Swedish vs. Japanese Mobile Technology

A study on the technologies and services
which can be transferred between the two markets.

M I K A E L   E D B O R

Swedish vs. Japanese Mobile Technology

A study on the technologies and services which can be transferred between the two markets.

Mikael Edbor

<medbor@kth.se>

Thesis course: IK121X

Supervisor/Examiner: : Prof. Gerald Q. Maguire Jr.

KTH - Royal Institute of Technology

Stockholm, Sweden

9 June 2011

Abstract

This report investigates what services and technologies currently separate the Swedish and the Japanese mobile phone markets, and what they can learn from each other. The purpose of the report is to find if there are any services or technologies that can be transferred between the two markets. The research was done by both literature study and interviews with people and companies who work in both markets, or who conducts their own research on the subjects brought up in this report. The interviews were conducted using a questionnaire with a few core questions and then extended by questions fitting the person's own area of expertise. A few services such as micro payments via near field communications (NFC) technology, were found to be eligible candidates for introduction to the Swedish market.

Keywords: Sweden, Japan, mobile, NFC

Sammanfattning

Den här rapporten undersöker vilka tjänster och teknologier som för tillfället skiljer den svenska och den japanska mobilmarknaden åt, och vad dessa marknader kan lära av varandra. Syftet med rapporten är att finna ifall det finns några tjänster eller teknologier som kan överföras mellan marknaderna. Undersökningen gjordes både genom litteraturstudie och intervjuer med personer och företag som jobbar i de två marknaderna, eller utför egen forskning inom områdena som tas upp i den här rapporten. Intervjuerna utfördes genom att följa ett frågeformulär där ett par kärnfrågor användes och som sedan byggdes på med frågor som passade den intervjuades expertis. Några tjänster, så som betalning via Near Field Communications tekniken (NFC), anses vara passande kandidater för att importeras till den svenska marknaden.

Nyckelord: Sverige, Japan, mobil, NFC

Acknowledgements

Table of Contents

List of Figures

List of Acronyms and Abbreviations

Acronym	Description
1G	First generation mobile telephone system (see NMT)
2G	Second generation mobile telephone system (see GSM)
3G	Third generation mobile telephone system (see UMTS)
4G	Fourth generation mobile telephone system (see LTE)
APP	Mobile Application
GPS	Global Positioning System
GSM	Global System for Mobile Communication
ISDB-T	Integrated Services Digital Broadcasting – Terrestrial
JDC	Japan Digital Cellular
LTE	Long Term Evolution
NFC	Near Field Communications
NMT	Nordic Mobile Telephony
PDC	Pacific Digital Cellular
PTS	Post- och Telestyrelsen
SMS	Short Messaging Service
UMTS	Universal Mobile Telecommunications System
URL	Uniform Resource Locator
WAP	Wireless Application Protocol

1. Introduction

Sweden and Japan are both at the forefront when it comes to mobile technology. Sweden was the first country to launch a public 4G network and Japan has had phones with TV capabilities for five years. Although they are both at the forefront of development, the two countries have taken two very different paths to get where they are today. However, now the markets are converging and we see them becoming more and more the same.

Until recently the Swedish and Japanese market for mobile phones have been vastly different. A Swedish phone could not work in Japan nor would a Japanese phone work in Sweden. However, with the third generation (3G) of mobile technology both countries adopted a common standard and the two markets have begun to converge. This process was sped up by the introduction of "smart phones" in both markets and today there are not many technologies left that differ between the two countries. Instead, the services that exist are different.

Nordic Mobile Telephony was launched in 1981 and became the first common standard for mobile telecommunications in the Nordic countries. Before this, each country used their own standard, making communication by users visiting in another of the countries difficult. Later Europe adopted the Global system for Mobile Communication (GSM) standard. GSM was adopted in countries in Asia (excluding Japan) and eventually in the United States, making it the mostly widely used global standard used around the world. However, the same handsets do not work in all countries as different countries allocated their frequency band for GSM in different parts of the radio spectrum. [1]

Why did the development of mobile phones take another path in Japan?

The standard initially promoted for the mobile Internet in Sweden was the Wireless Application Protocol (WAP). This standard was developed by Ericsson, among others. The Japanese operator DoCoMo launched its own variant of a mobile Internet platform called "i-mode" in February 1999, and it was a major success. By August the same year i-mode had gained 1 million subscribers and the number had increased by a factor of 10 one year after that. [2] The goal of i-mode was to implement a packet-based network that was inexpensive for users to use. Since i-mode is packet-based technology, users are only charged for all the data that they send and receive. This means a user could stay connected all of the time, unlike the WAP-service which worked just like a dial-up service with per minute charges. This apparently constant connectivity made e-mail a great way for the Japanese to communicate, since their language requires using non-Latin letters and thus Short Message Service (SMS) message length limitations with a multiple

---

1   A picture of the allocated spectrums can be found in GSM-Boken. [Wall00] pages 22-23
2   The original goal for i-mode was to have 10 million subscribers in the first three years. That goal was reached in under half the time. [Nat00]

octets per Japanese character would be too limiting.

Several other mobile technologies have gained popularity in Japan, some partly because of i-mode's success. These include near field communication (NFC), 1seg (a technology to watch TV via a mobile phone), and QR codes (a two dimensional bar code that usually contains a uniform resource locator (URL)). This means that it is possible to scan QR codes printed in magazines or on posters and go directly to a site with more explanation, a commercial, or some kind of offer.

Now that smart phones are increasing in popularity in both markets we see them growing more and more alike, with the markets possibly converging at some point.

2. Project definition

This report is the final result of the bachelor's thesis project at the KTH Center for Wireless Systems. The thesis project was conducted during the spring semester of 2011. The report builds on surveys conducted on mobile user attitudes in Sweden and aims to find corresponding technologies and services to meet these demands.

2.1 Problem definition

There is a common conception in Sweden that Japanese phones are very futuristic and far ahead of the phones available in Sweden. However, few people seem able to really grasp what the exact differences are, other than the futuristic feeling around them. This report explains many of the actual differences in what these mobile phones can do.

As the markets continue to develop, their differences are beginning to fade away. The big leap came with the introduction of the latest generation of smart phones. Instead of the many available operating systems used earlier, both markets have adapted in the same way to mostly the use of the two dominant operating systems: Android and iOS.[3] This means that the two markets are converging and are beginning to look more and more alike. However, they are taking different paths to get there. Therefore while they are facing the same problems, the developers of both markets have disparate views and probably different solutions to these problems. There is a need for research that combines and compares the studies of what users want with what is available elsewhere so that operators and manufacturers know what to focus on.

