Mobile Services in Estonia

Policy Analysis No 2

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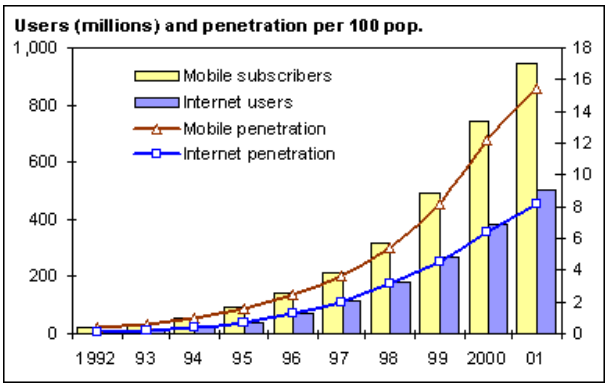
Contents

Introduction

It is now clear that the impact of mobile technologies has been greater than most of us expected 10 years ago. Within a decade, mobile phones have evolved from devices that were used by a few technology enthusiasts and business-men for calling, to "remote controls for our life[1]" that most of us use several times a day, and not only for calling, but also for sending messages and using mobile services. Beside Internet, mobile technology is the other most important driver of the information society:

> "The mobile revolution is changing the way we live and work. Mobile phones are already pervasive in all major developed economies and in an increasing number of developing ones too... The mobile Internet is a powerful enabling technology that will make possible new services and applications".[2]

Mobile devices, always with the user, enable information to be reached from more places, extending the reach of the Internet.



Source:International Telecommunications Union (ITU) 2002. „The Internet for a Mobile Generation"

Also, mobile penetration exceeds Internet penetration, which enables information society services to be reached by more people:

> "The mobile phone promises to do the Internet what the telephone did for telegraph: to make it a truly mainstream technology…. Many people expect the mobile Internet to be the same as the wired version, only mobile, but they are wrong… Instead, the mobile Internet, although it is based on the same technology as the fixed-line Internet, will be something different and will be used in new and unexpected ways." [3]

There are two hotspots of mobile technologies in the world[4]. One of them is in Japan, where the local mobile operator NTT DoCoMo, established in 1999, has attracted a 28 million paying customers in less than two years to a completely new service called *i-mode*, a Japanese version of mobile Internet; and launched the world's first successful 3G trial in 2001.[5] Another hotspot is Scandinavia, where mobile technology companies Nokia and Ericsson have made Finland and Sweden two of the most wired countries in the world, leading both in Internet and mobile penetration.

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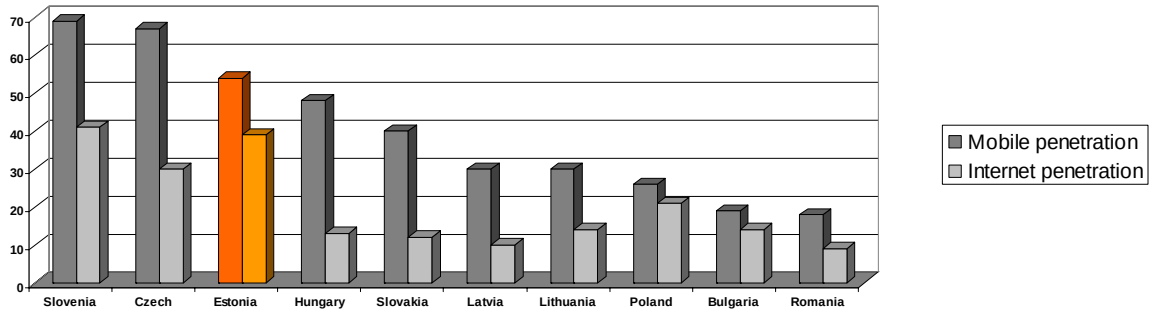
[1] Rheingold, Howard. 2002. *Smart Mobs: The Next Social Revolution.* Cambridge: Perseus, p. xii.
[2] International Telecommunications Union (ITU). 2002. „The Internet for a Mobile Generation" Executive Summary, http://www.itu.int/osg/spu/publications/sales/mobileinternet/exec_summary.html
[3] Standage, Tom. 2001. „The Internet Untethered" Economist, 11 October 2001, http://www.economist.com/surveys/displaystory.cfm?story_id=811934
[4] See for example Rheingold, Howard. 2002. *Smart Mobs: The Next Social Revolution.* Cambridge: Perseus. Chapter 1: „Shibuya Epiphany" p. 1–29.
[5] *Ibid*, p. 8.

Estonia, situated across the Baltic Sea from Finland and Sweden, has benefitted from several spill-over effects of the closeness to Scandinavian countries, and is among both the most wired and wireless countries in Central and Eastern Europe, with Internet penetration of over 40% and mobile penetration of over 60%[6].



Mobile penetration as December 31, 2001. Internet penetration as of March 31, 2002. Source: PwC Consulting "1st Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector). July 25, 2002

However, in the field of mobile value-added services, i.e. the services that go beyond the traditional phone-calls, Estonia has achieved some remarkable results. Some of those services have been more successful in Estonia than in other Central and Eastern European (CEE) countries, perhaps even more successful than in Finland and Sweden. Estonia was the first country in the world to have mobile positioning in commercial use and one of the first to have 112-emergency calls linked with mobile positioning system to determine the origin of each call. Estonian system for using mobile phones to pay for parking has achieved a remarkable penetration. In 2002, Estonia has launched several successful mobile commerce projects. Estonia is used as a test-bed for mobile services by some leading mobile infrastructure providers.

The current study takes a closer look at the past, present and future of mobile value added services in general, as well as more specifically in Estonia. The discussion is divided into four parts:

- First part, *context*, where the nature and pre-conditions of mobile value-added services are explained and key players in the mobile value-added services arena are introduced.

- Second part, *case-studies*, where some of the most innovative Estonian mobile services are presented and examined in detail.

