not an obvious marketing activity, are the recommendations on the types of mobile phones and associated services that should be used by a particular type of employee (appendix 1 and 3). The recommendations that Ellen and Per-Anders talked about, are based on financial benefits that the SRA can gain by recommending that people use certain services. Or recommendations that are connected to the type of work that the employee performs and the information requirements implied by this. Recommendations are also a tool for management to decide what resources should be acquired and made available to their subordinates. As such they are a way of marketing a package containing a specific type of mobile phone or smart phone in combination with a set of mobile services to a predefined type of user group. Since the recommendations are based on what users from the same type of user group find useful and economical factors that aim to lower the overall cost for the SRA, these kinds of recommendations seem to provide both users and the organisation with benefits.

One thing that, according to Rogers (1995), can cause problems in the diffusion and adoption phase following the commercialisation phase is that one organisation recommends one innovation and another organisation recommends another. If we see the different units and regions as their own separate organisational units this could be a problem within the SRA, but given the way the SRA have developed recommendations surrounding mobile phones and the services used with them perhaps helps the organisation to avoid this kind of problem.

What we found most interesting about this phase is that it does not seem to be a phase that gets much attention in the SRA. Marketing of the services is not something they commit a lot of resources to, like time and money. It looks like the first and second phases, recognising a need and the following research are held to be more important. That is where the SRA makes sure that the services that are developed are of interest for the potential users and perhaps makes extensive marketing unnecessary.

The core of their marketing efforts are made through the intranet where the employees themselves can find the information they need. We first thought that this was a result of the fact that the customers and suppliers reside within the same organisation and that this was the reason that the suppliers were not more active in marketing of their products. But based on the way the customer-supplier organisation is built up according to our interviewees, that does not seem to be the case. The regions pay the IT unit for the services and the IT unit is dependent on the services having enough paying users (appendix 9). In one of the last two interviews we got the chance to ask a little bit more about one of the employee's perceptions of this. When we asked

Adriano if it is the employees at the SRA that find the services they need on their own or if the SRA introduces services and offers them to the employees, he answered that he thinks it is the employees that say that they have a need and then get the service (appendix 8).

6.1.5 Diffusion and Adoption

Thomas told us that they do not have any specific methods for diffusion of new services when they have been completed, but he knows from experience that if the service is "good enough" it will be used (appendix 9).

Both Thomas and Per-Anders (appendix 3) said that they often start the diffusion process by presenting the services to a small group of users. Thomas called them "early adopters". SRA IT provide a great deal of support and information in the beginning and when these "early adopters" start using the services they start telling their colleagues about it, for example during coffee breaks, and the services soon "spread like wildfire". But Thomas also pointed out that this only occurs when the services are "good enough". He said that when the services are "good enough" they spread by themselves. Thomas' explanation was backed up by Per-Anders' experience, that services, to a large extent, are spread by word of mouth. Per-Anders explained that someone could for example see that someone else has a mobile service that they feel could be useful for them as well and in this way use of the service spreads within the organisation.

Almost all the people we interviewed said that it was a need and the usefulness of a service that made them adopt it. For example, Martin C. started using the e-mail and calendar services when his work role demanded that he knew about these kinds of services and after he started using them he saw the advantages in using them (appendix 2). The same thing applies to Per-Anders. He started using the service he is using because it was made available to him and because he, in his work role, needed to be able to help others with it (appendix 3). Malou uses the services in her mobile phone that make her accessible to others since her work role requires her to be reachable even outside the office and outside of office hours (appendix 7). Gun was the only one who gave a somewhat different reason for adoption when she told us that she chose the smart phone and e-mail solution "because it is further development both of myself and my way of working" (appendix 5).

The pattern was confirmed when we asked people why they chose not to use some of the mobile services available to them. Thomas had tried to watch TV in his phone with limited success, but he could not really see the use of it just yet and categorised it as entertainment. The same applied to the Mp3 player (appendix 9). Per-Anders held the same view of the camera, MMS and 3G-services and he told us that he does not use them because he cannot see the need for them – that he is not interested and sees no point in using them at all (appendix 3). When we asked Anders he explained that the smart phone he has comes with a great deal more functionality by default than he has a need for, and that he almost exclusively uses the SRA solution for synchronisation (appendix 10). Malou told us that the camera function was something she had actively chosen not to use because it is not useful in her job. She also added that it is difficult to find a phone that does not include at least a few "useless" services

such as the camera (appendix 7). Ellen does not use the e-mail and calendar functions because she can't really see the need for them since she does not travel much. She also added that she uses what she feels she has a need for, and that using functionality beyond that would be more like using the phone as a toy (appendix 1). Gunilla had the same view as the others and told us that she does not use the possibility to connect to the Internet in her phone because she has no need for it (appendix 4).

The focus on adopting services based on need is, to some extent, explained by Anders who told us that employees are encouraged to choose a mobile phone based on their information needs and that there is a dialogue with each employee where their role and its information needs are established in order for them to be able to make the right choice (appendix 10).

Our enquiries into the existence of policies that could perhaps be contributing or limiting factors to diffusion or adoption of services gave us the impression that such policies, covering mobile services and devices specifically, do not exist, or at least that knowledge of them is limited. What we did find was specific examples of best practices such as Martin C. who basically said that devices and services should be used for work and work only (appendix 2). Another example of guidelines for use is the service for separating private and work use of the mobile telephone, described, amongst others, by Gunilla (appendix 4) and Gun (appendix 5). Adriano mentioned a policy indicating use of mobile phones whilst driving (appendix 8). Anders spoke of the possibility that policies are built into the devices themselves (appendix 10). Per-Anders said that there were policies for mobile service use, but that only in so much as they are covered by the more general IT usage policies for the SRA (appendix 3).

We also found that there are other things that affect the adoption of certain services. Both Gun and Anders said that co-workers influence each other's use of different services. Something Adriano confirmed when he told us that he started using the e-mail service because he felt he needed it and the calendar function because others "demanded" he do so (appendix 8). He also told us that other employees, pilot testers, using this service played a large part in his adoption since he could ask them how well the service functioned and if they liked it.

The question of what to adopt and what to reject is also affected by the SRA as an organisation. Recommendations influence the employees' adoption. For example, Malou explained that mobile phones are ordered from a central location and that she assumes that you only get what you need to use (appendix 7). Anders told us about the Gothenburg regional office where approximately 100 employees started using the national mobile service, and not have a land line at all (appendix 10). What we see here is a drive in the organisation, but one which is not necessarily imposed on employees. More than one interview subject mentioned the national mobile service as something the organisation feels more and more people should use (appendix 1, 5 and 10), but this has not become an order as far as we could see. Ellen, describing how recommendations are followed, said that there will always be those who, for personal reasons, have and use a phone outside of the recommendations (appendix 1). Anders, for example, has both a smart phone and a regular mobile phone despite knowing that the recommendation is to only have one mobile that corresponds to work information needs (appendix 10). This adoption process is in line with what Rogers (1995) and Fichman (2000) bring up as typical for adoption decisions in organisations. Both of

them argue that adoption decisions in an organisation are something that often happens in two steps. The first decision is made by the organisation and the second by the individual in the organisation. It is not just the recommendations within the SRA that are part of this two-step adoption decision process but also the fact that the SRA in the research and development phase decides whether a certain service is worth developing or not. And also in the process of deciding what different mobile/smart phones and services they are going to make available to the employees. In this way only the services that are formally adopted by the SRA are made available to the employees for adoption or rejection.

Rogers (1995) writes that a particularly crucial point in the innovation development process is the decision to start diffusing an innovation to potential adopters. In our research we have not found any results pointing in that direction. The employees involved in the diffusion of mobile services within the SRA do not seem to think that timing is such an important factor. The only thing that matters is the fact that the service has to be ready or "good enough", as Thomas said, in order to be commercialised. This might be a result of the way they identify needs and conduct the initial research phase. They already in those phases investigate the need and potential users and they only carry on with the proceeding phases if the potential users are ready for the innovation. As a result of that the issue of when to introduce a new service is not of importance as the potential users have already been identified as ready to be presented with the new service as soon as it is developed.

As we brought up earlier, Fichman (2000) describes three different factors that affect diffusion and adoption of an innovation in a particular organisation combination; (1) organisation-innovation fit, (2) innovation perceptions and social influence and (3) the innovation delivery system. We can see clearly that the organisation-innovation fit is important for adoption of services within the SRA. The employees said that they only use the services they find useful for their work role in the organisation and named other functions like the Mp3 player, TV and in some cases even the camera as useless, entertainment or even toys. Some said that they only use the SRA solutions. This finding is also in line with the results of Berntsson and Johansson's (2006) study where they found evidence that the characteristics of SMSes and MMSes should be adjusted to the organisations' business activities in order to get the best power of penetration. When it comes to innovation perceptions and social influence two things are of interest; first the organisations and the individual's perception of the innovation itself and second the social factors that affect the individual's perception of the innovation. In our research we have not received much information on the ease of use of the mobile services but we have instead received a lot of feedback indicating that usefulness is very important to the adopters. This is something that almost every interviewee gave as a reason for adopting a certain service. We have also seen indications that social factors play an influential role in individual adoption within the organisation. Both in introducing the different services that are available, and also as a demand for use of them, as in for example Adriano's case (appendix 8) and the case with national mobile service at the Gothenburg regional office (appendix 10).

Fichman's (2000) third factor is the innovation delivery system, which sometimes includes top management support and support and training. That the mobile services in the SRA have support from top management seems to be clear since they have developed their ten principles for IT use that generally are very positive to all kinds of

work related to use of IT. The way the employees almost consistently pointed out that they only use services that they need for their work, can be an effect of this management support and the recommendations the SRA provides. Services that are not necessary for work purposes do not have management support, a factor which might influence employees not to use them (appendix 2). When it comes to support we see that the SRA has built up a three-tier organisation to handle it, and it seems like all the employees know about this support system and that they can get help there. A lot of the mobile services do not seem to need much support and training. Ellen said for example that the services she uses are ones that are fully established and that she is used to using privately as well. Therefore she has felt that education or support has not really been necessary for her in order to start using the mobile services she is using today (appendix 1). Martin C. has had the same experience and he learned to use the service on his own and did not find it very difficult (appendix 2). Per-Anders (appendix 3) also learned to use the service "the hard way", with some help from manuals and instructions. Various people have told us about opportunities for internal training or courses. Malou is of the opinion that support is something that is unevenly developed. She thinks the support organisation is well developed concerning computer problems but not concerning telephony (appendix 7). She thinks it might have to do with the assumption that a phone is a simpler device, not requiring as much support. But she disagrees with this viewpoint and thinks that mobile phones are small computers nowadays and so should have the same level of support as computers do. She feels it is more difficult to get a hold of someone who can provide answers to problems she has when it comes to her mobile phone – the usual advice is to refer to user manuals. This sentiment is backed up by Gun who also learned to use her services on her own and who said that education is something that is lacking (appendix 5). She thinks it is unfortunate that too little time is spent on education. She added that courses are available but you have no time for them. Colleagues though, seem to play an important role in the process of learning to use new services. Martin C. often helps his colleagues with various services (appendix 2). Gun, when asked if she thought co-workers influenced one another's use, replied "That's the way you learn" especially since there was no real time to take a course (speaking of when she started working there).

6.1.6 Consequences

Finally, after diffusion and adoption, the last phase of the innovation development process is entered. As described earlier this phase is where the initial problem or need is solved, or not, by the innovation (Rogers, 1995).

Ellen described the SMS service where she gets warnings from the TICs as "very practical" and the consequence of using this service is that it facilitates her job since she can take the necessary actions for meeting possible increases in phone traffic on the switchboard (appendix 1).