2.2 Purpose and objectives

The purpose of this report is to simplify and show the differences between the Swedish and Japanese mobile phone markets by explaining the available technologies and services that differentiate them. These are compared with the demands of Swedish users to find if there are any technologies or services that could successfully be introduced into the Swedish market. The services and technologies unique to the Swedish market are explained so that players in the Japanese market might find if some of these are solutions to the demands of their own customers.

In short the goals are:

1. Show the differences between the Swedish and the Japanese mobile market.

2. Analyze the results from surveys to find what the Swedish users want in their phones.

3. Match demand in Sweden with availability in Japan.

4. Explain Swedish technologies and services.

---

3 Android and iOS are currently dominating the markets both in market share and growth.

2.3 Research question

The main question of the report is what technologies and services in Japan can be introduced into the Swedish market. This is in itself divided into two areas, where the matter of available technologies is of interest to the manufacturers of mobile phones, while the services mainly are issues for operators. These two areas are somewhat intertwined as many services rely on specific underlying technologies to exist, just as many technologies in themselves have no purpose without an accompanying service. However, for the sake of simplicity this report will not go into too much depth about these relationships.

2.4 Scope

This report is mainly focused on what technologies and services can be introduced into Sweden from Japan and will focus less on Swedish technologies available for export to Japan. Due to the difficulties of conducting surveys in Japan and accessing results from similar surveys conducted there, any discussion of what the Japanese user wants will be full of speculations which can not be backed up by data. Because of this, the focus will be on what the Swedish users want since the discussion on this can be backed up by data from surveys. The surveys were conducted among young people belonging to the "mobile generation"[4] since young people are the persons most likely to embrace new technologies and services that come into the market. The results of these surveys will be evaluated in terms of technology and services that exist in the user's home market (Sweden) and the other market. This comparison might show that there are already technologies or services that could be rapidly developed for the other market. Other markets, such as the Korean market, could be of similar interest; but will not be covered in this report due to lack of time.

---

4   "The mobile generation" is a term coined by Halebop in the survey "*Den mobila generationen*".
    [HBOP10]

2.5 Related work

The Office of Science and Innovation at the Embassy of Sweden in Japan monitors and analyzes research, innovation, and growth in Japan. The key findings from their continuous monitoring are presented in reports. These reports enable companies and other interested persons to find information about research and progress relevant to them in their work that they could not attain themselves since they lack the same insight into the Japanese market and culture.

In the annual report called Ungdomsbarometern, by the company Ungdomsbarometern AB, the results from surveys conducted every year. The survey is designed to show young people's attitudes, values and behaviors in different areas. As a source of information in this report the results from surveys focused on mobile communication will be used. [5] A similar survey by Halebop, a subsidiary of Teliasonera, also shows the habits among young people compared to the older generation in terms of mobile communication. [HBOP10] The parts of interest in these surveys are the parts that deal with what users are interested in buying and using and also how this affects their choice of operator and hand- held devices.

Beyond listing technologies and services available in the Japanese market, this report combines information about the technologies and services with the results from surveys showing what the Swedish users want and thereby give data on what can be successfully imported to the Swedish market. The report also gives an overview of available Swedish technologies and services that might be of interest to players in the Japanese market.

---

5   Contact Ungdomsbarometern AB for access to the report. [Ung10]

3. Background

The mobile phone started out as a mean of making calls while still being mobile. After that came ways of communicating via text messages. Even later, mobile phones started to have Internet access, integrated cameras, and Global Positioning System technology. Nowadays, mobile phones offer so much more. These new technologies enable for new possible uses for the mobile phone.

The following anecdote is a great example of what mobile phones are capable of these days[6]:

> *After the recent earthquake in Japan much of the mobile phone network was down which meant that people could not make phone calls via their mobile phone. However, people with smart phones still had access to internet and could use Skype[7] and iPhone users could use Facetime[8] if they could find a Wi-Fi hotspot.*
>
> *People would also use their phones to watch live broadcasts of the news for updates on the situation.*

---

6   This was told to me by a person who was in Tokyo during the earthquake and used Skype to get in
     touch with friends after the earthquake had occurred.
7   An IP-telephony service where the calls are transferred over the Internet.
8   Apple's video calling service.

3.1 Development of the mobile culture in Sweden

The number of active mobile contracts in Sweden surpassed the number of people living here in 2005 according to [PTS05]. And in 2010 the number of mobile contracts in Sweden was about 12.6 million. This makes Sweden one of the few countries in the world where the mobile usage is well over 100 percent. Although, not everyone in Sweden has their own mobile phone, approximately 2.8 million of these contracts are so called "work subscriptions" which is payed for by the company a person works for according to [PTS10]. The reasons for the success and big growth in the Swedish market are many.

Important points in time for the development of the Swedish market:

1956	Mobile System A (MTA), the first fully automated mobile telephone system, is created by Ericsson and TeliaSonera.
1981	1981 – Nordic Mobile Telephony (NMT) is introduced as the first generation (1G) of mobile communications systems.
1987	First "pocket sized" mobile phone is released. Possible because of the new specifications of NMT-900 which enables battery saving features.
1991	Global System for Mobile Communications (GSM) is launched as the second generation of telecommunications system.
1997	First pre-paid refill card launched in Sweden.
2003	Universal Mobile Telecommunications System (UMTS), the third generation (3G) is introduced in Sweden.
2009	The first commercial network for LTE, the fourth generation (4G) is launched in Sweden.

MTA was a hit by the standards of that time that it was decided that two mobile telephone networks would be built, one in Stockholm and one in Göteborg. The system had 125 subscribers in total. [9] After MTA came the Nordic Mobile Telephony (NMT) system, the first common system for all the Nordic countries.

Sweden has been liberal in allowing the operators to sell bundled phones and contracts with a long binding period, this has enabled the operators to sell an expensive phone at a low initial (up-front) price. According to Mats Sjödin, editor in chief at Telekomnyheterna, this has given us a market with a relatively high share of high end phones. This has further meant that the Swedish market evolves quickly.