- Third part, *analysis*, where the financial figures, export potential and impact of mobile value-added services in Estonia and in general is analyzed

- Fourth part, *commentaries*, where the issues of 3G, mobile payment infrastructure, service design, and m-government are treated in detail, and recommendations for continuous development in these areas are given.

While this study focuses on Estonia, the universal nature of the topic and the intentions of the author both work towards the goal of making the study and its findings useful for other countries, especially to those, who will go through the same process in the coming years.

[6] Sources: http://www.emt.ee, http://mobiil.kolhoos.ee See also Kalkun, Mari and Kalvet, Tarmo (Eds). 2002. *Digital Divide in Estonia and How To Bridge It*. E-book. Tallinn: PRAXIS.

1. Context

1.1. Evolution of mobile technologies

The history of mobile phones dates back as far as 1946, when the US telecommunications company AT&T introduced the first mobile telephone service in St Louis, Missouri[7]. It included a device, mounted on a car, which enabled wireless voice transfer over an average city-distance. The device, taking up the whole package room of a car, however, was very power-consuming and used the frequency very inefficiently. Although the service quickly moved to other 25 cities, the inefficient frequency use was a problem, which limited the possible number of subscribers to this, and other early attempts at mobile communication.

In the late 1970ies, Nordic telecommunications players agreed upon the first common standard of mobile telephony Nordic Mobile Telephone (NMT). NMT phones, or the 1st generation (1G) mobile phones, introduced in 1981, enabled analog voice call transmission and quickly became the dominant standard in Scandinavia as well as elsewhere in Europe and Asia. Yet, as there were other standards in Europe, a phone that worked in one country did not necessarily work in another.

In designing the next standard, this limitation was taken into account and all major European countries joined in to create a new, common mobile communications standard. In 1988, the technical specification of the GSM (Global System/Standard for Mobile Communications) was available and in 1991, the first GSM (2nd generation) networks were opened[8]. By the late 1990ies, GSM had completely replaced NMT in most European countries.

Although the possibility to use mobile networks and devices for data communication and mobile services including text, pictures, video, etc. were already envisaged in the early 1990ies[9], 2nd generation networks or phones were not thought to be capable of transmitting data speeds necessary for non-voice services. More advanced mobile services were expected to come with the next, 3G standard that had been drafted in the early 1990ies, but not expected to become operational before the early 2000ies.[10]

1.2. Rise of short-text-message

However, one phenomenon, emerging in the late 1990ies challenged the notion of the 2G being only suitable for voice services. SMS (short-text-message), the ability to send and receive text messages to and from mobile telephones, became unexpectedly successful, more or less the same time as young people began using mobile phones[11]. In the first quarter of 2002, some 24 billion text messages were sent worldwide[12], signaling that SMS, once conceived as „almost an afterthought in the GMS standard,“[13] had become a mainstream technology.

A report from Mobile Streams explains, text messaging has a lot of advantages such as that fact that is convenient, available on all phones and discrete .As such, the current Short Message Service has some

[7] Meurling, John, and Jeans, Richard. 1994. *The Mobile Phone Book.* LM Ericsson, p.16.
[8] *Ibid,* p. 111
[9] *Ibid,* p. 205-222
[10] *Ibid.*
[11] Garfalk, Connie. 2001. „Kids on the Move“ in Telenor Xpress, 1/2001, http://www.telenor.com/xpress/2001/1/kids_move.shtml
[12] International Telecommunications Union (ITU). 2002. „The Internet for a Mobile Generation“. Executive Summary, http://www.itu.int/osg/spu/publications/sales/mobileinternet/exec_summary.html
[13] Rheingold, Howard. 2002. „Shibuya Epiphany“. The first chapter in *Smart Mobs: The Next Social Revolution.* Cambridge: Perseus, p. 1 – 29

unique advantages that other non-voice services do not have such as store and forward (in the case that the recipient is not available, the short message is stored) and confirmation of message delivery. However, SMS also has some disadvantages such as limited message length (160 characters).[14]

Person-to-person SMS is still the most popular form of SMS, used especially by young people for various purposes[15], but it is not the only way to use SMS. Soon, people, companies and operators realized that SMS can be used to offer a wide range of additional services in the fields of entertainment, security, comfort, commerce, advertising etc – all those things that were initially considered to be „3G services". It turned out, that thanks to the popularity of SMS, many 3G services could already be offered with a 2G technology - there was no need to wait until 3G arrives. International Telecommunications Union points out that, in a number of countries, SMS has been the unexpected "killer application" that has sometimes—ironically—effectively delayed the introduction of 3G[16]"

1.3. Operators face declining average revenue per user and look for value-added services

Currently, most of the advanced markets are facing the slowdown of mobile penetration growth. Competition between operators is increasing, which in turn reduces the prices of phone-calls. Operators all over the world are facing a decline in one of their most essential financial figures - average revenue per user (ARPU)[17]. While initially, operators had expected 3G to make up for the declining ARPU of voice-services, the delays in 3G network implementation have forced them to look for revenues elsewhere.

One way to increase ARPU is to make existing voice-calls more effective, for example by improving network quality. The other is to foster the development of non-voice, value-added services that can "add value to the bits.[18]"

Mobile value-added services can be divided into two: those that stand alone and need not be coupled with a basic service; and those that do not stand alone but add value to an existing basic service[19]. For example, voicemail and redirection of voice-calls to a different number are both value-added services that add value to the voice-calls service. Redirection of voice-calls would not make any sense without the basic service, voice-calls.

On the other hand, services like mobile payment or mobile advertising are totally separate value-added services that are not dependant on voice calls or any particular basic service. These services use either voice, SMS, WAP or GPRS as *carriers*, but the real content and value of the service comes from elsewhere.