Martin C. told us that the service for the drivers of road painting trucks has the effect that time and material consumption is reported into the databases directly, which speeds up the invoicing process (appendix 2). The fact that things happen in real time seems to be a sought-after effect of other services as well. Per-Anders told us that everything basically happens in real time and it saves resources when the test

officiators conduct driving tests with the new service (appendix 3). Thomas, talking about the same service, said that the effects are that they obtain faster reporting and that the person that was tested gets his or her license quicker (appendix 9). Thomas said that he was not the right person to tell us exactly how much time the officiators save by using this service but he estimated it to be something between half an hour to one hour per day. The consequences that Malou mentioned were also connected to saving time. She told us about the consequences for customer service and said that after their services have been adopted by the customers, the customer service department has more time to address more difficult questions (appendix 7). The benefit to external customers is that they can get faster responses from the "who owns the vehicle" SMS-service and if they have to call the customer service they do not have to wait a long time for an answer since customer service has had some of the work-load lifted from them.

Per-Anders thinks that the consequences these services have for the people using them vary according to their interest and experience using computers. But using the services should facilitate their information handling and make administration easier and hopefully streamline the whole process (appendix 3). Thomas confirmed parts of Per-Anders line of reasoning when he told us that his use of the e-mail service enables him to use his time more efficiently (appendix 9). Adriano described the different mobile services he uses as tools that simplify and reduce his need to make plans ahead of time. The effects of using them is that he does not have to make the same preparations any more and he does not have to plan for everything he needs to bring when he is travelling since he always has access to all necessary information (appendix 8).

Gunilla brought up spatial mobility as the greatest benefit of using the web-based BaTMan service. She said that "you can sit anywhere in the world and work with it if you have a gadget to log in with" (appendix 4). The consequences that BaTMan causes are, as Adriano sees them, that information in the database is always up to date (appendix 8), something Gunilla also pointed out. Adriano also mentioned that everyone works with the most recent data as opposed to before the service was developed when the data could lack updates made during the past six or more months, something which also caused problems when different people tried to update the same data.

Our investigation has not shown that any specific evaluations of the individual service have been done. But Malou pointed out that praise has come from customers spontaneously (appendix 7). They have, for example, said that the SMS-service is "tremendously fast". Thomas added that the services that he has been involved in developing are very popular and that people often come up to him telling him how much they like the services and how useful they are (appendix 9).

We also asked if people have had any negative experiences using the services or if the services themselves have caused them problems. Most of the people responded that this was not the case, but Per-Anders told us that colleagues have told him about access problems caused by inadequate mobile coverage or roaming contracts in the countries that they have visited (appendix 3). Thomas has also had some problems. He used to have a PDA, but gave it away when he got tired of finding it empty because he had forgotten to charge the batteries. The device caused more problems than it solved

(appendix 9). Martin L. and Adriano also told us about the problems caused by the 3G network that is not sufficiently built out and could only really start to be used a year ago (appendix 6 and 8). Martin L. told us that there are certain road constructions where it is impossible to work in the intended mobile way because there is no connection to the Internet. The users are then forced to either to resort to pen and paper or, as Adriano described, by driving to a place where you can get a connection and access the data from there. He also told us that when the system was first planned the project group counted on a more rapid development of the 3G-network. Gunilla also uses the 3G card option and said that there have been a few log-in problems now and then, but often the connection has been good. She added that "it is difficult to just pop in the card and log in, you need an antenna and access to a window with no obstructions" (appendix 4). Gun was the only one who told us that she is a little dissatisfied with one of the mobile services she adopted. She can access her e-mail account from her Sony Ericsson P990i smart phone and read her mail and send replies. This, however, is a service she does not use that much because the device detracts from the experience. She thinks the smart phone is too small to write and send e-mails with and that it takes too much time. In most cases she prefers to use her laptop with a 3G card instead and she would actually rather have a simpler telephone and a smaller portable computer (appendix 5). This might be a result of her basing her initial adoption of the services on slightly different grounds than the others.

Being reachable is also something that many of the interviewees mentioned as a benefit of using mobile services. Malou explained that her work role requires her to be reachable even outside of office hours and that her mobile phone facilitates this (appendix 7). Voice mail is also important in this regard. Adriano told us that he mainly uses the SMS-service to send messages to colleagues after office hours or when he feels it would be inappropriate to call (appendix 8). Anders also mentioned accessibility as something important in developing the e-mail services. He said "e-mail is perhaps the most important IT function that we have in our daily work" and that there are employees at the SRA who are very mobile in their work, out on the roads, and need to be able to manage information and be accessible (appendix 10).

Generally it seems like the effects of using the mobile services we have talked to employees at the SRA about are that they save time, save resources, facilitate work, provide updated data and information, and make employees accessible to each other no matter where they are, what time it is or what context they are in.

Using the different services is not problem-free. But these problems are often connected to the device used for the service, for example the PDA where all the information got erased or supporting technology like 3G connections. What we found out about during the interviews gave us the understanding of how the SRA work on these kinds of problems. Martin C., for example, has been in contact with Qtek about problems with their products. And regarding problems with, for example, 3G net access and other mobile support services, it is the development, administration and evaluation of contracts with service providers that is of importance. These contracts are a tool used by the SRA to make sure these services work in line with their needs and expectations.

6.2 Revised View of SRA Mobile Service Development

After going through the content of each interview, paying special attention to the actors we have identified and the steps of the innovation development process, we have established how each actor is connected to the process. This revised view is illustrated below with arrows indicating involvement in specific stages and the existing relationships between the actors left in place as before. We continue on to the next chapter which summarises our updated view of actor involvement in innovation development at the SRA.

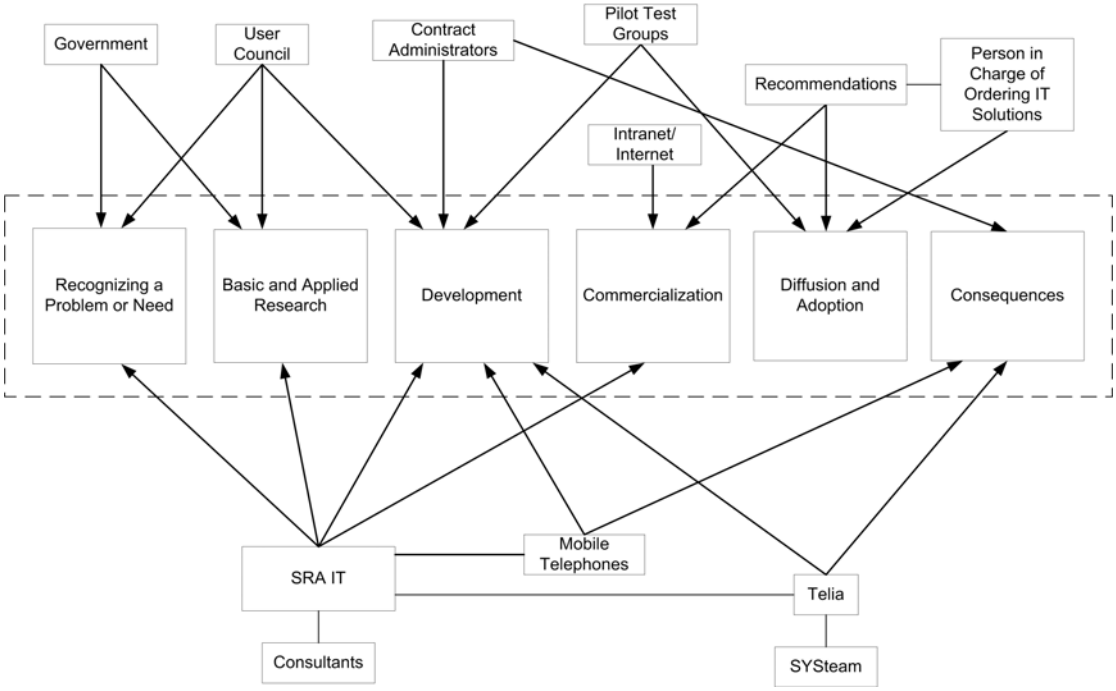

Figure 6-2. The Mobile Service Development Process at the SRA

7 Summary

This chapter summarises our findings from the two previous chapters and presents a few thoughts and questions we had about what we discovered.

7.1 Recognising a problem or need

In the first stage of the innovation development process at the SRA we found that needs/problems that were identified came from internal customers, external customers and employees actively interested in the latest innovations.

Needs were identified by means of established routines for users to communicate their needs, active analysis and interviews and meetings with users and representatives on user councils. The SRA organisation seems to be structured such that there are multiple lines of communication between users and developers – user council, interviews, the people in charge of ordering IT-solutions for the various regions and management/administrators are all points of contact that can lead to a new development project if an important enough need exists.

What we found most interesting about how the SRA goes about this first stage was the very close involvement with the users of the future system. Needs that resulted in successful mobile services seemed to come directly from the users. Development starts with them and throughout the process maintains a focus on satisfying those needs with a product that is “good enough”.

7.2 Basic and applied Research

The next stage involves finding people with the same needs. A task description is then created based on an analysis of the problem, solution, interested parties, usefulness, required resources, costs and legal restrictions. This analysis involves contact with experts/users, the people who have the need, and seeing how they will be affected.

This stage continues along the same line as the previous phase, with a focus on the users. They establish who will be using the new service and the process continues on into development if they feel that enough people will end up adopting and using the finished service.

7.3 Development

The next phase begins with the customer, a region, department or other subsection of the SRA, accepting the task description. Actual development is carried out in collaboration with external consultants if a new product is to be created. If it is possible to purchase a ready-made product, and it is financially beneficial to do so, then they will. In this case, service contract construction takes a more central role.

The goal with development is to make the final product "good enough". The definition of "good enough" is taken from a user perspective and is determined by considering usability, accessibility, security, usefulness, user friendliness and expense. To this end, reference groups and pilot groups are involved in the process, suggesting and testing functionality.

The concept of "good enough" and the involvement of reference groups and pilot groups indicate that the user perspective is maintained in this phase just as the previous two. Interesting to note here is the importance of the service contracts as an actor ensuring that the infrastructure surrounding a new service has been secured. Even the best constructed and most useful/user-friendly service will never be "good enough" if the technologies needed for it to be useful do not work as they should. And just because they work well now does not mean that they will be sufficient for future needs. The importance of service contracts and the administrative work surrounding them becomes clear when you consider this.

7.4 Commercialisation

Services are marketed primarily through IT-shops (on the SRA intranet), for internal customers, and the Internet, for external customers. Services that are deemed "good enough" by the users "spread like wildfire".

Secondary marketing methods which the SRA IT department make use of include informative e-mails and meetings with unit representatives. The recommendations that are made for which mobile devices and services suit different employee roles can also be said to be a part of the commercialisation phase. A new employee, or employee taking on a new role, can be guided in their choice of mobile solution through the existing recommendations.

What is interesting about how the SRA go about marketing their mobile services is that they seem to take such a passive role in the process. Their involvement is limited to providing information about what exists. The users themselves find out what is available and start to use it if they feel it worthwhile.

7.5 Diffusion and Adoption

As far as we could see the SRA do not seem to have any specific methods for performing this phase of the innovation development process. What we did find out is that new services are often presented to a small group of "pilot" users, or "early adopters". The service then spreads by word of mouth throughout the organisation if the feeling is that the service is "good enough". Social contacts, what co-workers think and say, during coffee breaks for example, are a part of this word of mouth diffusion. Usefulness from a work perspective was another deciding factor for mobile service adoption according to most of our interviewees, and was made quite clear by the fact that most, if not all, of the entertainment services that are delivered as standard in even the simplest mobile telephones were not considered worthwhile. The importance of organisation-innovation fit is exemplified here.