The lower price has been crucial for the increased use of mobile phones. In figure 1 it is easy to see how the number of SMS sent in Sweden increased at the same time as the operator's revenues from each text decreased as they lowered the price per SMS for the users. The numbers in the figure are taken from [PTS10].
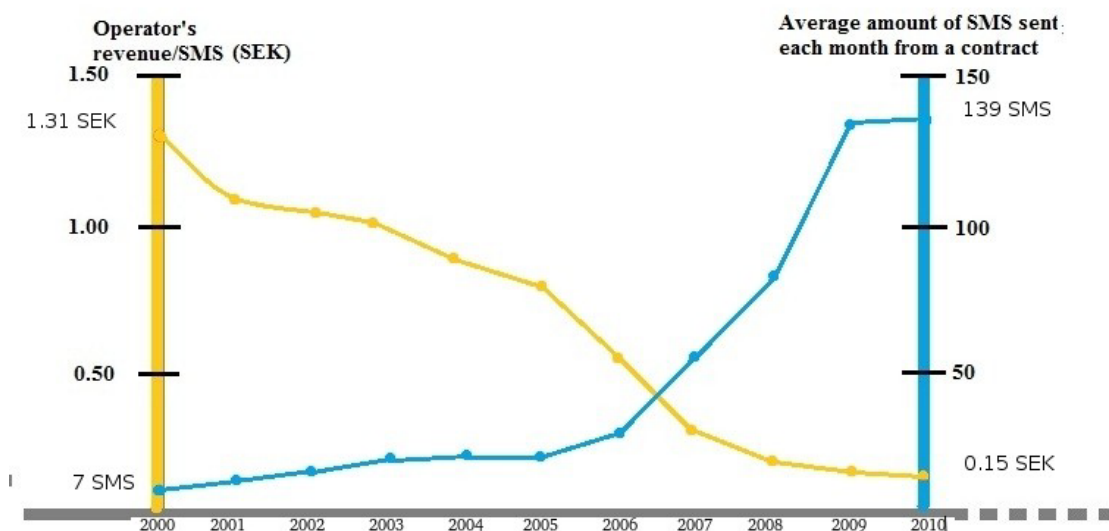

Figure 1: Increased use of SMS

According to Mats Sjödin, the Swedish market is maturing quickly now due to the large percentage of smart phones sold in Sweden.

---

9   69 of the subscribers were in Stockholm and the other 56 in Göteborg. [Wall00] pages 10-11

3.2 Development of the mobile culture in Japan

The Japanese governmental agencies wanted a compatible telecommunications system, but the frequencies used for GSM could not be freed for this new system, hence they gave Ericsson a project to design a system for Japan. The new system was first called Japan Digital Cellular (JDC) , but was soon changed to Pacific Digital Cellular (PDC) in the hope that the system would be adopted in countries around the Pacific and Southeast Asia. However, PDC was only used in Japan because of the success of the GSM-system, which managed to get a firm grip on the Pacific and Southeast Asia region as well, according to [Nyq04].

However, probably the most known success story of Japan's telecom industry is i-mode. In 1999, NTT DoCoMo launched a service which meant that users could be constantly connected to the Internet. This constant access to Internet via the mobile phone had a huge impact on the mobile phone usage in Japan. Seemingly over night, the use of mobile Internet exploded and more and more people signed up for the service. When the total number of Internet connections in Japan was 30 million, one third of those were through i-mode says Takeshi Natsuno in [Nat00] A cheap, packet-based Internet connection meant that people could also start using e-mails as a mean of communication, one of the differences compared to Sweden where most users chose to use SMS due to the different pricing model of Internet access in the Swedish market.

The operators in Japan have had a stronger position in their market than the Swedish operators has had in Sweden. In the Japanese market it is the operators who specify the mobile phones to handset vendors and then brand them as their own. The manufacturers deliver their phones to these operators and customers stay loyal to their operator instead of to the manufacturer. However, the situation is starting to look more and more like the situation in Sweden and Europe. Today manufacturers of smart phones (such as Apple, HTC, and Samsung) are starting to build their own brands instead of giving in to the demands of the operators. This is now changing the market and giving the manufacturers more power.[10]

---

10 Discussion with Mayuko Fagerfjäll at Ocean Observations in Tokyo who is currently working on designing the user interface for many of KDDI's Android smart phones.

4. Method

This chapter will explain the method used for this project. Section 4.1 will define and explain why the method was chosen. Section 4.2 and section 4.3 will describe how the information was collected through surveys and discussions with people in the field of telecommunications.

4.1 Research design

For this thesis, two research methods could be implemented: a qualitative research method and a quantitative research method. A qualitative research method uses more in-depth information of a few cases, and is more based on the points of view of those involved. Because of this it uses in-depth interviews and bases the results on conclusions drawn from subjective opinions rather than from statistical analysis of data.

A quantitative research method is more objective and focuses on statistical data. Surveys yield numeric information which causes the quantitative research method to rely more on the accuracy of the instrument used to measure the data in the survey, rather than the skill and experience of the interviewer. Time consumption is also heavier in the planning phase than in the analysis phase.[11] The research method used for collecting data on the different technologies and services utilized a quantitative research method as this method was able to best measure and show data about what users want in their phone and therefore what is worth bringing to the Swedish market.

The method used in the interviews was in-depth discussions. This gives a deeper understanding that is useful when analyzing the future of the market and gives the report some balance in terms of both general insight and in-depth evaluation. Before each discussion a script was constructed based on each interviewee's area of expertise, so that each person's knowledge could best be utilized. The core questions were kept the same in each discussion, but beyond that the script for the discussion was customized for each occasion. A more detailed description of the process is given in section 4.3.

---

11 A table compiling the differences between the methods can be found at
http://www.orau.gov/cdcynergy/demo/Content/phase05/phase05_step03_deeper_qualitative_and_quantitati
    ve.htm (May 2011)

4.2 Data collection

To better understand the situation in both markets and how they had each gotten to their current state point, research was done by studying reports written by the Office of Science and Innovation at the Embassy of Sweden in Japan (OSI) and other companies conducting research in the field. Additional research was done by gathering relevant information through articles, the Internet, etc. A literature review was conducted to find the information needed about the technologies and services studied in this report. The information was taken from the Internet, articles, and reports on the subject, and interviewing people who work with the development or research of both technologies and services.

Further information was gathered through discussions with people who work in electronics companies, consulting firms, the telecommunications press, or research the subject themselves. The questions asked were open questions allowing for a more personal response from the interviewee, in his or her own words, this gave a greater depth and provided a better basis for the subsequent analysis. The questions were altered between each interview to fit the expertise of each respective interviewee, but the core questions remained focused on what they thought was the major differences between the two markets and what they expected to see next in the area of mobile communication.

Analysis of surveys made about the attitudes and behaviors among young people was done to understand what the Swedish users want in their phones, and therefore what could potentially be introduced to the Swedish market. This method has a few disadvantages, mainly because these surveys were not conducted for the same purpose and with the same aim as this report. This means that there is irrelevant information and some questions asked in the survey has a slightly different focus than what is needed in this report. Due to this the data is analyzed for relevance and with a critical point of view.

The sampling method used to choose the people who where interviewed was snowball sampling. This is a method where the interviewees suggest other people and companies who might be of interest in the research. However, the information collected from interviews had to be compared with information gathered from other sources to determine the validity of the answers. Snowball sampling has a disadvantage when is comes to gathering information from a diverse group because the method can create group bias if the interviewees recommend people with similar opinions as themselves. However, this was not a problem in this report as it already focused on people within the same field.