Both are important for mobile operators, but from the society's point of view, stand-alone mobile VAS are far more promising, as they enable to do completely new things or old things in new ways. While

[14] Mobile Streams. 2001. „Next Messaging: From SMS to EMS and MMS", http://www.mobilestreams.com
[15] See for example: Weilenmann, Alexandra, and Larsson, Catrine. 2000. „Collaborative Use of Mobile Telephones". NordiCHI2000 Proceedings, Stockholm, October 23-25, 2000, http://www.comlab.hut.fi/opetus/040/weilenmann.pdf; Kasasniemi, Eija-Liisa and Rautianen, Pirjo. 2002. „Mobile Culture of Children and Teenagers in Finland", http://keskus.hut.fi/opetus/s38001/s01/materiaali/4/rautiainen.pdf; Ling, Rich and Yttri, Birgitte. 2002. „Nobody Sits at Home and Waits for the Telephone to Ring: Micro and Hyper-Coordination through the use of Mobile Telephones", http://www.telenor.no/fou/prosjekter/Fremtidens_Brukere/Rich/Nobody%20sits%20at%20home%20and%20waits.doc
[16] International Telecommunications Union (ITU). 2002. „The Internet for a Mobile Generation". Executive Summary, http://www.itu.int/osg/spu/publications/sales/mobileinternet/exec_summary.html
[17] See for example: Gillot Research. 2002. „How Mobile Operators Can Realize the Full Potential of the Wireless Market". http://www.telespree.com/docs/iGillottReport_homepg6_11.pdf; Keuneke, Sthephan. 2001. „Enabling 3G Services – Portable and Interoperable". T-Mobile International.
[18] Keuneke, Sthephan. 2001. „Enabling 3G Services – Portable and Interoperable". T-Mobile International.
[19] *Ibid.*

complementary value-added services can only be offered by mobile operators, there are several possibilities for offering stand-alone value-added services.

1.4 „Walled garden“ vs open approach

There are two main approaches operators can take to mobile value-added services provision. The first is a „walled-garden“ approach, where an operator tries to offer everything itself. The other is open approach, where operators create an open platform that enables third parties to offer services at a revenue sharing basis.

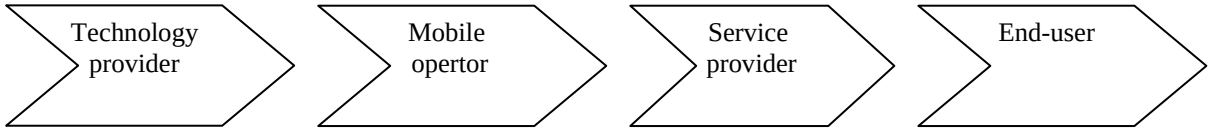
According to Napier, the “walled garden“ approach rests on several false premises, like “customer information needs can be met by a limited number of content providers“ or “operators can pre-determine which applications consumers value[20]“. As Napier points out:

> “Walled-garden approach assumes that with better planning and market analysis, the small operator team can determine what appeals to their customer base. There are two flaws with this approach. First, it does not allow for niche content that may have a small, but loyal following. Individually, these content developers do not have mass appeal, but collectively, there is huge potential revenue. Second, it requires a constant effort and overhead to evaluate the applications and insure there is end user appeal. Hint to operators: free markets are more efficient.[21]“

While initially “walled-garden“ approach had quite a few followers among big European telecommunications operators, the Japanese experience (where there around 48 000 service providers for *i-mode*) as compared to the US experience (where only operators provide value-added services[22]) has shown open approach to be more beneficial and most European operators have adopted it. Keuneke from T-Mobile, a German mobile operator, notes:

> “We do not know exactly which applications will bring revenue. We can not afford to ignore niche-markets and therefore we need a large number of specialized applications. Successful Internet model has shown that a million tries produces a couple of real hits (e.g. IRC, Amazon, eBay, Napster). Dotcoms are experts for end-users ‘non-voice needs’, not operators. If all operators would choose ’walled-garden’-concept, dotcoms would find ways to substitute operators[23]“.

As a large majority of, if not all, European operators have adopted open-approach to mobile value-added services provision, this has re-arranged the mobile services value-chain, adding a new player: *value-added service provider*[24], who uses the the infrastructure made available by the operators on a revenue sharing basis to offer stand-alone mobile value added services (VAS).



1.5. Major players in the Estonian mobile value added services value-chain

1.5.1. Technology providers

[20] Napier, Chuck. 2002. „Overcoming declining ARPU: Carriers and Content Providers Working Together“, http://www.wirelessreport.net/guestcolumns/january/chucknapier.html
[21] *Ibid.*
[22] *Ibid.*
[23] Keuneke, Sthephan. 2001. „Enabling 3G Services – Portable and Interoperable“ T-Mobile International.
[24] J. V. Blázquez de Julián „Value added mobile services“, http://www.tid.es/presencia/publicaciones/comsid/ing/articulos/vol812/value/value.html

Although Estonia itself does not have any important technology providers, we benefit from the proximity of Nokia and Ericsson, two of the world-leading Scandinavian mobile handset and network technology manufacturers. Ericsson, for example, is very active in Estonia. In collaboration with Tallinn Technical University and EMT, the largest mobile operator, it launched a mobile services testing centre called MAI center (a.k.a. Mobility World) in 2000. The center provides a test environment for services as well as learning opportunities for students, developer companies, and service providers, regardless of brand or affiliation. Several location based services that have been launched, have been tested in the MAI centre.