The first three stages of the development process were marked by an emphasis on user involvement and influence. The diffusion stage (and commercialisation as well), where one would think there would be the greatest contact with the users, takes exactly the opposite approach. Here the users are left to their own devices and adoption and diffusion are left to occur on the basis of the quality (level of "good enough") of the product that was developed. This relaxed attitude is not at all what we would expect given how aggressively products typically are marketed. Instead of thrusting information about new services in the users' faces, the SRA limit their involvement to providing information in a location that all employees have access to. This approach is perhaps a consequence of the SRA being a governmental organisation and we wonder if other organisations/companies would be able or even willing to risk such a gradual pace given how fast the business world moves. Nevertheless, we feel that there is something to be said about this diffusion process and wonder if the long term effects in terms of service penetration can balance the shorter term drawback of having to wait to see benefits.

The mobile device/service recommendations also exert some influence on diffusion and adoption. These recommendations are grounds for those people in charge of ordering IT-solutions for the various SRA regions/units to make decisions about what employees will be using. On the one hand they can be the reason for employees adopting a new service in that service use is forced upon them because of the information needs of their role. On the other hand, the opposite could be true and adoption of newer services could be restricted for the same reasons. However, the impression we got from our interviewees was of a more relaxed attitude to these recommendations, where employees need not necessarily follow them and the people in charge of placing orders approved mobile phones and services outside of employee work role needs. We wonder if a more controlled adoption process would be more effective in encouraging mobile service diffusion. Or if the more relaxed, organic approach where service use spreads on the initiative of the users, can be a contributing factor to mobile service diffusion success.

There do not seem to be any specific policies regarding use of mobile services/devices. None of the interviewees spoke of specific policies but rather guidelines and unofficial best practices. Policies that were mentioned were about IT on a more general level. It could be that policies are built into the services, as Anders

said, and so do not require explicit explanation. If not, we wonder what effect explicit policies really have/could have in mobile service diffusion and adoption.

7.6 Consequences

The end result of the innovation development process should be a service that fulfils the needs established in the beginning of the process. In the case of those services in use at the SRA the overall consensus was that the services facilitated their work, make employees and information more accessible, no matter where they are or what time it is, save time and speed up processes.

The problems we found out about were limited to the devices and infrastructure surrounding the services not functioning correctly, or upgrades causing conflicts, and not really issues with the services themselves. The importance of contract specification and anticipation of future needs is apparent in this regard. Contracts are especially important for mobile service development since the bulk of the infrastructure that supports these services is handled externally and this infrastructure is under continual development.

Evaluation of the mobile services and their consequences does not seem to be something that is really done, presumably because it is not something that is easy to do either. Rather, evaluation has come in the form of users offering spontaneous praise of services that they use and find useful. Successful adoption and diffusion itself would seem to be an evaluation of the services involved.

7.7 Additional Thoughts

In investigating the various phases of the development process we came across other interesting aspects of mobile services at the SRA. The calendar service (described in appendix 8 and 10), for example, was an interesting aspect of mobility, where personal mobility was not as interesting as information mobility - that calendar information could be accessed by others “on the go” and meetings booked and verified. This view of mobility was not one we had really considered. The idea of mobility being a matter of the individual being freer from spatial, temporal and contextual constraints was clear to us, but that information could be seen as mobile in and of itself was not something we had thought much about.

Another consequence of mobile service use that was not brought up, but which we contemplated was the line separating home and work use of mobile devices and services. It is interesting to note that there seems to be a drive towards combining the work phone and the home phone into one at the SRA, using switchboard and billing services provided by Telia. Since the mobile phones provided by the SRA are supposed to be chosen or assigned according to your work needs it stands to reason then that the work phone may influence or perhaps even control your choice of private phone since they will be one and the same. This would seem to blur the lines between

a phone targeting individuals and phones targeting companies and we wonder if it means that phones chosen by employees will end up being more sophisticated to satisfy their personal needs/wants or the opposite, that those people who only need to ring and SMS will end up using the simplest sorts of phone privately as well despite their personal interests.

The importance of policies specifically about mobile/smart phone usage is of interest in this regard as well. If private and work mobile phone use are to become so interconnected, then it stands to reason that clear rules and boundaries be established if they have not already been. The apparent lack of policies or lack of knowledge of their existence or full content is a matter of interest. With relatively limited advanced mobile service usage (OneBridge for example) at the moment, this seems to work without visible negative consequences. But we wonder what will happen in the future if advanced mobile service usage becomes more pervasive and no clear policies for this usage exist. It could be as Anders said that the policies are implicit in the technology and need not be written out, but we feel that there could be a danger in this approach. Expertise in drawing up policies does not necessarily translate accurately to expertise in designing mobile services/device interfaces.

Table 7-1. Summary of Innovation Development Process and Involved Actors

Phase	Actors Involved	Points of interest
Recognising problems/needs	- User Council - SRA IT - Government	- Strong user involvement - Multiple organisational channels for communication between users and developers
Basic and applied research	- User Council - SRA IT - Government	- Strong user focus - Next phase starts only if it is felt that enough people will adopt/use the new service
Development	- User Council - SRA IT - Contract Administrators - Pilot Test Groups - Mobile Telephones - Telia	- Focus on making the service "good enough". - “Good enough” is determined by the users and their needs.
Commercialisation	- SRA IT - Intranet/Internet - Recommendations	- SRA takes a passive approach to marketing (information simply made available). - Intranet (IT-shops) for internal customers.Internet for external customers. - Informative e-mails and meetings of secondary importance.
Diffusion and adoption	- Pilot Test Groups - Recommendations - Person in Charge of Ordering IT Solutions	- Services that are "good enough" and useful for work spread "like wildfire". - Recommendations exert some influence. - No complete policies for mobile services/devices specifically.
Consequences	- Contract Administrators - Mobile Phones - Telia	- Services facilitate work, save time and make employees and information more accessible. - Important to ensure infrastructure supports services sufficiently now and in future (contract specification). - No active evaluation of services exists.

8 Conclusion

In this final chapter we present our concluding remarks, reflect on our study and suggest paths for future research within the area.

8.1 Concluding Remarks

The most interesting thing about the innovation development process at the SRA is the relationship that the process has to the users of the future services. This clear focus on the user is seen in that they make sure that the final product is one that the user needs and will actually use by basing it on work requirements. Based on our study we would say that the close connection to users at every step is a major contributing factor to mobile service success at the SRA. Development as we have understood it is done when they know that people have a need, and will most likely end up using the service.

Another aspect of development that is important is the technologies and infrastructure that enable that service to function. Mobile services are highly dependent on the external companies that control this infrastructure. It is of extra importance to make sure that this aspect of the development process is not neglected. Our investigation shows quite clearly how important the work surrounding contract specification and administration at the SRA is for mobile service success.

We cannot say if the relaxed approach to commercialisation and diffusion has positive or negative consequences for the organisation or if the approach is applicable to other types of organisation, but it is intriguing and deserves attention. If this more gradual, user-controlled diffusion process is as effective as or more effective than traditional marketing approaches in the long run, then there should be interest from other organisations to at least consider how they go about getting users to adopt new innovations.

Lastly, we have the importance of policies. We see a potential danger in the amount of attention mobile services policies have been given at the SRA. We wonder what effect stricter and more precise policies would have on adoption, especially since the line between private and work use of mobile phones/services is being blurred. It might not be an issue yet, but if mobile devices and services continue to spread, and take on a more central role in the organisation, this could become more of a problem later. The importance of policies may not be clear, but what is clear is that they should not be ignored entirely with a new type of information technology that might not necessarily fit perfectly within existing IT policies.

8.2 Reflection on the Study

Looking back on the time we have spent on this study we see both positive and negative aspects of our choices. The focus on the user perspective in the development process indicates to us an organisational culture (at least in terms of mobile service development) at the SRA that leans more towards the social deterministic side of things, rather than technological determinism. In other words, they seem to have a view of social and technological influences bringing about change or benefits in cooperation. This would tend to indicate that ANT was a good choice of method for structuring our information given its focus on the human and the technological as equally important parts of the same process. The insight we got into mobile service development at the SRA added strength to our choice of incorporating ANT and of looking at the entire development process as opposed to just the diffusion stage. We also felt that our combined framework assisted in understanding, describing and analysing the mobile service development process by providing us with a good structure with which to do so.

One thing we felt was missing was the perspective on mobile service projects that were considered failures. It would have been interesting to see how those projects compared to these successful mobile services and what aspects of the development process contributed to that failure.

Another limitation to our study was the lack of range of interviewees looking vertically in the organisational hierarchy. An addition of interviews with people with a stricter use perspective of a mobile service (a snow plough driver using the RAPPA service, for example), and perhaps even interviews with higher management might have given a broader range of perspectives and further insights into the development process. Had it been possible, we would also have preferred face to face interviews, as we have already mentioned, and on-site observations of mobile service use.

Future research that we feel would be of interest now that we have completed our study would be an investigation of the “good enough” term and what it really involves/should involve – an evaluation of mobile service usefulness or success. Another interesting area of study could involve the influence policies have on mobile service diffusion and adoption. The social ramifications of work encroaching on our private lives is one aspect of this - having a mobile phone can already mean that you are always at work, even when at home, especially when your mobile phone number looks like an ordinary landline number.

In conclusion, despite the mentioned limitations we are pleased with the results of our study and believe that it can contribute to the body of research within this field. We would like to thank the Swedish Road Administration and all the people we were in contact with and who helped make our study possible.

Appendix 1 – Summary of Interview with Ellen Brubråten

Work role - Responsible for the coordinated telephony commission

Ellen is responsible for the telephony services connected to the SRA switchboard. The SRA has centralised this functionality and have only one switchboard which is located in Borlänge. A part of Ellen's responsibilities is to manage all telephones, telephone services and written documentation (instructions). Her work also involves a great deal of contact with various people, for example employees from the various regions, marketing firms, and direct contact with external customers. When we asked her to tell us about her daily work tasks, she laughed and answered "I talk on the phone". She also travels a small amount as a part of her work.

Ellen is not involved with any one particular mobile service, but is responsible for drawing up recommendations for mobile telephone and mobile service usage. These recommendations contain information on which phones and which services different employees should use. For example when PDA usage is warranted, or when the national mobile service (nationell mobil) is appropriate. She explained that the national mobile service means that employees only have one phone, a mobile phone, which functions as a normal connection in the switchboard when at work (within the SRA walls). This service can of course imply some additional costs, but it is more cost-effective and can save money in certain cases of phone use.

The recommendations that Ellen participates in producing are, for example, based on financial benefits that the SRA can reap by having employees use certain services, based on the type of work that the employee performs and the requirements that work implies. Ellen explained that one kind of recommendation can be that someone who travels a great deal and needs access to e-mail on the road has a justified need for a more advanced smart phone solution. Recommendations are also a tool for management to decide what resources should be acquired and made available to their subordinates. But Ellen also told us that they can only give recommendations and that it is up to the manager to make the final decision on who gets what. There will always be those who, for personal reasons, have and use a phone outside of the recommendations.

Ellen uses a Sony Ericsson and she says that for her, the telephone is something that should function as a work tool. She uses her mobile phone for calling, voice mail and sending and receiving SMS messages. For example, the SRA has a mobile service where the traffic information centres (TIC) send out warning messages via SMS. The messages that are sent out are based on information that the TICs receive and can be accident reports from the police or ambulances, information about animals on the roads from the general public or information from the weather bureau (SMHI) about changes in the weather that can cause traffic problems. If the TICs anticipate an increase in phone traffic that may overload the switchboard, an SMS, along with an e-mail, is sent out informing those concerned/involved. Ellen finds this SMS service "very practical", since she can receive them anywhere and if necessary call up the TIC and get more complete information and then take the actions that are necessary for meeting this increase in phone traffic at the switchboard.

Ellen does not use the e-mail and calendar functions available to her in her mobile phone. This is because she cannot really see the need for it since she doesn't travel much. And when she does, it is to another SRA office where she has access to the information she would access with those functions through other means. She told us that she has chosen to use the services that she uses today based on the work she does. If she needs e-mail in her phone because her work requirements have changed then she can get it, but for now "it's not necessary yet".