4.3 Interviews and discussions

During this project many people were consulted for their expertise. The interviews were not conducted in a traditional way, but rather as discussions. This style was advantageous as it meant that the questions could be open-ended and be extended to cover any new information that came up during the discussion. Being able to adapt to such situations is important since the interviewees themselves suggest topics and technologies or services that they wanted to talk about.[12] Most of the discussions were held through e-mail correspondence This was a great advantage as it would have been impossible to conduct the interviews with the people working at companies in Japan and the interviewees in Sweden could reply to the questions when they had time. Additionally, it meant that I had written record of the discussion written in the words of each participant.

The people with whom the major discussions have been held are:

• Mats Sjödin, editor-in-chief at Telekomnyheterna. He worked at the Mobil-website[13] and is thought to have revealed more mobile phones before their official release date than any other reporter. His expertise is in the telecommunications industry and the market trends.

• Mayako Fagerfjäll, managing director at Ocean Observations' Tokyo office. Working with designing the user interface of mobile devices. Ocean Observations is working with KDDI, Japan's second largest operator, since 2008 .

---

12 See Appendix A.
13 www.mobil.se

5. Technologies

This chapter will describe and explain some of the technologies available in Japan. The technical aspects of the technologies will only be explained sufficiently to give the reader an understanding of the technology in layman's terms. The depth of the technical information is also chosen so that it is just deep enough to be used as basis for the explanation of why or why not the technology or service would be applicable in the Swedish market.

5.1 Technologies in Japan

This section describes the technologies found in Japan. The technologies are those who are considered most interesting and really differentiates the Swedish and the Japanese market according to the experts consulted in this report.

5.1.1 1seg

The standard used in Japan for mobile TV broadcasting is called 1seg. This technology was launched officially on April 1, 2006. The digital broadcast standard in Japan is called Integrated Services Digital Broadcasting – Terrestrial (ISDB-T) which has 13 segments. A high definition TV-channel takes up 12 of these segments, but you can fit three standard definition TV-channels in the same number of segments. The one remaining segment used for broadcasting to mobile devices. This is what gives the service its name "1seg". The broadcasting standard ISDB-T uses the video CODEC H.264 and audio CODEC AAC which are both formats supported by many smart phones today.

The screen is split in two, as seen in Figure 2. The top half is used for viewing the video and the bottom half has a field which is linked to Internet content such as news feeds and commercials. This allows the user to directly access content related to the programs they are watching.

Figure 2: Mobile phone showing a 1seg broadcast.

One of the goals of having Internet access beside the video is to allow viewers to purchase items they see in a show. During shows it is possible to display offers and links which take the viewer to an Internet store where they can buy the clothes an actor is wearing or the furniture they are sitting in. Another possibility is for emergency broadcasts or news, which can be shown as feeds while users are watching TV.

5.1.2 NFC

The Near Field Communications technology (NFC) is becoming more and more popular in Japan. The technology allows for contactless transfer[14] of information between nearby devices and chips. The information is transferred via coiled antennas in each chip. The transferring chip emits a magnetic field which induces an electric current in the nearby receiving antenna. Transfer can take place between two chips with their own battery supply, where the chip waiting for information shuts down its own magnetic field. The two chips alternate generating their fields to achieve bi-directional communication. A chip without it's own power supply can also be used powering itself with the induced current from the device attempting to communicate with it.

Since it is possible to create chips which do not require a battery, they can be made cheap and incorporated virtually anywhere. So called "smart posters" can have a chip containing further information. If mobile phones are equipped with NFC readers they can be held up to the poster and access the information. This could also be applied to promote offers where users are able to acquire coupons by visiting special areas hosting such chips. Providers and retailers can by this strategy make the consumers visit certain areas they want to promote. Retailers and grocery stores can also make use of this technology by placing chips in the shelfs where the goods are they would enable users with a smart phone, equipped with an NFC-chip and the correct application, to use the self scanning system of shopping.[15]

The NFC technology itself is very interesting, but the important part is what new applications and services it enables. These will be reviewed in chapter 6.1.1.

---

14 4 cm or less. More specifications available at www.nfc-forum.org

15 The concept of self scanning, applied with bar code scanning, is explained in the report *"Självscanning med mobiltelefon"* by Mikael Stockman and Daniel Olausson. The report also examine the use of NFC. [SMM11]

5.1.3 QR codes

Quick response codes (QR codes) are a type of 2-dimensional bar codes. They can be scanned using the camera in a mobile phone. A QR code can store information, such as a URL. When the tag is scanned the image is interpreted by an application in the mobile phone which returns the information stored in the tag. If the information is a URL the user often has the option of being redirected to the web page which the tag links to.

Japanese magazines often have QR tags next to both articles and advertisements. The URL in the tags often links to additional information or downloadable contents. There are even entire magazines devoted to downloadable content, where every page in the magazine is covered with QR tags which link to a page where ringtones, games, and mobile decoration can be downloaded.[16]

The QR tag in figure 3 contains the URL for the KTH homepage. By using a smart phone with a QR code scanner application the tag can be scanned and the mobile phone can be redirected to the web page.

Figure 3: QR code for the KTH home page URL

Using QR codes means users do not have to manually input URLs in order to reach the desired web page. This method is both quicker and more convenient.

---

16 http://www.japantrends.com//tada-gets-qr-code-only-print-magazine/, June 16, 2011.

6. Services

This chapter will give a short introduction to some of the technologies found to be most interesting for transfer between the two markets. Section 6.1 review services found in Japan while Section 6.2 deals with services available in Sweden.

6.1 Services in Japan

The mobile services in Japan that differ from Sweden derive from both the Japanese culture and traditions, such as manga, and from Japan's forefront position in technology, where NFC is the technology providing the most opportunities for innovating and new services.

6.1.1 Osaifu keitai and other applications of NFC technology

NFC opens up for many new uses for mobile phones. The most prominent services are the mobile wallet and information collection. However, other uses for NFC exist but many of them do not have the mobile phone as their primary sector of application.

The use of mobile wallet (Osaifu keitai) is well rooted in the Japanese society. In December last year almost 10% of all consumers in Japan made a purchase with their mobile wallet.[17] The technology has been available in Japan since 2005 and many stores have installed readers which makes it possible for the customers to pay for their groceries by placing their phone on the reader. The NFC-chip has an account connected, working as an electronic debit card from which the payment is made.

As a branch of the mobile wallet is the transit pass and access card service. In Japan all the commuter train stations and subway stations the turnstiles are equipped with readers that are capable of reading the transit passes such as the Suica[18] card. Suica uses NFC technology to transfer the ticket information from the card to the turnstiles. With the technology incorporated in mobile phones it is possible to charge one's phone in the same way as one would with the Suica card and use it to pass through which 2.7 million people did in Japan last December.