1.5.2. Mobile operators

There are three mobile operators in the Estonian market:

Name	*Established*	*Ownership*	*Clients*	*Website*
EMT AS	1991	AS Eesti Telekom[25]	430 700[26]	www.emt.ee
Radiolinja Eesti AS	1995	Finnet Group (Finland)	156 600[27]	www.rle.ee
Tele2 Eesti AS	1997	Tele2 (Sweden)	350 000[28]	www.tele2.ee

EMT, grown out of the national telecommunications monopoly, has always been a market leader. In the recent years, its share has been declining, but it still has attracted most business users and has the highest ARPU[29] of all the three. Second in ARPU, but third in market share is Radiolinja[30]. Tele2, the youngest of the three, positions itself as the price-leader, has a large share of pre-paid customers, and has the lowest ARPU. In 2003, two mobile virtual network operators (MVNOs) are expected to enter Estonian market[31].

1.5.3. Service developers and providers

There are around ten key service mobile value-added service developers and providers in the Estonian market:

Name	*Brand*	*Core competence*	*Ownership*	*Product development in Estonia*	*Website*
AS Inpoc Baltics	Inpoc	Mobile entertainment	Schibsted Group (Norway)	No	www.inpoc.ee
Jippii Estonia AS	Jippii	Mobile entertainment, games and portal	Jippii Group (Finland)	No	www.jippii.ee
Mobi Solutions OÜ	Mobi	Mobile services development and provision	Estonian private	Yes	www.mobi.ee
OÜ Oskando	Oskando	Telematics products and services	Estonian private	Yes	www.oskando.ee
OÜ Plusdial-	Plusdial	Mobile ticketing	Plusdial	No	www.plusdial.com

[25] AS Eesti Telekom is owned by Sonera (Finland) 24,5%, Telia (Sweden) 24,5%, Estonian government 27%, public investors 24%
[26] Includes contractual and prepaid as of 31 March 2003, source: Eesti Telekom, http://www.telekom.ee/dl_file.php3?lang=est&fail=68&/Kommentaar_est_EEK.pdf
[27] All contractual, as of 31 March 2003, source: Radiolinja.
[28] Including contractual and prepaid. Given number is an estimation, as Tele2 does not publicly disclose its client figures.
[29] EEK 452 for the year 2001. Source: Annual report of Estonian Telekom, p 16.
[30] See http://www.radiolinja.ee
[31] Source: Estonian press.

MTSP-Estonia			(Finland)		
Regio AS	Regio	Location-based services, MMS	Estonian private	Yes	www.regio.ee
Tele-A OÜ	Telejazz	Mobile entertainment, mobile portal	Estonian private	Yes	www.telejazz.com
Trigger Software OÜ	Trigger	Portal and other software development, SMS services development	Tele2 (Sweden)	Yes	www.trigger.ee
Voicecom OÜ	Voicecom	IVR services development	Estonian private, EMT (25%)	Yes	www.voicecom.ee
OÜ Wap Oneline Eesti	Buum.net	Mobile entertainment, mobile portal	Wap Oneline (Finland)	Yes	www.buum.net
OÜ Yoyota Eesti	Yoyota	Mobile entertainment, mobile portal	Estonian Private	Yes	www.yoyota.ee

2. Case-studies

In this part of the paper, an overview of Estonian mobile value added services will be given. Here, only stand-alone value-added services are considered (voice-mail, and redirection of phone-call type of services are excluded). The choice, which services to include in the analysis, was made based on two criteria: first, a service has to have an innovative value; and second, this value must have been added in Estonia.

Innovation, often incorrectly used as synonyms for "new" or "invention," is a concept introduced by Austrian-American economist Joseph A Schumpeter. According to Schumpeter, innovations are new products, processes or distribution or financing mechanisms that are brought into the economic process with an aim of gaining competitive advantage or short-term monopoly.[32] It is important that innovation had an economic impact – if it is a novelty that is not commercialized, it is not an innovation. Until the first mobile phone was sold, it was not an innovation, but rather an invention.

In the context of this survey, *an Estonian mobile value-added service* is something that can be either completely new, unique and was first implemented in Estonia (radical innovation), or the service that has existed in other countries before, but the Estonian version was developed independently of other versions and its technical solution and its effects differ significantly from those in other countries (incremental innovation)[33].

Applying these criteria, the following 6 services were selected as a basis for this survey and analysis: mobile parking, mobile transport ticketing, mobile commerce, location-based services, telematic services, and mobile voting. Each of these will be discussed in detail.

2.1. Mobile parking

Mobile parking, launched by the mobile operator EMT in June 2000, is generally considered to be the first wide-spread, and the most successful mobile value-added service in Estonia.

[32] Schumpeter, Joseph. A. 1939. *Business Cycles.* See also: Drechsler, Wolfgang. 2001. "Mis on innovatsioon?" in Postimees, Oct 27, 2001, http://www.postimees.ee/index.html?op=lugu&id=40337&number=364&rubriik=6

[33] For discussion on radical and incremental innovation, see for example: Christensen, Clayton. 1998. *Innovator's Dilemma.* HarperBusiness; Freeman, Chris. 1994. „Technological Revolutions and Catching-Up: ICT and the NICs". In: Fagerberg, J., Verspagen, B., Tunzelmann, N. von (Eds.), *In The Dynamics of Technology, Trade and Growth.* Aldershot: Edward Elgar, p. 198-221

It provides an alternative, more convenient, method for paying for parking in four Estonian major cities, where the main payment method so far has been coin-operated ticket-machines.

To use the mobile parking client calls a short number, opens a virtual parking account, and adds a fixed sum of money to it. To begin parking, the customer sends an SMS message with the license number of the car and the location code of the area he is parking in, to a short number. To end the parking session, a customer calls to the same short number. Parking charge is added to customer's monthly phone bill. Parkers who use mobile parking should have a mobile parking sticker attached to the windshields of their cars. The controllers use mobile phones, and can use SMS or a special built-in menu to see, if any particular car is currently paying for parking[34].

The main advantages of mobile parking for the consumer are convenience (one does not have to get out of the car, nor need coins, etc.) and accuracy of payments. Using the conventional parking ticket systems which require the customer to specify the parking time in advance, the amount of time a person pays for parking is usually either bigger or smaller than the amount of time he actually parks. With mobile parking, the time parked and the time paid for is exactly the same.