When asked if she has chosen not to use specific services she responded by saying that her work determines her requirements of the phone ("What I feel that I need, I use") and that functionality beyond that would be more like using the phone as a toy. The services she uses are ones that are fully established and that she is used to using privately as well. Therefore she has felt that education or support has not really been necessary for her in order to start using the mobile services she is using today.

Appendix 2 – Summary of Interview with Martin Collin

Work role - IT-technician in mobility.

Martin works for SRA IT in Västerås. His work does not ordinarily require much travel, but at the moment he travels a little between Solna and Västerås, mainly for meetings. At the moment, Martin works mostly with technical questions within projects at the construction and maintenance (Produktion) unit. He works with the synchronisation platform OneBridge and configuration of it. He describes OneBridge as a communication solution where information can be transferred in or out through the firewalls of the SRA. The information can be transferred to and from databases or e-mail servers like Exchange or Lotus. The handheld devices that communicate via OneBridge can use any kind of platform, but the server part has to use the Windows platform. It is standardised within the SRA what kind of handheld devices can be used in combination with OneBridge. It has to be a more advanced mobile phone like Sony Ericssons P900 models or different Windows Mobile PDAs.

Further, Martin told us about a project he has been involved in called RAPPA (Rapport Av Pågående Produktivt Arbete) which, translated to English, means report of ongoing productive work. RAPPA is a mobile service where snow plough drivers report their position on the roads and the activities they are performing to a database at the SRA. The information is synced with the database every 15 minutes or less. The information is then transferred to a system called TRISS (TRaffic Information Support System) and the information is used by the traffic information centres (TIC) across Sweden. The TICs, in turn, use this data along with other data in order to inform the public about what is happening on the roads.

The drivers in the snow ploughs use a handheld computer with integrated mobile phone, a Qtek. When using the service the drivers start the RAPPA-application on the Qtek and then enter who is driving, what truck is being used and what task is about to be performed. Then the start button is pressed and the application starts the automatic synchronisation which sends the snow plough's position to the database until the driver presses the stop button. The service is developed in this way in order to minimise handling while driving. The only information the application shows is whether it is in start or stop mode and if something has gone wrong, for example if there is no GPRS or GPS contact or if something went wrong in the synchronisation process. Martin said that the support organisation around the RAPPA-service not has been built up yet but it is planned for.

The development process started when the SRA as its own customer, in 2002, requested the possibility for digital positioning every 15 minutes. It was then up to the project group to solve that problem. The project group made a list of requirements and collected information from experts in construction and maintenance that knew how the snow ploughs work and had experience from the older system, Prodata, which was used for reporting, though not in real time, before RAPPA was developed. The system was finished in 2003-2004. Prodata is still in use because it contains a lot more information than RAPPA is built for and a new project, MPS, has been started where the goal is to integrate the good parts from both systems into one new system.

Martin also told us that there is a similar service for the drivers of road painting trucks where the goal is to get rid of time consuming paperwork and instead use a digital form that is synchronised through OneBridge. In this case they have chosen a more advanced computer, an ordinary Windows laptop, which they can have in the trucks. Through this, service time and material consumption is reported into the databases directly which speeds up the invoicing process. This is a service that is still under development and Martin also told us that most of the development of these kinds of applications is handled by consultants, but some of the work is done by SRA employees.

Martin mostly uses a Qtek 9090 himself but he has an abundance of different mobile phones. Martin uses the other phones for different tests that are connected to his work role. He uses most of the services in his Qtek 9090. He uses it for calling, calendar and the RAPPA application. When he travels he also uses it to access his e-mail account. He surfs the Internet for news and checks the SRA-service "the situation on the roads" and uses MSN sometimes if he wants to contact someone at work. He also

has a GPS navigation program, Destinator, in his Qtek. He finds the calendar and being reachable the two most important functions for him in his work. He told us that the calendar service is a copy of the calendar he has in his computer. Every invitation to a meeting he gets through Outlook ends up there and he can also instruct the service to give him an alarm signal for important scheduled tasks. The benefit he sees in using this service is that he gets a very good summary of what is going on and that it is always in sync with the information he has in Outlook. Before this service was available, Martin used a pocket diary and didn't use Outlook much at all. He started using the service when his work role started demanding that he knew about these kinds of services. He got a smart phone and the ability to synchronise with it, and he could soon see the advantages of having all the information both in his computer and in the smart phone. He learned to use the service by himself and did not find it very difficult, but he knows that they sometimes hold courses if there are a few people that have that need. It often happens that Martin gets questions from his colleagues. When he has problems himself he finds a lot of information on a forum for Qtek users on the Internet. In some cases he has also e-mailed Brightpoint, the suppliers, and asked questions. For normal users within the SRA there is a help desk. Martin is happy with the functionality and his expectations for the service have been fulfilled. He also finds the services easy to use but admits that other users could quite easily get stuck with problems. There have been problems with small bugs in the system. For example, when users changed their passwords in their computers the smart phone did not register that automatically, but an upgrade of OneBridge has solved that problem.

The only problem Martin has had is when the batteries in his PDA were allowed to drain all the way down and all the information in the PDA was erased. But this is no longer a problem since the new devices being used retain their information even if the batteries are flat.

Martin also told us that there is a kind of policy for using mobile phones and the services in them. He spoke about a set of rules and regulations for IT security, but he was not sure if it took up mobile phones and mobile services in particular. He did not think there are any restrictions on how employees are allowed to surf the Internet but pointed out that the mobile phone is a work tool, just like the computer, and that its intended use is for work only.

Appendix 3 – Summary of Interview with Per-Anders Fredriksson

Work role - OneBridge administrator.

Per-Anders works for SRA IT support at the Kristianstad regional office and periodically he travels a lot in his work. Per-Anders is responsible for developing, updating and adding new functionality to OneBridge, which is a mobile platform produced by a subdivision of Sybase which is called Ianywhere. OneBridge is used to synchronise different types of data between point A and point B. It is specialised in mobile synchronisation and used mostly for synchronisation of PIM-data which consists of personal information, calendar, mail and other similar data. The services can be used on any kind of advanced mobile phone. The product also handles things like encryption, authentication and synchronisation of any kind of information between all kinds of systems.

Per-Anders told us that OneBridge was introduced to the SRA by a couple of people that were very enthusiastic about the field. They had heard about this service and its field of application through their contacts and thought it might be interesting for the SRA. In the beginning the service was introduced to a rather small user group consisting of 30-40 persons. Per-Anders estimates that OneBridge is used by about 1000 SRA employees today. 600 of them use it for synchronisation of PIM-data and he thinks that number will increase to about 800 by the end of the year. He told us that knowledge of the service, to a large extent, is spread by word of mouth. He explained that someone could, for example, see that you have this mobile service in your phone, you tell a little bit about it and the other person has the same needs or wants one because they can make use of it. There are also other ways that the services are diffused across the organisation. The SRA intranet is used as a tool for guiding users and it contains a great deal of information on what needs can be satisfied with what types of services.

Per-Anders also told us that new needs in terms of functions for OneBridge can come from various units within the SRA. When new needs are identified the policy is that the development team investigates whether one of the existing technologies available in the organisation can be used to solve the problem or if further refinements or new technologies are necessary. The goal with this approach is to avoid getting too many different solutions that do roughly the same thing, which would not be an effective way of working.

Over time OneBridge has expanded and the SRA have found new fields of application. Both internal and external developers have been part of this process. For example, it is used for a system called RAPPA, which is used by SRA Construction and Maintenance. This unit has a number of snow ploughs, gritting-, salting-, and road painting trucks working on the roads. The drivers of these vehicles use a smart phone, with a special kind of application installed, in order to report in real time where they are, how much material they have used and what actions they have performed.

Another example is a project, which is still under development, concerning the administration of drivers licence tests. The system is based on a smart phone, a digital form and an Anoto[3] pen. The form is filled out during the test and the data synchronised with the system at the SRA for transfer when the test is completed. Essentially, everything happens in real time and it saves on resources.

Yet another example is a project that uses OneBridge, a PDA, a camera, GPS and a digital form to collect information about accidents in order to secure the roads and make travelling safer. This service is still being developed and at the moment is only used by a few persons in one of the regions.

What consequences these services have for the people using them varies according to Per-Anders. It is dependent on their interest and experience using computers. But using the services should facilitate information handling and make administration easier and hopefully streamline the whole process.

[3] Digital pen and paper. More information at http://www.anoto.com/

Per-Anders also described the support organisation within the SRA. It is organised into three different levels of support. The first helps through phone and e-mail and solves relatively simple problems. The issues that cannot be solved this way are transferred to the second level, which is specialised in those kinds of problem. If the second level cannot solve the problem the third level, where those responsible are specialised in specific products or platforms, takes over.

There are also three different levels of mobile phones for the employees at the SRA and there are quite strict rules governing who can use which kind of phone and for what purpose. The first level is a simple mobile phone that is used primarily for calling and sending and receiving SMS. This category of phones is mainly used by slightly older persons or persons that work outdoors and in contexts where the phone is exposed to wind and weather. The second level contains more advanced phones like the Sony Ericsson 910, 900, Nokia 9300 and Windows mobile. It is intended for use of e-mail services but is not accessed through OneBridge but through synchronisation that comes standard with the phone itself. Typical users at this level are people that travel a lot, often some kind of manager. The third level has almost the same type of users and phones. The difference is that they synchronise through OneBridge and that they have an extended need of an updated calendar and access to their e-mail accounts. Per-Anders told us that there is a policy for the use of mobile services within the SRA. It is not a specific policy for mobile services but one for IT-usage generally which includes both use of computer en mobile phone.

Per-Anders uses a Qtek S200 smart phone himself, but he alternates between different mobile phones in order to be up to date on the various systems used by SRA employees. He uses his phone for calling and sending and receiving SMSes. He receives alarms in relation to the emergency services he works with and he also accesses his e-mail account and calendar. The most important functions for him in his work are calling and the e-mail services. He also has something he calls “Office Extension” which means that he only uses his mobile phone and that his landline number is connected to his mobile number. He does not use the camera very much and he does not use MMS and 3G-services, like TV and video, at all. The reason he gives for not using them is that he has not seen the need for it - he is not interested and cannot see the point in using them at all.

The e-mail service includes, besides accessing e-mail, calendar, contacts (address book) and a service for keeping notes and organising tasks. The service is accessible through various communication links like 3G, GPRS, and WLAN. The service is important to Per-Anders when he is travelling and the benefit it brings is that it makes him more mobile. He started using the service because it was made available to him and because he, in his work role, needed to be able to help others with the services. When we asked him how he learned to use the service he answered “the hard way” and with some help from manuals and instructions. He also told us that there has been some internal training. Per-Anders is satisfied with the functionality of the service and seldom experiences any problems, but he told us that colleagues have told him about access problems caused by inadequate mobile coverage or roaming contracts in the countries that they have visited.

Appendix 4 – Summary of Interview with Gunilla Kleiven

Work role - Bridge engineer.

Gunilla works at the Road-user service (trafikantservice) department of the Western region office in Gothenburg. Part of her responsibilities includes being responsible for the BaTMan system in her region. She and her co-workers are responsible, amongst other things, for purchasing inspections for the 1000 (approximately) bridges that need inspecting each year.

The basic inspection process involving BaTMan is that they get inspectors, create groups in BaTMan, and have start up meetings with the inspectors who in turn go out, do the inspections and finally return the data to BaTMan. The system is not limited to bridges though and is used to "take care of bridges, tunnels, support walls" et cetera.

As users of BaTMan she and her colleagues have it as their tool to administrate bridges from inauguration through its 120 years (for example) of use till it is torn down. The inspections, planning of repair measures, previously conducted repairs, photos, blue prints and other documentation is stored and organised using BaTMan during this time. It is web-based and so updates are instantaneous. "That is the greatest benefit. You can sit anywhere in the world and work with it if you have a gadget to log in with…". Inspectors are given access only to those bridges that they are responsible for by a system of access privileges.