In addition to debit cards and transit passes, other cards can just as easily be replaced and transferred to the mobile phone. Many people walk around with their wallets (over)stuffed with different membership cards to retail stores which are used for discounts and accumulation of bonus points.

---

17 Read the story at http://www.nearfieldcommunicationsworld.com/2011/02/26/36163/10-of-japanese-consumers-made-a-purchase-with-their-mobile-wallet-in-december/ (June 2011)

18 The Suica is a prepaid card used in collaboration between the railway companies in Tokyo.

Many retailers also use NFC in promotional campaigns where users log in to certain areas to collect coupons and points. This method is effective both for encouraging customers to purchase the discounted items and for making the customers visit areas where the retailers would want them to be. A store could be made the spot for getting such coupons, hence increasing the number of customers entering the store in their attempt to collect more points and coupons. This location specific use of NFC is useful in other areas as well, such as information at transit stations, bus stops, and tourist attractions. By just sweeping the mobile phone over the billboard or information plaque, the user immediately gains access to additional information.

6.1.2 Mobile manga

Manga comics is a huge industry in Japan. It is a big part of the Japanese pop culture and closely connected to Japan in the eyes of foreigners. The book shops in Japan have entire sections devoted to Manga and every day you see people standing in the stores, reading from the shelfs – which makes the stores look more like a library. Everywhere on the subway and commuter trains you see people reading their paperback manga books. With all the things possible to do with a phone already, incorporating manga readers in the phones is a natural step.

The pages of a manga comic book cannot just be split into different parts and then shown one by one in the screen. The comics are redrawn and edited to fit the smaller screen. One of the advantages of viewing manga in a mobile phone is that it allows for effects that are not found in an ordinary print comic book to be used. For instance, a panorama picture could be shown as a short animation, and effects such as sound and vibrations can be used to enhance the experience if timed with events in the storyline of the comic.

6.2 Services in Sweden

6.2.1 Spotify

Previously, users were forced to put music files in the mobile phone in order to be able to listen to it. After a while mobile phones came with built in FM radio. However, that limited users to the broadcasting schedule of the radio station. Spotify allows users to access the collected music library of all the record labels with whom Spotify has a contract, which adds up to over 10 million tracks.

Spotify is a music streaming service for both computers, mobile phones, and now also some TV sets. To gain access to the music available on Spotify, users need an account where the free versions of the accounts, funded by commercials, are heavily restricted and only available on the computer. The most exclusive version, Premium, allows users to access their music on their mobile phones. Access to the music is done by streaming or storing playlists for offline use.

Spotify was launched in 2008 and the service is well rooted in Sweden and the other European markets where it is available with over 10 million registered users, according to Spotify's press pack from April 2011.

6.2.2 SMS

Short messaging service (SMS) is the most popular way of communication in Sweden. The number of SMSes sent each day are more than twice as many as the number of mobile phone calls made. Even when the number of non-mobile phone calls are added they still do not reach the same levels as SMS. [PTS10]

The service allows for users to send short messages of text between mobile phones. The use of SMS has increased steadily over the years and in 2010 around 17.8 billion SMSes were sent in Sweden alone.

SMS messages are limited to 160 characters, including spaces and punctuation, a number which was set in 1985 after some unscientific testing. 160 characters was deemed *"perfectly sufficient"* by its inventor.[19] However, modern mobile phones are able to divide longer texts into several SMSes and sending them, letting the receiving mobile phone put them back together to a single text again. Using SMS as a way of communication became really popular among young people in Sweden, and the limitation of 160 characters became a catalyst for the invention of the SMS language. In order to keep the message within the limitations, people started using abbreviations and smileys to convey feelings.

The SMS service has later been extended and upgraded to enhanced messaging service (EMS) which can include simpler pictures and animations, multimedia messaging service (MMS) where the message can contain pictures, sounds and even videos.

---

19 http://latimesblogs.latimes.com/technology/2009/05/invented-text-messaging.html (June, 2011)

7. Studies on preferences among young people

This chapter will deal with the analysis of the demand in the Swedish market by gathering what a major consumer group, specifically young people, want and how they perceive mobile telephony. Section 7.1 present the company which performed the survey used and section 7.2 compiles the views of the young people about their usage and preferences.

If you take a look around you on the subway or in the city, you immediately see who is holding the most advanced mobile phone containing the latest technologies. It is the young people who are in the forefront when it comes to having the latest gadgets and being the first at acquiring any new technology that enters the market. This is why young people is the most interesting group to study in the context of this thesis project. Young people are very interested in new technologies and hold a lot of the buying power in the market.[20] Knowing what the young people want then becomes a good indicator of what will work in the Swedish market.

7.1 What Ungdomsbarometern is

Ungdomsbarometern AB is a company started in 1991 specialized in knowing and understanding young people's opinions on different topics. They provide services for companies who want help attracting youths to their products, company, or education by answering the questions; "Who are they?", "What do they want?" and "How can we reach them?". [21]

Every year Ungdomsbarometern AB gathers data through surveys and the results are published in different reports. As a source for this report, I received permission from Ungdomsbarometern AB to use *"Youths, mobile communication and operators 10/11"*. [22] It is the latest report by Ungdomsbarometern AB that deals with young people's attitudes towards mobile communication, what they use their mobile devices for, and what they think is important when they choose between the different operators in Sweden.

---

20 The average working young person could in theory afford buying a new smart phone every month, and university and high school students would not have to save for too long according to data from Ungdomsbarometern.

21 Ungdomsbarometern's home page http://www.ungdomsbarometern.se/#vad_vi_kan

22 Original titel: *Ungdomar, mobil kommunikation och operatörer 10/11*, [Ung10]

7.2 Analysis of Swedish user's preferences

From the surveys done by Ungdomsbarometern AB and other researchers I have gathered and compiled information about how Swedish users perceive their mobile phone usage and what they think is important.

7.2.1 Owning a mobile phone

The number of mobile telephone contracts are increasing while the number of non-mobile phone contracts are decreasing.[23] Today 99% of the people in the survey Ungdomsbarometern said that they have at least one mobile phone.[24] A mobile phone is an important link between a person and their social network. With the mobile phone, a user can always stay connected with their friends, wherever they are. At the start this was only possible via phone calls. After a while the Short Messaging Service (SMS) was introduced and became a quick way of keeping in touch with people.

However, "old school" users from the group of mobile immigrants[25] often have a different opinion. In figure 3 is a quote representing a very common opinion among mobile immigrants who grew up before the mobile phone was widely used in Sweden. They are slower at adopting these new technologies, trends, and services; especially in mobile phones. However, their views is being pushed out by the mobile generation and nowadays there are many more options for the person who wants to stay connected all of the time – in more ways than one.