As a downside, SMS-cost is added to the price of the parking ticket. An average parking ticket costs about 10 EEK - the SMS-cost of 2.50 increases the whole cost of parking by 25%. Yet this has not proven to be a problem, as the parkers are not very price-sensitive.

In 2002 in Tallinn 40% of the parking payments are made via mobile. In other cities (Tartu, Pärnu and Kuressaare), where mobile parking was introduced later, the figure is smaller. Initially, m-parking was open only for EMT clients, but since 2001, Radiolinja and Tele2 clients can also use it. EMT has also licensed the m-parking solution to a Norwegian operator.

2.2. Mobile transport ticketing

In summer 2002, two different mobile transport ticketing pilot projects were launched in Tartu and Tallinn. In June, a SMS-based solution was launched in Tallinn by Regio and Mobi Solutions, followed closely by a voice-based solution in Tartu by EMT.

The main idea is to give the commuters a possibility to buy bus, tram and trolley-bus tickets with their mobile phone, offering more convenience and reducing the amount of paper-based tickets in circulation. Although SMS-transport tickets had already been in use earlier in Helsinki, both Estonian solutions were developed in Estonia. Solution-wise, they differ significantly from each-other, as well as from the Finnish solution.

To buy a ticket, in Tallinn, a commuter can buy an one-hour ticket by sending an SMS to a short number and receiving a SMS with a ticket, which has the serial number and expiration time. The cost of a ticket is added to consumer's monthly phone bill. The controller verifies the ticket by looking at it and typing the serial number into his mobile phone[35].

In Tartu, a commuter can buy various period tickets (1-hour, 1-day, 30-days) by calling a short number. The cost of a ticket is added to consumer's monthly phone bill. The ticket arrives with an SMS, and it is verified the same way as in Tallinn. In addition, people can purchase a special proximity card that enables a controller to check the authenticity of the ticket by touching it with a special device, thus saving the time of typing in the serial number[36].

[34] Source: EMT, http://www.m-parking.net
[35] Source: Regio and Mobi Solutions
[36] Source: EMT

The main benefit of mobile transport ticketing as compared to traditional ticketing, is bigger convenience for users. The downside is higher "distribution cost" as compared to traditional paper-based tickets. Large part of the "distribution cost" is made up of communications cost (i.e. the cost of the SMS or the phone-call that the user makes for ordering the ticket with a mobile phone), which in case of lower-priced tickets can be as large as 20-40% of the end-user price as compared to less than 10% figures for traditional ticket distribution.

Tallinn pilot project ran from July to August 2002 on 5 public transport lines out of 65. During that time 16 000 tickets were sold, averaging 340 tickets a day[37]. The project was termed a success by all the involved parties (commuters, controllers and the city) and is likely to be extended to all public transportation in Tallinn, as the part of a whole-new electronic ticketing system, becoming operational in the late 2003 or early 2004. In Tartu, 300 tickets were sold during the first week, most of them being hourly tickets[38]. The testing period ended in May 2003, after which the project was evaluated as successful and continued as the commercial service.

2.3. Mobile commerce

The first attempt at mobile commerce in Estonia was made in 1999, when a special Coca-Cola vending machine was put to the lobby of EMT headquarters. By dialing a short code, one could buy a can of coke of 10 EEK, the price of which was added to the buyer's monthly phone bill.

This solution, while good for public relations and marketing purposes, did not, however, prove itself to be a viable mass-market solution for selling physical goods because of the high credit risk - there was no guarantee that a person, after having emptied all the coke-machines in the city, pays his monthly phone bill.

The banks became interested in mobile payments in late 2001 - Hansapank and Ühispank, two of the biggest banks with a combined market share of about 90%, together with Eesti Pankade Kaardikeskus, a credit-card payments clearing company, co-owned by the same banks, decided to introduce mobile payments, designed for selling physical goods, where the money is taken directly from the user's bank-account.

M-payments pilot project for test group started in summer 2002 and ran until 31 October; the system was opened for everyone in November 2002.

In order to accept mobile payments, a merchant has to make a contract with the bank, and he is given a m-payments code. There is no contract fee, and no monthly fee, the transaction fee per each transaction is the same as in credit-card payments – around 3%. A client, before he can make mobile payments, must also make a contract with a bank, tying his mobile number to his bank account.

To pay, the client has to call *1214*shopcode*kroons*cents* (for instance, *1214*1008*50*, to pay 50 EEK to a merchant no. 1008), and accept the payment by pressing confirmation key (in case of larger payments, a four-digit security code) on his mobile keypad. In a few seconds, the merchant gets an SMS-message to his mobile phone which confirms that the payment has been made and he can give the buyer the goods[39].

The goal of m-payments, looking from the banks' side, is to decrease cash circulation by providing a cheap alternative to credit-card payments. Good examples of merchants who might be interested in mobile payments are small shops that have not introduced credit-card payments because of the high

[37] Eesti Päevaleht, 23 August 2002, http://www.epl.ee/artikkel.php?ID=212794
[38] Source: EMT, http://www.emt.ee/est/html4/?smg=uudised&schg=arhiiv&nt=314
[39] Source: Hansapank and Ühispank, http://www.estcard.ee

cost of credit card terminals; and merchants who sell in places where it is difficult to establish an internet connection required for the operation of credit-card terminals (i.e. open-air events and taxis).

According to the survey conducted after the pilot project, 52% of the participants were willing to use the system daily, and an additional 47% in occasions where cash or credit-card is not available – only 1% was not willing to use it in any circumstances[40]. Also, 82% of the survey participants preferred the money to be taken from their bank-account instead of adding it to the mobile phone bill – the latter was the preferred option for only 9% while another 9% had no preference.