In terms of mobility, Gunilla said that the ability to "connect on location at the bridge" is something that eventually the inspectors will want to do. Many regions which conduct inspections themselves (rather than hire in private businesses or consultants) and have the necessary equipment do so already. But "many choose to use paper and come back to the office to type it in…". The option to use a 3G card is available though. Her region has received 6 such cards, but this was really due to a push from the "Borlänge office and the BaTMan project group who wanted them to try it to see how it worked with reception and such.". So there are 6 people in her region who use the 3G solution, but she could not say anything about the other regions. There are no restrictions in BaTMan for how you connect, so anyone (even outside of the SRA) can, provided they have legitimate access to BaTMan can connect using a 3G card or any other option for accessing the internet.

When we asked about her experiences using the 3G cards she said that there have been a few log-in problems now and then, but often the connection has been good. She said that you often need an antenna, "it is difficult to just pop in the card and log in […] you need an antenna and access to a window with no obstructions". "But it works very well. I have sat on trains and used it just to test it and it worked perfectly."

Development of BaTMan involved a user group where all interested parties sent a representative to provide feedback, and she was the representative for the Western region.

In terms of support, Gunilla mentioned that there is a help desk which is open daily and which works very well. Experts in the BaTMan system and people who perhaps were involved in development are there to help. There are also courses available for learning how to use BaTMan, each one tailored to a certain type of user. She gave examples of courses for inspectors, constructors, administrators and entrepreneurs. When we asked about evaluation of the system she said that she didn't think any had been done, but that it was more a responsibility of the BaTMan project group in that case. But from her (and her colleagues) experiences using it she said that it was "incredibly good".

In the past the system they used was something called SAFEBRO. With it you could borrow bridges and have them on your computer when you went out to perform an inspection. But in so doing you locked anyone else out from being able to work with that bridge until you returned and transferred back the bridge with its updated information.

When we asked about personal mobile phone use she said that she has an Ericsson phone with Telia as the service provider. With it she mostly sends/receives SMSes and places calls. “I don’t have many more functions, and they are enough”. She has a built in camera and other such options but she doesn’t use them.

Speaking about the SMS function she said that it is a good way to send off a message without it having to be long and drawn out, and you know that it is received even if the person on the other end has a phone but cannot answer. Prior to having access to it she just called or sent an e-mail. “Now we have a lot of people out in the field and who are not reachable by mail […].”

She learned to use it herself and because everyone else used it. “It grew, people SMSed me and you grew into it…”

If the function should stop working or be problematic she said that she didn’t think she would really care. If it were a temporary problem she would just skip it. It’s not so important that if it stops work she is left in a jam. “I don’t think it should replace a landline phone just because it’s on the table.”. She said that the mobile phone was just a part of something new, a new possibility for contacting people. “A variation on calling and e-mailing”.

In terms of functions she has actively chosen not to use she mentioned the possibility to connect to the internet. “…I have no need. So I don’t use my phone for that.”

Responding to our question about if there were SRA policies for mobile phone/service use she said that they most likely existed. “Everything costs and that’s where it lies”. As an example she said that with her phone she has it set up so that she has a prefix number which allows her to separate her private calls from her work calls so that she gets two bills. The same applies for calls or SMSes when outside of Sweden. In that case it is her responsibility to specify which calls were private so that the SRA is not charged for them. She said that the system “is great because it means that I don’t need to have a private telephone”.

Appendix 5 – Summary of Interview with Gun Landén-Slars

Work role - Communications strategist and administrator of the communications platform.

Gun's role is as an administrator of the entire communications platform for the SRA. This includes all communication in the form of telephony, mobile telephony, data communication and radio communication. She is a part of VVIT, the SRA IT unit in Borlänge. She does some travelling for the job, but not much.

Part of her work role involves working on the contracts that cover the services that the SRA requires for communication (specifying requirements, evaluating contracts and acquiring quotes from different service providers). In terms of these contracts, the SRA is using the Swedish Administrative Development Agency (VERVA or Verket för förvaltningsutveckling in Swedish) blanket agreement which the SRA participated in drawing up. Telia have been, and will most likely continue to be, the main provider of the services these contracts cover.

Requirements specification with regards to mobile services has been mainly a matter of making sure that functionality and service coverage that they require is preserved. Gun told us that they have been "very pleased" with the services they have and worked in their new contracts to lower costs and acquire, to some extent, new functionality. People involved in the process of drawing up and administrating these contracts are the users of the services. This has been done through interviews with users, and contact with the user council where representatives for the SRA as a whole sit. Requirements on the part of the mobile phones themselves included low radiation (specification of radiation values) which is a demand users have at the SRA. This is of extra interest given the idea of moving over to only using the mobile phone and making use of the national mobile (nationell mobil) connection service. Gun told us that three year contracts have been established for data and telephony and two years for mobile telephony with the possibility of extending this for up to another three years. The reason for the shorter mobile telephony contract is the substantial drops in prices in the mobile area of late.

Gun isn't really directly involved with development of any particular mobile service. Rather, she is involved in stating requirements in cooperation with Telia and a company called SYSteam, both suppliers of mobile services, with SYSteam as a subcontractor to Telia. In her words, "our direction is to buy ready made services and not develop and maintain our own because it becomes too costly in the long run". Currently, they are looking at the next generation or model of phone from Sony Ericsson to see what functionality it will provide and the possibilities for new services. Taking pictures is an example of a use that they are interested in and that will be included in future requirements specifications when a new model is released by Sony Ericsson. The people at SYSteam can then be asked to assist in developing what the SRA is interested in if it is possible.

When asked about options should something go wrong with the mobile services they have Gun replied that they have a service desk, and if they cannot help then they enlist the help of their service provider, Telia/SYSteam.

In terms of personal use, Gun has a Sony Ericsson P990i (a smart phone). With it she can read her e-mail and send replies (though she doesn't do so often). Otherwise it is the telephone service itself. "That's all I have time to make use of".

Most important of the two is the e-mail function/service, but the device detracts from the experience. "I think it is too little to write and send e-mail. I think it takes too much time." She prefers to use her laptop with a 3G card instead. "If I were to choose I would actually have a simpler telephone and a smaller portable computer". "I think it [laptop with 3G card] is more easily accessible". If there is a problem with the smart phone she just skips it entirely. "I never get stuck with the mobile unit. I don't use more functions on the telephone than I have access to on the computer".

She was given the option to choose what she wanted to have in terms of technological support and chose the smart phone and e-mail solution "because it is further development both of myself and my way of working". She learned to use it on her own. Education is something she feels is lacking. "I think it is unfortunate" "...too little time is spent on education [in this branch]". She added that courses are available but you have no time for them.

Should something go wrong she makes use of a short user manual she has with her. More serious problems she takes up with "expert help" at the SRA. In terms of who she thinks uses the service, she felt people in higher positions within the organisation more than anyone else probably use it. When asked if she thought co-workers influenced one another's use she replied "That's the way you learn" especially since there was no real time to take a course (speaking of when she started working there).

Contact information is another aspect of the mobile phone she appreciates. Being able to sync with Outlook and get all contact information transferred to the phone so it is available when she is out.

If she feels there is something she wishes to change or suggest about the mobile service, she can, but that is largely due to her work role.

Regarding policies at the SRA she explained the use of prefixes to distinguish between private and work calls in order that billing is handled correctly. As a general rule things that cost the SRA should not be used privately.

Appendix 6 – Summary of Interview with Martin Lindén

Work role - Consultant involved in the development and implementation of the BaTMan system.

Martin has been involved in various stages of the development process, with different roles depending on what is important at the moment. He mentioned working as an IT-architect initially, and with more of a requirements administrator role now. He was hired in as a consultant from a company called NetHouse in Borlänge to work on the BaTMan project.

BaTMan is a system for administration of road constructions. It was created to replace a system called SAFEBRO which was built using an older platform called VAX. "…functionally, there are no real differences" between the old system and the new, but there are details which make it easier to use, more "easily accessible" and "more intuitive".

When we asked why BaTMan was developed he answered that they "wanted to switch technical platforms […]" from VAX which they used from the 80s to Microsoft .NET. During development they established system requirements where mobility was one topic. "…one, in this case, should be able to use this system regardless of whether you are sitting in your office, or if you are sitting out at […] the actual bridge." Development of the system was, however, not done with mobility as the focus. Performance, response times and accessibility were other such considerations. Requirements establishment was done in cooperation with the users of the system, through interviews with "those who are out conducting inspections". The system was developed from 2000 to 2004 when it was put into use, completely replacing SAFEBRO.

The VAX system cost a great deal, partly because of the added expense of maintaining two different environments (the old VAX environment, and the more current Microsoft environment). So a major reason for working on BaTMan was administrative costs and a desire to switch to a "modern environment which has allowed, for example, being able to be mobile". BaTMan was developed in house at the SRA ("The SRA has been the one that established requirements and actually developed the implementation"). "Further development and […] operation are handled by the SRA in Borlänge".

Evaluations of the system take place in the form of meetings with users of the system. "We meet them […] two times per year…". In these meetings they discuss what is good and what isn't good. "Recently we have looked quite a bit at the idea of mobility" and options for being able to work "offline". Martin also mentioned the help desk as a source of feedback on the system.

The system is intended for use from the moment a construction project is open for use. In the case of a bridge, BaTMan comes into play "when the first car drives on the bridge" and "…until it is demolished". During this time, BaTMan is used to "register damage, plan repair measures and so forth".

There are many different users of the system, from inspectors working for the SRA to other organisations such as Banverket, Stockholm's public transportation network (Stockholms Lokaltrafik or SL), 30 to 40 of Sweden's municipalities and Gothenburg harbour. Currently there are "500 registered users".

Support for users of the system is taken care of by a BaTMan help desk which handles issues directly pertaining to BaTMan. When it comes to questions of a more technical nature, you are referred to the more general SRA user support.

In order to start using the system you have to first submit an application for a user account. The account you receive comes with certain access privileges. Depending on your role you should only be able to access information necessary for doing your job and not more.

There are a number of different courses depending on the user roles within BaTMan (for example, if you perform inspections, or work with administration). Each role has its own specific course that you can take.

With the old system, there was a system called PC-Bro which "allowed you to bring bridge information with you in your laptop PC" with "a little Access database which held this information in the client application." Inspections could be performed and new data entered and then the "borrowed" and now updated bridge information was then returned to the VAX database. Now there is no need to "borrow" information. You can be out at a location and connect using, for example, the 3G network. "You have a laptop, you have your 3G card, you have your SecureId gadget in order to access BaTMan since it is at the SRA". "So you log in essentially in the same way that you do when you are sitting at the office, besides the gadget". Inspection work is done and you enter new information, such as reporting a crack in the concrete. "You do everything online". "Everything is updated as soon as you click save […] so that someone else can look at that information…". The limitation is connection possibilities such as the 3G network and getting a signal. Martin admitted that "today we have some [constructions] where you cannot connect at all". In that case you resort to pen and paper and return to the office to register the new information.

In terms of personal use Martin, as a consultant, has a work phone provided to him by his company outside of the SRA. So we were not able to gain insight on personal mobile service use at the SRA from him.

Appendix 7 – Summary of Interview with Malou Lubell

Work role - Expert in telephony systems.

Malou's responsibilities are, in her words, to ensure that the SRA has a functioning telephony system. She works at the traffic registry division of the SRA (Örebro) and her work doesn't require much travel.

More specifically, her role entails administration of some of the telephony contracts at the SRA. They have a contract specifying functionality, meaning that mobile services are purchased and that technical infrastructure is not something that the SRA is responsible for. These services are purchased from Telia. Contracts specify, for example, service levels and accessibility, and follow-ups are conducted with "customers" within the SRA in order to see if the existing and future contracts will satisfy their needs. Another aspect of her work is administration of the various telephony systems for the different divisions at SRA. She is also involved with traffic registry contracts regarding the "self-service" services and the platform for the entire customer service centre at the SRA.