> *The only thing you ever need to be able to do with a mobile phone is make calls and send SMS.*
>
> - Anonymous mobile immigrant

Figure 4: Mobile immigrant quote

---

23 [PTS10]

24 [Ung10]

25 Mobile immigrants refers to users who grew up while the mobile phone had not yet reached the big mass of people in Sweden, whereas the mobile generation consists of users who grew up when the mobile phone had already become a part of normal life. People in the mobile generation are born in 1988 or later. [HBOP10]

In the survey Ungdomsbarometern a staggering 95% say they have a Facebook account and about half of those say that they use their phones to log on to Facebook to update their status or communicate with their friends. [26] This has spurred some to use Facebook[27] integration as a selling factor in their mobile phones. Other social networks, such as Twitter [28] have also become a natural occurrence in mobile phones, so it is easy to see that the ability to constantly stay connected is important to the users.

According to *"Den mobila generationen"* more than 20% of the mobile generation say they check their phone for new events first thing in the morning. [HBOP10] The phone has really become a necessary part of their everyday life as a connection to their social life.

7.2.2 What young people are planning on buying during the next year

The Swedish user always want the latest gadgets and it is not uncommon to buy a new phone every year. In Ungdomsbarometern, almost half of all the people in the survey answered that they thought they would buy a new phone during the following year. According to this survey 45% of all participants considered themselves to be intermediate users and 26% said that they were high end users. [29] A high end user is defined as someone who always has the latest phone and uses most of the services and technologies available in the phone, whereas an intermediate user might just use some basic functions. However, this does not mean that an intermediate user only makes calls and sends SMS with their mobile phones. About 25% of all intermediate users say they use their phone for Facebooking, browsing on the Internet, and using applications. These are features mostly found in high end phones, showing that even intermediate users tend to buy more advanced mobile phones. A common argument in this group when buying smart phones such as the iPhone is that they are stylish, as the quote in figure 4 illustrates.
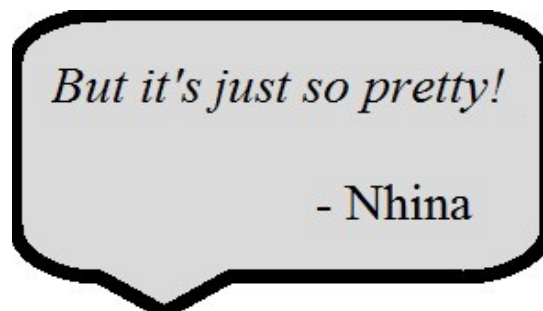
Figure 5: Intermediate user quote

According to Mats Sjödin; *"eight out of ten mobile phones sold today are smart phones"*. This clearly shows that this is the way to attract customers.

---

26 [Ung10]

27 Facebook is a social network founded in 2004 and grew rapidly to have over half a billion users in the world. Half of those use their mobile phone to check their Facebook. See www.facebook.com

28 Twitter is a service where users "tweet" messages of 140 characters or less to the people who follow them. See www.twitter.com

29 See [Ung10] for full definition and data.

8. Discussion

In section 8.1 I will discuss different services and technologies available in the Japanese market to determine if they could be introduced to the Swedish market. In section 8.2 the services and technologies in the Swedish market that can be of interest for players in the Japanese market will be discussed.

8.1 NFC and its many applications

NFC is a technology with the ability to make new services available. These services include the mobile wallet and other forms of payments made via the mobile phone. Japan is a cash based society which might be one of the reasons why the service has not expanded to the magnitude it could have. However, Sweden has a culture of using cards for payments as it is more convenient and it is free to use. This makes the probability of success for a transaction solution where the phone is used much greater than in Japan. In figure 5 is a quote from a high end user about this service.
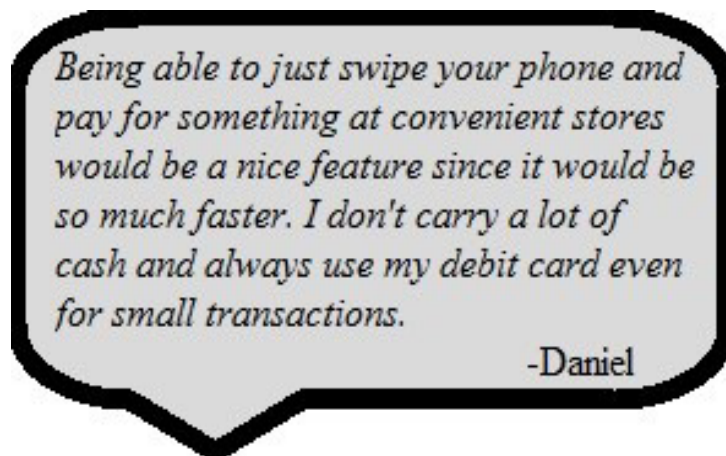

Figure 6: Card user quote

If all the membership card in a standard wallet were virtually transferred to the mobile phone the thickness of the wallet would easily shrink by at least 1 centimeter as seen in figure 6.[30] The mobile phone will however not increase in size when electronic membership cards are put in it, as seen in figure 7.

Figure 7: Regular wallet test   *Figure 8: Mobile wallet test*

However, putting all membership cards electronically in your mobile phone leaves out the often most important part of the physical card – the logo and name of the company. Every time someone uses a branded card they, and people in their vicinity are exposed to the company logo. Having the logo of the company shown as much as possible is of interest to the companies.

Stockholm Public Transport (SL)[31] launched its new ticket system SL Access in 2008. The system uses RFID technology to provide ticket information from the ticket card to the card reader in the turnstiles or on the bus. If a mobile phone was equipped with NFC technology the phone could store the information for an SL Access ticket and respond to an SL card reader in the same way as a normal SL Access card would. Travelers could then use their phones to pass through the turnstiles. This technology has been in use in Japan for several years now and last year 2.7 million mobile users used their phone for public transport.[32] An SL Access card in use is shown in figure 8.

Figure 9: SL Access card in use

30 This conclusion was based upon testing with my own wallet.
31 sv. Stockholms Lokaltrafik, www.sl.se
32 http://www.nearfieldcommunicationsworld.com/2011/02/26/36163/10-of-japanese-consumers-made-a-purchase-with-their-mobile-wallet-in-december/   June, 2011

Stockholm Public Transport has also begun with putting QR codes at bus stops for easy access to current information on traffic situations and similar information that is of interest to the commuters.[33] This service could be complemented with the use of NFC tags providing the same information. One aspect to keep in mind is the high price of an NFC tag compared to the price of putting up a QR code.