2.4. Mobile positioning services

In 1999, Tartu-based developer of mobile services, Regio developed software for Ericsson's mobile positioning technology called PinPoint Mgine that increased the accuracy of mobile positioning about 2-8 times to 100-500 meters[41]. Estonian mobile operator EMT was the first to install the software to its network and the first operator in the world to start offering location-based services (LBS).

While end-user and corporate location-based services, such as location-sensitive info, friend-finder, vehicle tracking, location-sensitive marketing etc. are expected to become popular in the coming years[42], the first LBS implemented in most countries is a public service – emergency call positioning. The service, often called enhanced112, e112, or e911, shows on emergency call center worker's computer a map with the location of the person who is making an emergency call.

The main benefit of the system is an ability of the emergency service to react quicker in case of emergencies. United States' Federal Communications Commission made it compulsory for all operators to be able to offer location-detection of emergency calls to be able to detect location already by October 2001, and European Union has made a similar requirement to be reached by July 2003[43]. Estonia was the first country, where in February 2000 due to the joint efforts of Regio, Ericsson, EMT and Estonian Rescue Board e112 became operational.

Several other Regio positioning solutions, such as a friend-finder (where people can use SMS, WAP or Internet to determine the location of their friend's mobile phone, when their friend has given them permission) and bomber (a location-based game, where two persons play against each other trying to guess the actual distance between them with a goal of hitting the other player with an "SMS-bomb") have been first introduced in the EMT network, and later exported to other Eastern European countries through Ericsson's sales channels.

2.5. Telematic services

Telematics, another interesting sub-field of mobile value-added services, enables one to control various devices via a mobile phone, coming closest to what Rheingold meant when he called mobile phone a "remote-control for one's life"[44]. In Estonia, such services are offered by Tallinn-based developer Oskando, a local associated partner of Ericsson Estonia.

The following are a few examples of telematic services. Gate Controller is an example of a device mounted on automatic gates or doors which enables the owner or otherwise authorized persons to open and close the gates and switch on and off other devices with a phone-call and SMS-messages. Its

[40] Survey statistics are based on: Käosaar, Mati. 2002. „Mobiilmaksete ühisprojekt". Presentation in Mobile Communication Applications seminar in Tartu, 28.10.2002., http://park.tartu.ee/iktk
[41] Source: Regio, http://www.regio.ee
[42] See for example: Accenture. 2002. "The Future of Location Based Services" http://www.accenture.com/xd/xd.asp?it=enWeb&xd=Services\Technology\tech_lbservices.xml
[43] http://www.mobilein.com/wireless_emergency_services.htm
[44] Rheingold, Howard. 2002. *Smart Mobs: The Next Social Revolution.* Cambridge: Perseus, p. 1.

usage areas so far have been opening and closing gates of closed parking zones and controlling an entrance gate to a concert, where people could enter by buying a ticket via mobile phone.

House Controller, is a convenience-service, which when installed to one's home, office, summer-cottage or industrial facility, enables one to control the electrical heating, internal and external heating, security systems and turn on and off sauna via mobile phone. Nevertheless, it is not expected to become a mass service, but rather stay as a niche-product, with its sales figure in the home market around 300.[45]

Car Controller is a device, which offers possibilities to control car security and auxiliary devices via mobile phone. Its functions include alarm controlling and monitoring, central locking control, heating device control, car blocking (e.g. fuel pump switching off), and GPS and MPS positioning. The latter has turned out to be the most useful feature of the product, as it has already helped to track and retrieve several stolen cars[46].

2.6. Mobile event services

While SMS-based chat and games in television are common in many countries, a Tartu-based company Mobi Solutions[47] developed a unique solution which enables similar chats, polls and games to be offered in any event. Launched in summer 2001, the solution has been used in about 60 events, including an SMS-quiz in Elton John's Tallinn concert in July 2001, Eurovision Song Contest in Tallinn in May 2002, and about 40 business-conferences in Estonia and abroad.

At an event a question is displayed on screen, along with possible choices for an answer. Each choice has a letter associated with it. People use their mobile phones to choose an appropriate answer for a question, and send it's letter via SMS to a short number. Results are in real-time shown on display screen, with each SMS affecting the final outcome.

The service has proven to be a cost-effective alternative to voting-machines at a conference, and an addition to entertainment events. Since 2003, it has been also exported through Ericsson's Associate Program to other European countries.

3. Analysis

According to Estonian and foreign press, Estonian mobile services have been rather successful. Press coverage as such, however, does not measure success, for which the assessment of market impact that mobile services have had, is needed. According to the concept of innovation, discussed earlier, new products and services can be called innovative only if they have some impact on the market. The willingness of consumers to pay for the service separates innovations from inventions. This section of the survey will look at the financial performance of mobile services, their income and profitability on the home market as well as in exports.

However, quantitative indicators like financial data and usage figures are not always sufficient for judging the success of a service. This is especially true about the emergency 112 service, where neither the financial nor usage play a role in determining the success, but rather the amount of lives saved by the enhancement. In the same vein, the following analysis will scrutinize not just the market impact but also qualitative impact, both positive and negative, of mobile services on people's lives.

[45] Kalev, Raul. 2002. "Mobiililt juhitav kodu toob kokkuhoidu" in Äripäev, juuni 2002 at http://www.oskando.ee/artiklid/it_hc1.htm
[46] See: http://www.epl.ee/artikkel.php?ID=212575, http://www.postimees.ee/index.html?number=584&op=lugu&id=68227
[47] Disclaimer: The author of the current study is an empolyee and co-owner of Mobi Solutions OÜ.

3.1. Estonian market in figures

While a thorough financial analysis of the Estonian m-services is beyond the scope of this study, I will present a brief analysis of the turnover and profit of the services as a relation of the GDP, to give an indication about the economic volume of mobile value-added services.