When we asked about mobile services she was involved with she told us about how customers have greater expectations for service availability beyond office hours. Manual customer service answers 1 ½ million questions per year, a source of enormous pressure on them. As a response to this there have been attempts to shift as much control over to the vehicle owners to improve the quality of service at customer support. ("a necessity for us to survive"). This has been done through various button, voice controlled and SMS services for vehicle information.

Tasks such as activating vehicle registration (which could be of interest, for example, for campers during the Easter holidays) are examined to see if things can be set up allowing customers to perform the task themselves, instead of sending in registration information, or waiting in line for it to be done by an official. The focus is on the customer and facilitating his/her needs and in so doing, free up time to address more difficult questions.

The "who owns the vehicle" (Vem äger fordonet) SMS-service is an example of this idea in practice. Development of this SMS-service started with an analysis. "What do people want when they call? Do they only want information? Can we give it to them easily? What do they want to carry out? Do they want to activate their vehicle registration? Do they want this done quickly?". An analysis is done to see if a planned system is feasible within the confines of Swedish law and regulations. Malou described how a vehicle owner's name can be transmitted via SMS, but that same information may not be made available on the SRA intranet. Development is also seen as a part of the push for the 24-hour government agency (24-timmarsmyndigheten), which despite the more publicly known focus on internet based services, also covers telephony. Malou gave an example of subscribing to an SMS service providing traffic information (where congestion is currently located). The possibility of providing such services is as she sees it a big part of the push for the 24-hour agency directive.

As far as she knows no specific evaluations of the individual service have been done, though she did say that something like that might have been carried out by the marketing department. Otherwise, praise has come from customers spontaneously; the service is "tremendously fast". Certain times during the year imply higher SMS traffic which by itself means that response times from the service are reduced.

The "who owns the vehicle" SMS-service works by sending in the registration number of a vehicle to a certain number (71456). The name of the registered owner, the type, the colour and registration status of the vehicle is then sent back in the form of an SMS within a few seconds (no address information is sent – as this is restricted by PUL, a Swedish law protecting personal integrity). The service is free, or rather the SRA foots the bill, and currently they receive ½ million SMS questions each month. The service was launched on the internet without being marketed and the Swedish people adopted it and it "spread like wildfire". Professionals who make use of it are, for example, security guards, police, tow truck drivers, or anyone really who is mobile and needs to check vehicle related information quickly.

She also sees it as a useful first step when looking into buying a used car – a quick and easy way to verify that you're dealing with the actual owner before proceeding.

In terms of personal use, Malou has a Sony Ericsson mobile phone ("a T-something", "I don't have an advanced phone"). All she uses it for is to be reachable ("it is mostly for being reachable and to be able to call when I am not at the office"). Her role requires her to be reachable even outside of office hours and her work phone is also used as her private phone. Voice mail is also important given her need to be reachable even when off of work.

SMS usage is also available, but not something she uses much at all. E-mail is not used at all. She feels that her home and work computer are enough in this regard. The camera function is something she has actively chosen not to use simply because it is not useful for her job. Yet it is, in her words, difficult to find a phone that doesn't offer at least a few "useless" services such as this.

When we asked about policies governing mobile phone/service use she told us about a service using a special prefix with the work phone to separate billing for work and private calls.

Telephones are ordered from a central location and Malou said that she assumes that you only get what you need to use, with the option to acquire certain services available to SRA employees as they are needed (e.g. e-mail in the mobile phone). She described how an analysis is done based on your role at the SRA, and the role and the work you do determines what you need and what phone you can/should get. Services are also ordered from a central location. There is a "folder of services available to SRA employees"

Support for mobile services is something she feels is unevenly developed. The computer side of things is well established and developed, but not so when it comes to the telephony side of things. She thinks it might have to do with the assumption that a phone is a simpler device, not requiring as much support – "everyone has been to school, everyone has a phone, everyone knows how to use it, lift the receiver and speak". But she feels that mobile phones are small computers nowadays and so should have the same level of support as computers do. She admits that support is not as easy to do. A computer can be accessed remotely, with a support person looking at the same screen as you to see where you have run into trouble. The same isn't possible with a mobile phone. Phone problems have more immediate and "permanent" consequences as well. "If a call is cut off it is gone. It cannot be revived in the same way that a computer problem can".
She feels it is more difficult to get a hold of someone who can provide answers to problems she has when it comes to her mobile phone – the usual advice is to refer to user manuals.

In her role she has a more direct line to the resources that can bring about change (if she wanted to see a new service introduced or the like). For SRA employees in other roles there is a user council where opinions and requests can be voiced.

She also told us of a push within the SRA to have only one work phone and organise the switchboard so that phone is a normal mobile outside of work hours, and during work it is a connection with the switchboard.

Appendix 8 – Summary of Interview with Adriano Maglica

Work role - Coordinator for maintenance of bridges in the South-East region.

Being responsible for all maintenance of bridges in the South-Eastern region includes everything from handling data, inspections, maintenance planning and carrying out repairs. Adriano needs to be available both for the organisation, his team of four people and for external customers. Adriano decides what bridges need to be inspected and who will carry out that work. Sometimes SRA personnel do the inspections themselves and sometimes they hire in consultants. Adriano also prioritises which maintenance actions need to be taken and it is a part of his role to sometimes support the bridge engineers by inspecting bridges together with them. Adriano is also there as support for the project leaders that manage the maintenance and repair projects. Quite a lot of travelling is included in his work role.

In the development of BaTMan, Adriano has been part of the reference group and he has also been part of the small project group developing BaTMan. A large part of his contribution has been testing, designing and telling the developers about functional requirements. The project group developed a set of (50-100) user cases and Adriano has evaluated and commented them. Adriano is the only one from the South-Eastern region that has been involved in development of BaTMan. The other regions have also had representatives in the reference group, but not in the project group.

Adriano uses BaTMan a lot in his daily work. He looks at data from inspections, but mostly he uses it for planning and prioritising. He also retrieves blueprints and photos of the constructions. He uses a 3G-card for mobile access and thinks that it works fairly well. There are only a few places where the 3G coverage is insufficient and he thinks the service is not very good when using the GSM/GPRS net. Before BaTMan was developed, and the 3G-service available, Adriano used an application called SAFEBRO. With SAFEBRO it was possible to download data from a database in Borlänge, update the data and then return the data to the database when finished. The time between retrieving and returning data could sometimes be several months, and in the worst cases almost a year. The difference with the new system is that the information in the database is always updated, and everyone works with the most recent data. Adriano also told us that some parts of BaTMan are still under construction.

If Adriano has a problem accessing BaTMan with his 3G-card when he is out in the field he typically solves that problem by driving to a place where he can get a connection and access the data from there. If he has other problems with BaTMan he can contact the help desk in Borlänge. Adriano also told us that there are different courses for different types of users of BaTMan. These courses are organised by the road sector education centre (VUC or Vägsektorns utbildningscentrum in Swedish).

Adriano told us that there have been some evaluations of BaTMan, though mostly connected to the mobile functionality and 3G coverage. The 3G service is quite new. BaTMan was ready for use in 2004, but there was no possibility to work using the 3G network until the 3G-cards were delivered in 2005. By that time the demand for this service had increased greatly. This need was first identified in 1999 when the way the system was used at that time caused a lot of problems when different people tried to update the same data. When the system was first planned the project group counted on a more rapid development of the 3G-network.

Adriano does not exactly know how many users use the 3G-service but said that almost all the SRA bridge administrators that use BaTMan also use the 3G-service and he estimated that around 50% of the external consultants use it. He thinks the difference lies in the fact that the consultants only need access to a small amount of the data during a short period of time as opposed to the SRA employees who use the system every now and then for various tasks.

Adriano has a Sony Ericsson, P910i smart phone. He uses SMS-services, the calendar, the tasks-service, and sometimes the camera. He uses the camera when he does not have his more advanced camera with him. He also uses his phone to access his e-mail account, but he does not send many e-mails from his phone. The SMS-service is mainly used to send messages to colleagues after office

hours when he feels it would be inappropriate to call. He also uses SMS to send a question or just as a reminder about something he wants to discuss with someone the next day. He finds the calendar and mail services most important for his work. The mail service enables him to access his usual e-mail account, and everything except the attachments is downloaded into his phone. He added that the service is under development and that better ways of reading attachments are being researched. Adriano told us that the service is important to him because it enables him to stay up to date even when he is travelling and that using this service is a lot quicker than starting the laptop and logging on to the network in order to access his e-mail. The calendar function specifically he started using because he felt he needed it, but also because others "demanded" that he use it, in order to gain access to his calendar and schedule information. He called it a mutual-beneficial agreement and laughed. He found out that the service existed because he is very interested in these kinds of services. He also told us that there are always groups within the SRA that are pilot testers of the new services and that he had some contact with them, asking how well the service functioned and if they liked it. When we asked him if it is employees at the SRA that find the services they need themselves or if the SRA introduces services and offers them to the employees, he answered that he thinks it is the employees that say that they have a need and then get the service. He learned to use the service by trial and error but said that there is support available. The expectations he had of the service have been fulfilled and he thinks the functionality is terrific. The only problem he has had is when the mobile coverage has been inadequate and the synchronisation could not be done. This has led to situations where he could not book new meetings because he could not access his calendar and verify that he had time for a meeting, or that he double booked. Adriano told us that he does not use the blue tooth functionality in his phone much - he forgets to charge the batteries to his headset and it becomes too much of a bother to use.

Of all the mobile services we talked about during the interview he said that they are all tools that simplify and reduce the need to make plans ahead of time. He does not have to make the same preparations any more and he does not have to plan for everything he needs to bring when he is travelling since he always has access to all necessary information.

He also told us that there are policies regarding mobile phone use. In one case connected to usage in the car - you are not allowed to drive while you are talking. In another case, connected to the way the synchronisation is done. That is that you have to synchronise wirelessly because if the synchronisation is done in other ways there is a risk that all stored information can be erased. He told us that it has something to do with what data is considered the original data. If you mistakenly erase all your information in your phone and the phone is considered to contain the original data, all that data in the computer will also be erased when you perform a synchronisation.

Appendix 9 – Summary of Interview with Thomas Mannerhagen

Work role - Responsible for telephony contracts, both landlines and mobiles.

Thomas works at the IT department in the head office in Borlänge. He travels quite a lot to his customers at the other units within the SRA. In his role as responsible for the telephony contracts, he analyses needs, makes administrative purchases, develops communication agreements and makes sure that the services are actually used. This requires a lot of contact with the people working in the organisation in order to understand what needs they have in their different roles. There are well established routines for this process including meetings with the different user groups. When certain needs are identified for one user group the next step is to present this to other user groups in order to see if there are more people that might have the same need. In this way the whole organisation can benefit from the future solution and the different sections can learn from each other. It is Thomas' job to find enough employees that are interested in a solution in order for him to go on to the next step which is where he tries to find or develop new services to offer the employees at the SRA.

He told us that the SRA is a customer-supplier organisation which means that they, after a need is identified, collect all their thoughts and ideas and make a task description. The task description, including the problem, how they want to solve it, who might be interested, description of usefulness, resources required and estimated costs, is then presented to the customer. The customer hopefully accepts the description which means that a project is started. The projects are often carried out together with their telecommunication supplier, Telia, and their subcontractors. When the services are ready for testing they bring in reference groups and pilot groups.