One thing that Japan's urban areas are famous for is the vending machines available everywhere, and with every imaginable content. Many of these are equipped with NFC readers so that customers can use their mobile phones to pay for the content. The vending machines in Sweden initially first only accepted coins as payment. This was later changed so that they could accept 20 SEK bills as well. Later the available methods of paying were extended to include sending an SMS to the machine as a form of payment. However, using SMS is a slow and unreliable method. If the machines were redesigned to also accept NFC payment this would be a much quicker and safer way for customers to pay for the content. In figure 8 is a picture of a vending machine in Japan containing alcoholic beverages (a product not found in Swedish vending machines).

Figure 10: Alcohol vending machine

---

33 http://sl.se/Resenar/Planera-resa/SL-i-mobilen/SL-testar-QR-kod/ (in Swedish, June 2011)

8.2 1seg

The 1seg technology has been a huge hit in Japan and there is no stopping it in sight. However, the standard used in Japan to broadcast digital TV is different from the standard in Sweden, and changing the entire Swedish broadcasting system just to allow for the 1seg technology to be used in Sweden is not a feasible solution. Also, according to digital TV providers in Sweden the customers here are more interested in television on demand, and less in normal broadcasting. Unless there is a major sporting event such as the Olympic games where live TV is preferred. However, even at such times the users would probably want to decide for themselves what to view and not be restricted to watching what is currently being broadcasted. Therefore would broadcasted TV to the mobile phone probably not be very successful.

Instead there are lessons to be learned from the ways that related services are incorporated with the mobile TV in Japan. There are many new possibilities to increase revenues, and these are applicable in the Swedish market as well. The mobile data usage in Sweden is increasing and more and more people are getting bundled services where the mobile internet is a part or an add-on to their contract. [PTS10] With faster mobile internet watching streaming video is no longer a task which require a lot of slow buffering to work. Video access can be instant so it is probably we will see an increased use of mobile video services.

In lieu of the 1seg technology, the demand of mobile TV can be met with applications for smart phones. Many of Sweden's major TV channels are launching their "play sites" for on demand video as applications for the mobile phone. The mobile software company SPB Software have launched their application SPB TV which gathers several channels for both broadcasted streaming and on demand mobile TV. A screen shot of the application is seen in figure 11.

Figure 11: Screen shot of SPB TV mobile TV application

If the applications for mobile TV incorporated the methods from 1seg there would be more opportunities for revenues, mainly from commercials. The Internet backtrack could also help boost sales of tickets which would timely be promoted as commercials for artists or trailers for movies which are shown in the video stream.

8.3 Mobile manga

The market for e-books has expanded, much because of the introduction of the smart phone where an e-book reader was just another feature in the phone which you always carry with you. This means that you no longer have to carry around a big e-book device.

The market for comics in Sweden is not nearly as big as the market for manga is in Japan, but now that the smart phone is becoming today's common goods it could open up for a market for comics as well. One scenario could be where the parent downloads comics to their phone to keep the children entertained during a long drive.

I had the opportunity to try this service during my stay in Japan. I have read a fair deal of manga before, and I was pleasantly surprised with the way that they had transferred the manga to the small screen format. The vibrations and sound effects during the story seemed more like a superfluous gimmick at first, but soon I noticed how they helped elevate the story which made up for the small screen.

8.4 QR codes

QR code tags have only recently begun appearing in Sweden in common places. In Japan the concept has been used for a long time, and QR tags are a natural part of many advertisements where they often contain the URL to a site with additional information or downloadable content. However, in Sweden the technology has not previously been successful. However, the popularity of QR codes is now growing here as well, much because of the increased market share of smart phones. Since manufacturers in Sweden have previously not included QR interpreting software in mobile phones there has not been a wide base of users able to read QR tags, hence the technology has been of little or no use to companies trying to market themselves. However, with the introduction of smart phones which can easily install QR interpreting applications the user base is expanding.

Many companies, such as Stockholm Public Transport, are now opening their eyes to the possibilities of QR codes. Several bus stops have been equipped with QR tags (like the one in figure 12) which can be read by commuters with smart phones. The QR tag takes the user to the SL mobile web page customized for the bus stop in question where information about the departing bus and current traffic situation can be found.

Figure 12: QR code for Älvsjö bus stop

Other examples of the use of QR codes can be found on grocery products. Some packages have QR tags on them linking to web pages where recipes and tips on what to do with the product can be found. This is where the future use of QR codes will be, and as the number of users with access to the technology increases the use of QR in marketing and information gathering will increase as well.

The main competitor of the QR code is NFC technology. Both technologies have their advantages and drawbacks. The QR code is virtually free since it is just ink on paper. The users carry the cost of the scanner by buying the mobile phones capable of QR interpretation. However, it can not hold as much information as an NFC tag can, but it is often not the point of the QR code either. A QR tag usually redirects the user to a web page and thus only need to carry an URL. One of the advantages of the NFC tag is that there is no need to see the tag, as opposed to QR codes where the tag has to be scanned with the mobile phone's camera. However, QR codes and NFC technology are not competing for the same exact fields of usage. Instead, the fields are overlapping and it is more likely that the two technologies will complement each other.

8.5 Spotify (from the Swedish market)

The success of Spotify can be partly accredited to its timely launch when the debate on music pirating in Sweden was going on. This created an immediate demand for the service and a wide base of users. Spotify has since then become a part of every day life of many Swedish users and operators have started including bundled offers with Spotify as a sales argument. This practice is similar to the way that manufacturer incorporated Facebook as a feature in their mobile phones.

Spotify has not yet seen any competition in the Swedish market, hence the service has been able to become the dominant streaming music service in Sweden. However, there are already several players in the Japanese market. To be able to compete with the local services in Japan, Spotify would need to differentiate itself and offer something else than what is currently available.

Another problem for Spotify in the Japanese market is that Spotify does not currently have any contract with Japanese record companies, and with Japans heavy focus on its local music market Spotify will not become successful by just offering foreign music.

8.6 SMS (from the Swedish market)

SMS is already available in Japan. However, the service has not had the same success there as it has in Sweden. The reason for this is the early success of i-mode and the possibility for Japanese users to communicate via e-mail. An email can contain more information than an SMS, which is needed for the complex characters of the Japanese language. The Japanese users are also very fond of animations and complex smileys (called *emoji* in Japan) in their messages. The standard set of smileys available in Japanese mobile phones can be seen in figure 13. Each operator modifies the appearance of the smileys, but they are all available and converted when emails are sent between users by any of the three major operators. Many of the smileys are animated as well.

Figure 13: Standard set of smileys in a Japanese mobile phone

The complexity of the Japanese way of mobile text communication means that SMS would not meet the demands of the Japanese users.