Arguably, M-parking is financially the most successful Estonian mobile value-added service. It has an annual turnover of 0,5 million EUR, and leaves EMT with a profit of a about EUR 20 000 each year[48]. M-parking, being the biggest VAS, accounts only for 0,4% of the total income of EMT[49]. Its share of the profits of EMT, which were around EUR 50 million in 2001, is even less remarkable, accounting for less than 0,1%.

Currently, about 50% of all the parking payments in Tallinn are made with mobile phones. In other cities, the usage is lower. It can be implied that the service has not reached its peak yet and the turnover is expected to rise, perhaps even twice, in the next few years. Even considering the potential twofold increase of turnover caused by the service reaching its peak usage, the financial size of the most successful Estonian mobile service in the home market still remains small and has no significant impact on the economy. Neither does the combined amount of all the services have a significant impact. The whole size of mVAS market in Estonia is estimated by experts to be around EUR 3-5 million[50]. Currently, this makes up about 0,05% - 0,08% of the Estonian GDP of EUR 6,1 billion.[51] Gartner group recently revealed that mobile value-added services currently make up at around 2% of the income of European mobile operators, expecting it to rise to 8 times by 2006. Yet even an 8-times increase would leave the share of mobile services to be well below 0,5% of the GDP.

Out of the six services analyzed above, only mobile parking claims to be profitable. Several services are breaking even (mobile positioning, telematics, mobile event services),[52] while the rest (mobile transport ticketing, mobile commerce) are too new to have any meaningful financial data about them yet.

Lack of profits is not surprising, considering that all the services operate in a high-growth market. This dynamic is explained by the Boston Matrix, which helps companies to classify the products (or businesses) on the basis of their market share relative to that of their competitors and according to the rate of growth in the market as a whole.[53] In this matrix, the "cash-cow" is a product or service, which has a large share of a mature market and where little investment is needed to generate large cash-flow. "The dog" is a product or service, in its decline stage, which has a small share of a mature market, and which is taking more money than it is generating – thus, a company should get rid of it. "The star" is a product or service that has a large share of a high-growth market, hence it requires a lot of investment but promises to become a cash-cow once the market matures. Finally, "the question mark" is a product or service in its introductory stage that has a small share of a high-growth market, requires a lot of investments and thus has a negative cash-flow, yet if everything succeeds, the product might become "a star".

Considering the Gartner group predictions about the share of mobile VAS rising from 2% to 16% of operator's income, it can be said that the mobile value-added services is one of the fastest-growing market segments. Here there are still no "cash-cows" or "dogs" either, which both are common to mature low-growth markets, but only a few "stars" and "question marks."

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[48] Source: EMT
[49] The total income of EMT was 2 billion EEK in 2001. Source: Annual report of Eesti Telekom 2001, p. 10
[50] Includes the turnover of all the service providers, as well as value-added services of mobile operators. Source: mobile operators
[51] Source: PwC Consulting "1st Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector)". July 25, 2002.
[52] Source: service providers
[53] See for example: http://www.nvq5.com/businessreview/boston.htm

3.2. Export of the services

Most developers consider Estonian market of 1.4 million inhabitants and around 0.8 million mobile phone owners barely big enough for services to break even. As Raul Vahisalu of EMT has noted:

> "Considering the small size of the market, the life-cycle of different technologies, and their bigger-market-oriented pricing, service providers have to constantly struggle to earn back the investments made to the mobile services.[54]"

This has led companies to look for larger markets. The survey of Estonian ICT cluster reports that due to high foreign demand, the export of Estonian ICT industry has increased rapidly, with Finland and Sweden being the largest business-partners with 84% of the ICT exports going to these two countries.[55] However, on the downside:

> "most of the rise can be assigned to a single company's activity – Elcoteq (which manufactures mobile phones for Nokia and until recently, Ericsson – R.R.) provides 83% of the total Estonian ICT exports and 96% of telecommunications equipment exports ... The share of services, comprising only 4%, was marginal in total Estonian ICT exports ... The neighboring Scandinavian countries have by far a more balanced trade portfolio, as services account for one third of their ICT exports[56]"

As the above statistics clearly indicate, Estonian mobile products and services exported to foreign countries have been few. EMT has exported mobile parking to Norway and some mobile services have been exported to neighboring countries Latvia and Lithuania. Export to other countries has been very rare. ICT cluster study also argues that the main export impeding factor is the small resource pool of Estonia, and concludes that:

> "Estonia alone is unable to gain the critical mass needed to access international markets. International cooperation is therefore essential in gaining experience and skills, in adopting innovative solutions to the market needs, and for obtaining more market power via strategic alliances.[57]"

The most successful Estonian example of exporting of mobile value-added services has followed exactly this model. Tartu-based developer Regio has signed a global partnership agreement with Ericsson, where Regio mobile positioning and MMS products are added to the product portfolio of Ericsson, and sold by Ericsson's sales representatives all over the world. In 2002, the co-operation had first successful results, as Regio's products were sold by Ericsson to several Central and Eastern European mobile operators.

3.3. Impact on the quality of life

Ling discusses four most important social and cultural impacts of the mobile telephony, out of which three are positive and one is negative.[58]

The first aspect is the increase of *safety and security*, where the main benefits of the mobile phone are seen in the possibility for parents to feel more secure about the safety of their children, the elderly to get help in case of emergency, and an easier possibility to call for help in case of road accidents and

[54] Vahisalu, Raul. 2001. "M-kommerts Eestis". Presentation in Tartu, Fall 2001, http://park.tartu.ee/iktk
[55] Kalvet, Tarmo, Pihl, Tarmo, Tiits, Marek. 2002. *Analysis of the Estonian ICT Sector Innovation System*. Executive Summary. Archimedes: Tartu, p. 20
[56] *Ibid*
[57] *Ibid*, p. 27.
[58] Ling, Rich. 2002 "The Social and Cultural Consequences of Mobile Telephony as seen in the Norwegian Context". Telenor Scientific Report 9/2002

other injuries. The second aspect is a more effective *micro-coordination* of everyday life, saving time and money, for example by enabling to change trips en-route and avoiding needless travel. The third aspect is *accessibility*, especially important for the young, as mobile phone makes accessing friends easier and facilitates social relationships.