Thomas also told us that they don't have any specific methods for diffusion of the new services when they are ready for adoption, but he knows from experience that if the service is "good enough" it will be used. He explained that "good enough" means that the service is user friendly, proportionately cheap and, above all, that it is useful. They start by presenting the services to what he calls "early adopters" and give a great deal of support and information in the beginning. Thomas told us that when these "early adopters" start using the services, they start telling their colleagues about them, during coffee breaks for example, and news spreads like "wildfire". But he pointed out that this only occurs when the services are "good enough" and that it is a way for them to evaluate their ideas and learn for the future.

They don't have any documented routines for making their services "good enough" but they place great demands on accessibility and security and that the services are user-friendly. Thomas admits that usefulness is very hard for them to measure. They try to do it by interviewing the users in the reference and pilot groups. They have had problems with people forgetting to charge their PDA batteries, resulting in loss of information, but these problems have been avoided since they switched to smart phones instead. Thomas added that the services that they have developed are very popular and that people often come up to him telling him how much they like them and how useful they are.

Thomas told us that the IT department offers an abundance of different services and that it is his job to market these services by making them "good enough" so that they spread by themselves. But he also markets the services by presenting information on the SRA intranet, by sending informative e-mails, and by conducting phone meetings and personal meetings with representatives from the various organisational units.

When we asked Thomas about examples of mobile services that he has been involved in, he told us about the mobile synchronisation system that they have. Employees, through a smart phone like the Nokia 9300 or Sony Ericsson 910, can synchronise their e-mail, including attachments, calendar, contacts and to-do-lists. It is a mobile service that has been developed by one of Telia's subcontractors, SYSteam LessWire in Karlstad, and was called LessWire Office when the SRA was involved in developing it four years ago. The SRA could see great potential in the product as they have 6800 employees, a great many of which travel a lot in their work and many of whom had tried to access their e-mail accounts through existing communication links but never been satisfied. Not everyone had a notebook, which, at that time, could cost 30.000 SEK, and if they had one it was a time-consuming

process to connect via GSM communication. The solution was to use this mobile service, which is a lot quicker and more stabile, on a smart phone that is less expensive (around 6.000 SEK). Nowadays Telia sells this product under the name ”Telia Business Success” and the SRA has about 600 users of this mobile service. There is no “typical user” of the service but different types of employees, from truck drivers to managers, use it. And when they have problems with the service they turn to the three-tier support organisation within SRA IT.

As further examples of mobile services within the SRA, Thomas described a reporting system, which is used through a mobile phone. It is a system used by the employees in road painting trucks in order to report their work tasks. The system has been very successful and is currently under further development. Another example is a system used during driving tests. It consists of an Anoto pen with a small camera which registers what is written with it, and a special paper form. During the driving test the officiator checks with the system that the person being tested is who he or she claims to be, that all bills have been paid and that they have passed the written test. Thereafter the test is started and the form is filled out just as it used to before the service was available. When the test is finished the officiator checks a box on the form which makes the pen send the stored information, through blue tooth, to a mobile phone which passes the information, via GPRS, through the OneBridge platform and into the databases at the SRA. With this service they obtain faster reporting by avoiding that the officiator first has to fill out the paper form and afterwards enter the same information into the system by computer. The person that was tested can get his or her license quicker since the manufacturing process can be started earlier. Thomas admitted he was not the right person to tell us exactly how much time the officiators save by using this service but he estimated it to be between half an hour and one hour a day. The system is thought to be used by 300 officiators.

Another service Thomas described is ”Fotodestinator” which is based on a mobile phone with a GPS-receiver. It is used during road inspections. When damaged road sections or other repair needs are found it is important to document them. By using this service the inspectors can take photos of the damage with the camera in the phone, get satellite positioning of the location, fill out a form and synchronise all the information via OneBridge into the system at the SRA.

Thomas explains that OneBridge is the mobile platform they use and that OneBridge is where the GPRS-traffic from the mobile phones ends up. OneBridge receives this traffic and routes it to its final destination, which can, for example, be someone’s private mailbox or a database. The advantage OneBridge has over other platforms is that it works independently of the operating system used in the mobile phone. It handles, for example, Symbian, PalmOS and Microsofts WindowsMobile.

To the question whether these development processes are ongoing he answered that these services undergo constant development and that it is very important for the SRA to continue the development process since they reflect clear trends in society. He says that they can see that people have become more and more mobile and have increased needs of being able to work where they are. A notebook has its advantages but in many cases an advanced mobile phone or a smart phone is enough. One extension to the e-mail system is to integrate information about news and messages from the intranet such as, for example, press releases. They think that service will be very useful for people travelling since it gives them the chance to be kept up to date on what is happening at the office. He also foresees that more mobile services will be made available to the public in the future and mentions one service where questions about who owns vehicles can be answered by SMS. A service that peaks with over 500 000 answered questions every month.

Thomas has two mobile phones himself, a Sony Ericsson T910 and a Nokia 9300. He used to have a PDA, but gave it away when he got tired of finding it empty because he had forgotten to charge the batteries – it caused more problems than it solved. Thomas only uses mobile phones and he has no landline. His extension at the switchboard is connected to his mobile.

He uses his phone for calling, sending and receiving SMSes and synchronisation of mail, calendar, and contacts when he is on the road. He also uses his phone to access various websites for news and he listens to the radio. Sometimes he uses it to access the SRA’s WAP-site (wap.vv.se) where he can get information about road conditions through a service which, translated to English, is called “the situation on the roads” (“läget på vägarna”). He has also tried to watch TV in his phone with limited success, but he can’t really see the use of it just yet and categorises it as entertainment. Thomas has chosen not to use the Mp3 player and the camera in his mobile. He doesn’t see these services as useful.

Beyond calling and sending SMS messages, he finds the e-mail service most important for his work role. This service is important to him because it enables him to use his time more efficiently. For example, if he is travelling by train from Stockholm to Borlänge, he can go through the e-mails he received during the day and answer them instead of sitting idle on the train and starting the next day by working through maybe 40 new e-mails. According to Thomas there are no policies for how to use mobile phones within the SRA.

Appendix 10 – Summary of Interview with Anders Taberman

Work role – Responsible for the regional support process IT and data management.

The SRA has a central IT-department called Vägverket IT (SRA IT). SRA IT can be seen as a business that the individual SRA units order IT solutions from as if it was an external entity, even though they are part of the same organisation. Each unit that makes up the SRA organisation has someone responsible for placing such orders and that is one of Anders' roles. He is a part of the user council that "discusses levels of support […], products and services…". He is as he put it an "organisational representative who places demands on the IT organisation". His work keeps him mostly in Jönköping but does require some travel.

He has participated in a few mobile service projects and says that the region he works in (the South East) voiced the most enthusiasm for introducing a mobile information management system at the SRA.

In the past they had "dos-subscriptions" to Telia's mail management service. Outlook was set up to send copies of incoming messages to a dos-letterbox at Telia which in turn sent out notifications to your mobile phone. You could then WAP into a certain page and retrieve those new messages. They also had a sync-solution with simpler PDAs which would be synced by means of "active sync" in order to be able to update and bring their calendar information. Such synchronisation required physical proximity – it was not mobile.

Then they started a new project to see if they could produce a better structured solution for themselves at the SRA. The reasons for interest in a mobile service such as this were, as Anders put it, that "e-mail is perhaps the most important IT function that we have in our daily work" and that there are employees at the SRA who are very mobile in their work, out on the roads and "need to be able to manage information and be accessible". Their efforts resulted in OneBridge, a service Telia bought and incorporated into its product line-up and which the SRA bought and have further developed and customised for their own use. OneBridge involves mobile synchronisation of Outlook, being able to retrieve e-mails and attachments and calendar management. Approximately half of his co-workers have the application available to them in their mobile phone (smart phone) or PDA. Anders made special note of the calendar function. In managing your calendar in Outlook it is also made available to others so that when meetings are being scheduled (an almost daily activity) it is possible to retrieve calendar information about when the people you need to meet are free to do so, book the meeting and get a positive or negative response immediately, all through your mobile phone. This is a whole new level of accessibility that they are "trying to make standard practice for all co-workers"

One thing Anders said he feels is missing from OneBridge is an "SRA profile" - to have a smart phone that has been customised and is visibly an SRA phone when it starts up, that automatically goes into the SRA intranet when the web browser is started.

OneBridge has led to a further project that has been going on for two years and is still in progress, first called Fotodestinator, now Tom Tom. The idea is to solve as many problems and satisfy as many needs as possible using a single hand held device. The base platform is that for talking on the phone and synchronising e-mails and calendar information. There are a number of SRA employees out on the roads doing studies of road accidents. These individuals can have a number of equipment needs such as navigation support, written documentation (recording information about an accident for example), visual documentation (taking pictures of accident sites or maybe even small video sequences). Based on such needs the idea is to see how far they can go with current technology in providing all this with a single mobile device rather than having to carry around a GPS receiver, mobile phone, PDA, digital camera and whatever else might be required. The difficulty of charging more than one device at a time in a car is one reason for interest in such a solution. They have tried some solutions (PDA phone with digital camera) and will be continuing with this project for a while to come. There is even the idea of including support for ISA (intelligent speed control, a device installed in company cars that steps in and prevents the driver from exceeding the legal speed limit) in this all-in-one device.

When a product or service is ready to be used it is made available to all at the SRA via so called IT-shops. It is through these shops that one can see what products are available and place orders. Before being made available via an IT-shop the product or service must be ready "both from a use perspective and a technology perspective". As Anders put it, "our IT organisation must be well equipped to handle support".

When asked if everyone at the SRA has a mobile phone to be accessible or if there are those who do not require one he answered that there are very few ("you could count them on one hand, or maybe two") who don't have one and that there is a push towards having a single mobile phone only. He gave the example of the Gothenburg regional office which, when they moved, got approximately 100 employees to start using the national mobile service and not have a land line at all. "A development we also see that we want to move towards". According to him, it is mainly from a financial stand point that this drive exists. Integrating mobile phones under this service plan means that calls made between phones covered by it are free. Despite this there are those who have a mobile phone and a land line where almost all calls are forwarded to the mobile. This means that even calls within the SRA end up being charged at the mobile rates. There is also the simple matter of being accessible. You always have your mobile phone with you ("I don't leave my office without taking my mobile phone")

In terms of personal use, Anders said he has a Qtek 9100 and an Ericsson K750i, and was waiting for a new Sony Ericsson phone, the P990. The Ericsson is used for placing calls, and the Qtek for syncing and using the calendar functionality. He admitted that he wasn't exactly following recommended practice. The idea, and what employees are encouraged to follow, is that you should have one mobile phone which is selected based on your information needs, not one phone for placing calls and another for e-mails and the like. There is a dialogue with each employee where their role and its information needs are established so that such a choice can be made. But there is also the influence of others, seeing what co-workers have and use and going by that.

He uses Telia's "national mobile" service. This means that his Sony Ericsson phone is integrated in the switchboard so he has no land line, only a connection number in the switchboard and his mobile number.

Most important of the mobile services available to him in his phones (besides talking) is the e-mail functionality. He gets perhaps 30 e-mails a day which are more or less urgent. If he is away for three days and not able to check his e-mail then there will be a great deal of extra work waiting for him when he returns, sorting through those urgent messages - something that could "probably take all day". Should there be problems with the service then there is a support group dedicated specifically to that functionality. Examples of problems are upgrades that brought with them unforeseen problems that have caused breaks in operation for everyone. He didn't mention any individual problems he has experienced but then he also said that his involvement in development projects has meant that when problems that affect him personally have occurred he has felt able to solve them himself.

In terms of services he has chosen not to use it is a matter of smart phones coming with a great deal more functionality by default than he has a need for. "I use almost exclusively the SRA solution for synchronisation and surf a little perhaps. Not much more really."

There are a few written guidelines about mobile telephony usage within the SRA, and rules for how information can be retrieved or synchronised from a computer. The option to use the work mobile phones/smart phones privately means that they have a special billing function with rules for how such a setup is to be used (use of a prefix which differentiates work use from private use). There are no policies for use of smart phones specifically though. But he thinks that they might have gone a different route there, with restrictions built into the technology instead of written rules (e.g. having to have a password for your smart phone in order to be able to use it). The guidelines for which mobile phone you should have based on information needs can also be said to be a way of limiting use.