Using e-mail, compared to SMS, as a mean of text communication between mobile phones is much more convenient, and with a flat rate mobile internet plan it is also cheaper. Since the mobile operators in Japan only allow SMSes to be sent to other users within the same network it is much more restricted than e-mail which can be sent to any mobile phone and even to computers.

9. Conclusion

The purpose of this report was to simplify and show the differences between the Swedish and Japanese mobile phone markets by explaining the available technologies and services that separate them. These were compared with the demands of the Swedish users to find if there were any technologies or services that could successfully be imported to the Swedish market. The services and technologies unique to the Swedish market were explained so that players on the Japanese market might find solutions to the demands of their customers. In chapter 9.1 the technologies and services that are deemed suitable for transfer to the Swedish market is presented with the motivation to each and in chapter 9.2 the technologies and services that can be of interest for the Japanese market is reviewed.

9.1 What can be imported to the Swedish market successfully

In this section, the verdict on the eligibility of Japanese services as candidates for introduction to the Swedish market is presented and motivated.

9.1.1 NFC

I strongly recommend manufacturers to explore and expand the use of the NFC technology in mobile phones.

Motivation: NFC technology is already available outside of the mobile phone, such as in card readers for turnstiles at subway entrances. Incorporating this payment method in convenient stores would probably not be very difficult. There is both a demand and availability of this service already.

9.1.2 QR codes

I strongly recommend companies in Sweden to start using QR codes in marketing and similar situations.

Motivation: The QR technology is extremely cheap and the base of users is expanding as the number of smart phones in the market increase. There are almost limitless possibilities of how QR codes can be used in clever mobile marketing which would create both commitment in customers and intrigue them to further pursue offers given through marketing campaigns.

9.1.3 1seg

I recommend developers and operators to look to the strategies used in 1seg for creating additional revenues.

Motivation: The use of mobile TV is made more convenient for customers with the constant improvement in quality of mobile broadband. The use of mobile TV is likely to increase in the future with many new possibilities for revenues if the implementation is made in strategic ways where exposure to commercials is incorporated in the applications.

9.1.4 Mobile Manga

I recommend operators to explore this service together with publishing companies.

Motivation: The service of e-book readers is already available in most smart phones and with a simple upgrade they can be adapted to display the comic book format. This can just be seen as an expansion of the e-book service. The large screens of most smart phones also takes away much of the previous problems of the small size of the pictures in the mobile phones. There might be a market for mobile comics and other magazines.

9.2 What can be of interest for players in the Japanese market

In this section the services found in Sweden which can be of interest for export to the Japanese market are presented.

9.2.1 Spotify

Spotify is of interest for export to the Japanese market.

Motivation: Spotify's success in the European market shows that it is a service with a great demand. However, there is a greater competition in the Japanese market. The Japanese market is also different when it comes to music preferences, which means that Spotify needs to adapt before trying to enter the Japanese market.

9.2.2 SMS

SMS is not of any interest for Japanese mobile operators.

Motivation: The use of mobile e-mail in Japan makes the SMS service obsolete. E-mail is both cheaper and more convenient. There is no reason for operators to try and expand the use of SMS in Japan. There is no demand for it and it does not meet the requirements of the users.

10. Future research

Surveys should be done by giving information about these services to the interviewees and then letting them give answers about what services and technologies they would be interested in using. Then let them grade how much they would be willing to pay for these so that operators and manufacturers can see exactly what there is a demand for.

See Appendix B for an example of a questionnaire.

Extended research could be done with the other direction in mind to better find out what technologies and services from the Swedish market, the Japanese customers, operators, and manufacturers could have interest in.

The incorporation of NFC in Sweden is such a vast field to explore that it would really need its own research project and report to be fully justified.

References

[HBOP10]   Halebop, *Den mobila generationen*, 2010

[Nat00]   Takeshi Natsuno. *i-mode Strategy,* Wiley, 2003,
            ISBN-10: 9780470851012, ISBN-13: 978-0470851012, 182 pages

[Nyq04]   Johan Nyqvist, *Din guide till Telekomvärlden*, Studentlitteratur AB, 2004,
            ISBN: 9789144034140, 400 pages

[PTS05]   Post- & Telestyrelsen, *Svensk Telemarknad,* 2005

[PTS10]   Post- & Telestyrelsen, *Svensk Telemarknad,* 2010

[SMM11]   Mikael Stockman and Daniel Olausson, *Självscanning med mobiltelefon*,
            KTH, 2011

[Ung10]   Ungdomsbarometern AB, *Ungdomsbarometern 10/11 – Ungdomar, mobil
            kommunikation och operatörer*, 2010

[Wall00]   Per Wallander, G2 – Andra generationen in *GSM-Boken,* PERANT AB
            (Per Wallander Antenn AB), 2000

Appendix A

Discussion topics used in interviews and e-mail correspondence.

The questions were adapted to each interviewee's field of expertise. By allowing the interviewees to freely talk the information from the discussions were not limited to what knowledge the interviewer had of the subject beforehand which the questions could be constructed from. However, each interviewee in the field of telecommunications was asked the following two questions:

- What would you say is the difference between the Swedish and the Japanese market in terms of available technologies and services for mobile phones?

- What technology or service do you think will be the next major hit in Sweden?

Beyond these questions each interviewee was asked some questions related to their field of expertise. From the replies new topics were compiled and used for further discussion.

Appendix B

Questionnaire for determining what services and technologies there is a demand for in Sweden. The questions are in Swedish to make it easier for the interviewees.

Vilka av dessa tjänster skulle du vilja fanns i Sverige?

[Lista på tjänster + kort beskrivning av varje och kryss-svar och under varje tjänst kommer följande frågor]

Q: Om du skulle välja operatör idag, skulle det spela någon roll ifall operatören hade Tjänst_N tillgänglig?

A:
-Ja, jag skulle hellre välja den operatören som har den här tjänsten.
-Nej, den här tjänsten är inte så viktig för mig.

Q: Skulle du kunna tänka dig betala en avgift för att få använda Tjänst_N?

A:
-Nej, det ska vara gratis
-Bara en låg avgift (upptill 10 kr/månad)
-Ja, mer än 10 kr/månad
-Annat, _____

Vilka av dessa tekniker skulle du vilja fanns i Sverige?

[Lista på tekniker + kort beskrivning av varje med kryss-svar och under varje tjänst kommer följande fråga]

Q: Om du valde mellan två mobiler som är likadana i övrigt men att ena har Teknik_N, skulle du då hellre välja mobilen med Teknik_N?

A:
 -Nej, den här tekniken är inte så viktig för mig.
 -Ja, men bara om de två mobilerna kostar lika mycket (eller det skiljer mindre än 300 kr i pris).
 -Ja, även om mobilen med Teknik_N är dyrare.
 -Annat, _____.