Appendix 11 – Letter to Potential Interview Subjects (Translated)

Dear <*name*>

We are two masters level students at the department of Informatics (Lund University) and we have just begun our thesis work. We are interested in investigating use and benefits of mobile services within organisations. With mobile services we mean services which are offered via mobile phones. The contribution we hope to give is an increased understanding of the use of these services; which services are used, which are not, how they are used and why. Something which is currently unclear and needs more research.

To carry out our study we need contact with a company which uses mobile services and which is willing to contribute with information – this is why we have written to you. If collaboration is a possibility we would like to interview a few (ca 5 – 10) persons in different roles and occupying different levels within your organisation. These would be short interviews at a maximum of one hour.

We are still in the preliminary stages of the thesis process and are flexible and can adjust parts of our study to suit your organisation if there are aspects of the area which are of special interest and use to you.

If you are willing to participate in our investigation, or if you have further questions, you are welcome to contact us. We look forward to your response.

Yours sincerely,

Frida Mattsson
<*telephone number*>
frida_mattsson@hermes.ics.lu.se

Douglas Gumaelius
<*telephone number*>
douglas_gumaelius@hermes.ics.lu.se

Appendix 12 – Letter Requesting Approval of Interview Summary (Translated)

Dear <*name*>,

Please find attached a summary of the interview content we wish to use in our thesis, as agreed upon during the interview. The summary is written in English because the final thesis will be in English. If you would prefer to review the summary in Swedish you are welcome to get back to us. If there are changes or additions you would like to make, please send them to us in an e-mail or make those changes directly in the attached document and send it back to us. We plan to publish the thesis with all the interviewees' real names, but if you would prefer to be kept anonymous we will of course do everything we can to accommodate you.

If we have not heard from you within a week we will interpret this as an approval of the summary we have written and that we can use your full name as a reference.

Thank you once again for your contribution and for helping us,

Frida Mattsson
<*telephone number*>
frida_mattsson@hermes.ics.lu.se

Douglas Gumaelius
<*telephone number*>
douglas_gumaelius@hermes.ics.lu.se

Appendix 13 – Interview Guide (Translated)

Introduction: The interview will be used as the basis for a thesis which will be published. We will send a summary of the interview for approval before we publish anything. Do you have any questions before we begin? Is it OK if we record the interview?

(*Sub-questions used as guidelines in case interview loses momentum. Keep questions general.*)
Name: Title: Department:

Could you tell us a little about your history within the organisation?

Could you describe your work tasks?
(If responsible for a non mobile service, ignore points below)
- Could you tell us a little about how "your" system works? Why was it developed?
- How was development done? What considerations were taken? Goals?
- Is there support for users of the system? How does it work?
- How do you measure/evaluate the usefulness of the system/service?

How interested are you in technical things/technology?

Mobile phone: Operator: Other mobile device (PDA):

Could you list the things you use your mobile phone for?
- Which two functions are most important for you in your work? (following questions asked for each)
- Could you tell us a little about the function?
- Why is it important?
- What benefits does using it bring?
- Could you give an example of a typical situation where you use it?
- How did you perform this task before you had access to the function?
- How did it come about that you started to use it?
- How did you learn to use the new technology?
- What do you do if you have problems with it?
- Are there many others in the organisation that use the function? Why/why not? Do you think you affect each other in any way? Does other people using it have influence on your use?
- What expectations did you have of the function before you started using it?
    - Has the function met those expectations?

Are you satisfied with the function? (asked for each)
- Why, why not? (What influences if you think it's good or bad)
- Do you think it is easy/fun to use?
- Can you describe a situation where it has facilitated/complicated your work?
- Does the mobile phone itself influence what you think of the function?
- What could be improved and how? (would such changes mean you start using the function more?) (something you would like to see/have in terms of functionality or services?)
- Do you feel you have any influence over development of the function?

Are there functions in your mobile phone which you have chosen not to use?
- If yes, why? If no, does that mean that you use everything?

Are there policies for use of the functions in your mobile phone?

Is it OK if we contact you later with a few short follow up questions on what we have discussed?

Appendix 14 – Instructions for Summarising Interviews

Read through each interview transcript and lift out the information that is relevant to our study. The information we are interested in relates to mobile services that are mentioned, and that the interviewee works with and/or uses. A rough structure to the information we are looking for follows. Each point does not necessarily have to be included, but should be used as a guide.

Summary is translated to English for incorporation into the thesis. Important or interesting quotes are translated as closely as possible to the original Swedish and used in the text as such.

Organisational level

Work role
- Work tasks related to mobile services

Mobile services he/she is involved in
- Involvement in development/administration or otherwise
- How the service functions
- Mobile service use
- Who else is involved and how
- Evaluations of the service
- Policies

Personal level

Mobile Phone/Service Use
- Important services and why
- Background to use/adoption
- Consequences of using it
- Knowledge of policies

Appendix 15 – Coding Template

Topic	Code	Explanation
Mobile service	ms	
- Name	ms – name	
- Background	ms – bgr	
- Development	ms – dev	
- Use	ms – use	
- Technology	ms – tech	
- Evaluation	ms – eval	evaluations of usefulness and user perceptions
- Support/education	ms – sup	help connected to individual use of a service
- Adoption	ms – adop	how individuals have come to use the mob. serv.
- Diffusion	ms – diff	how mob. serv. use has spread through the org.
- Usefulness	ms – usef	
Organisational structure	org	
- Policies	org – pol	incl. rules, recommendations and best practice
- Support/education	org – sup	structures for help and support for employees

References

Aarnio, A., Enkenberg, A., Heikkila, J., & Hirvola, S. (2002). Adoption and use of mobile services. Empirical evidence from a Finnish survey. *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on*, pp. 1454-1463.

Berntsson, J.-P., Johansson, S. (2006). *Användning av SMS och MMS i svenska storföretag* (INF06-016). Lund: Lunds universitet, Institutionen för informatik.

Blazevic, V., Lievens, A., and Klein, E. (2003). Antecedents of project learning and time-to-market during new mobile service development. *International Journal of Service Industry Management, vol. 14*, pp. 120-147.

Bryman, A. (2002). *Samhällsvetenskapliga metoder*. Malmö: Liber Ekonomi.

Callon, M. (1986). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. In J. Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge* (pp.196-233). London: Routledge & Kegan Paul.

Creswell, J.W. (1998). *Qualitative Inquiry and Research Design: Choosing among Five Traditions*. California: SAGE Publications.

Fichman, R.G. (2000). The Diffusion and Assimilation of Information Technology Innovations. In R.W. Zmud (Ed.), *Framing the domains of IT management: projecting the future - through the past* (pp. 105-127). Cincinnati, Ohio: Pinnaflex, cop.

Fällman, D. (2004). *In Romance with the Materials of Mobile Interaction: A Phenomenological Approach to the Design of Mobile Information Technology* (Research reports in informatics, 03.04). Umeå: Umeå University, Department of Informatics.

Heikkinen, M.T., & Still, J. (2005). Business networks and new mobile service development. *Magnetics Conference, 2005. INTERMAG Asia 2005. Digests of the IEEE International*, pp. 144-151.

Howcroft, D., Mitev, N., & Wilson, M. (2004). What We May Learn from the Social Shaping of Technology Approach. In J. Mingers & L. Willcocks (Eds.), *Social Theory and Philosophy for Information Systems* (pp. 329-371). West Sussex: John Wiley & Sons.

ISCID. (2001-2005). *Encyclopedia of Science and Philosophy. Actor-Network Theory* [WWW document]. Retrieved 2006-05-06.
URL http://www.iscid.org/encyclopedia/Actor-Network_Theory

Kakihara, M., & Sørensen, C. (2002). Mobility: an extended perspective. *System Sciences. HICSS. Proceedings of the 35th Annual Hawaii International Conference on,* 1756-1766.

Kristoffersen, S. & Ljungberg, F. (1999). Mobile Use of IT. In K. Braa, C. Sørensen & B. Dahlbom (Eds.), *Planet Internet* (pp. 137-156). Lund: Studentlitteratur.

Kvale, S. (1997). *Den kvalitativa forskningsintervjun.* Lund: Studentlitteratur.

Latour, B. (1997). *Keynote Speech: On Recalling ANT* [WWW document]. Retrieved 2006-05-07.
URL http://www.lancs.ac.uk/fss/sociology/papers/latour-recalling-ant.pdf

Latour, B. (1998). *On Actor Network Theory: A few clarifications 1/2* [WWW document]. Retrieved 2006-05-06.
URL http://www.nettime.org/Lists-Archives/nettime-l-9801/msg00019.html

Miles, M B., Huberman, A M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook (2nd ed.).* Thousand Oaks, California: SAGE Publications.

Näringsdepartementet. (2006). *Näringsdepartementets myndigheter* [WWW document].
Retrieved 2006-03-28. URL http://www.regeringen.se/sb/d/3442

PTS-ER-2005:8. Framväxten av marknaden för mobila innehållstjänster. Stockholm: Post- och Telestyrelsen.

PTS-ER-2005:34. Svensk Telemarknad 2004. Stockholm: Post- och Telestyrelsen.

Rogers, E. M. (1995). *Diffusion of innovations (4th ed.).* New York: The free press.

Stalder, F. (1997). *More on Bruno Latour 1/2* [WWW document]. Retrieved 2006-05-06. URL http://www.nettime.org/Lists-Archives/nettime-l-9709/msg00012.html

The Swedish Road Administration 2005:35E. *Facts 2005- The Swedish Road Administration, Roads and Traffic* [WWW document]. Retrieved 2006-03-28.
URL http://www.vv.se/filer/publikationer/facts_2005.pdf

TeliaSonera. (2005). *Vägverket – SNRA* [WWW document]. Retrieved 2006-03-20.
URL http://www.teliasonera.se/article/0,2858,l-se_h-13006,00.html

Vägverket. (1998). *Grundprinciper för IT i Vägverket* [WWW document].
Retrieved 2006-03-28. URL http://www.vv.se/templates/page3____6406.aspx

Vägverket. (2004a). *Historia om Vägverket och vägarna* [WWW document].
Retrieved 2006-03-28. URL http://www.vv.se/templates/page3____9710.aspx

Vägverket. (2004b). *Welcome to the Swedish Road Administration* [WWW document]. Retrieved 2006-03-28. URL
http://www.vv.se/templates/page2_2____13172.aspx

Vägverket. (2005a). *Facts about the Swedish Road Administration* [WWW document]. Retrieved 2006-03-28. URL http://www.vv.se/templates/page3____13844.aspx

Vägverket. (2005b). *Organisation* [WWW document]. Retrieved 2006-03-28. URL http://www.vv.se/templates/page3____11901.aspx

Vägverket. (2005c). *Regioner* [WWW document]. Retrieved 2006-03-28. URL http://www.vv.se/templates/page3____11911.aspx

Vägverket. (2006). *Förarstöd* [WWW document]. Retrieved 2006-03-28. URL http://www.vv.se/templates/page3____546.aspx

Vägverket 2006:21. *Årsredovisning 2005* [WWW document]. Retrieved 2006-03-28. URL http://www.vv.se/filer/publikationer/arsredov_2005.pdf

World Trade Organisation. (2003). *Telecommunications Services: Glossary*. Retrieved 2006-05-20. URL http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel12_e.htm

Yin, R. K. (2003). *Case Study Research, Design and Methods*. Thousand Oaks, California: SAGE Publications.

Yoo, Y., Lyytinen, K., & Yang, H. (2005). The role of standards in innovation and diffusion of broadband mobile services: The case of South Korea. *Journal of Strategic Information Systems, vol. 14,* pp. 323–353.

Oral References

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