A negative effect of the mobile phone that Ling brings out is its disturbing effect in public places, like restaurants, public transportation, shops, etc., mostly because mobile phone conversations are usually louder than normal conversation and force people to eavesdrop other persons' conversations[59].

The effects of mobile value-added services are somewhat similar to those of the mobile phone in general. Many VAS serve the same needs that voice-calls do, although in a different way. For example, e112 contributes to our safety and security by letting the emergency workers know where we are, when we call emergency. So does car positioning by letting us track the location of the car, in case it is stolen. SMS-based information services, and "find the nearest" type of location-based services contribute to micro-coordination, saving us trips by providing us timely information. And SMS-chat and SMS-based flirting services, popular among teens, arguably contribute to the development of relationships.

4. Commentaries

The commentaries part is divided into three main areas: first, infrastructure, second, service design, and third, the new areas of application for mobile technology.

4.1. Infrastructure

4.1.1. Telecommunications infrastructure

None of the value-added mobile services would have been possible without the investments mobile operators have made to build an adequate telecommunications infrastructure. GSM network was built with the purpose of making voice calls only, but it turned out to be suitable for offering a wide range of value-added services as well. While most of the revenue of the network does not come from value-added services, none of the latter, however, would have been possible without the network. The success of Estonian mVAS has a lot to do with the fairly advanced, world-class GSM infrastructure, which supports among other things premium priced SMS, mobile positioning, WAP and GPRS.

While it is true that a large number of mVAS can be offered with current network technology, there are services that do need 3rd generation networks. Video streams, transmission of documents, high-quality images, etc, that are estimated to be the main driving applications of the next generation[60], do require network speeds far greater that current generation can offer.

It is expected that 3G services will bring revenue to operators. However, it is not yet clear how big this revenue will be. In the last two years, optimistic predictions of the earlier years have been critically revised, and potential revenue projections decreased. A recent report by Forrester Research claims that most European 3G-operators will not break even before 2014, with only exceptions being Finnish and Swedish operators that are expected to break even in 2010-2012, because in those countries, the government did not hold auctions to distribute 3G licenses, but gave them away for free[61].

[59] *Ibid*, p 10.
[60] Mobile Streams. 2001. „Yes to 3G". Whitepaper, http://www.mobilestreams.com
[61] Forrester Research report http://www.forrester.com/ER/Research/Report/Summary/0,1338,15658,00.html, Oct 14, 2002

Although there exists a rationale for operators to upgrade to 3G on grounds that current 2G networks will not soon be able to support the increasing voice-traffic[62], high risk and long break-even period has made many operators hesitant to build 3G networks. The situation has been compared to prisoner's dilemma[63]: it would be most beneficial for all operators to co-operate and delay building 3G networks for a couple of years; yet, if one operator builds a 3G network, then all other major operators in the same market also need to build a network, otherwise they do not remain competitive.

The first 3G network in commercial use was opened by NTT DoCoMo in Japan in 2001[64]. 3G networks in Scandinavia are expected to be commercially open in early 2003. As of November 2002, Estonia has not yet distributed the 3G licenses, and no operator has made an investment to 3G yet.

Out of the two competing models to distribute 3G licenses – auctions, where the highest bidders got the license, and "beauty-contests", where licenses were given out according to business-plans – most of the countries chose the auction model. Yet the Finnish, Swedish and Japanese experience has proven the "beauty-contest" model to be more successful. Although governments made a total of EUR 105 billion worldwide from the 3G license auctions[65], the auctioning process was not healthy for mobile operators, many of were put into serious financial trouble[66] and some were forced to write off their 3G licenses as they did not have enough money left to build the network.[67]

As of early 2003, the 3G license distribution policy of Estonian government is finally taking shape. Following the experience of Scandinavian countries, beauty-contest with a moderate entrance fee was selected and 3-4 licenses shall be given out[68]. However, some mobile operators are hesitant, and voice opinions that license distribution and 3G network building should be postponed. They argue that it is better to wait and see how 3G takes off elsewhere, learn from other countries experiences, and try to benefit as long as possible from current generation of services[69]. None of the three operators, though, have said that they will or will not get a license.

While waiting perhaps makes sense in an isolated environment, the prisoner's dilemma does not let this strategy to be successful in an interconnected world. Since Finland, Sweden, and most EU countries have already distributed licenses and the operators have started to build the networks, if Estonian operators and service providers want to remain competitive, Estonian operators should do the same. Without at least a test-network operational in a home-market, it is not possible to build competitive mobile services and a decision that might make sense in the short run is damaging to the long-run success.

4.1.2. Mobile payment infrastructure

An important difference between a typical Internet service and a typical mobile service is the fact that using the mobile service has costs. While many e-businesses have searched desperately to find a

[62] „There is a clear business case for investing in 3G for existing network operators that are facing congested 2G networks. Voice traffic over 3G networks will be the cash cow that supports and ensures the 3G business case can pay for itself. The main positive (rather than defensive) reason for mobile network operators to secure 3G network licenses is to solve capacity issues in terms of enabling far greater call capacity than today's digital mobile networks allow". – Mobile Streams. 2001 „Yes to 3G". Whitepaper

[63] See for example Aavo Kokk. 2002. "Kui teaks mida ta teeb", in Eesti Päevaleht, Nov 6, 2003. http://www.epl.ee/artikkel.php?ID=219493

[64] Rheingold, Howard. 2002 *Smart Mobs: The Next Social Revolution.* Cambridge: Perseus Press.

[65] Source: International Telecommunications Union (ITU). 2002. „The Internet for a Mobile Generation". Executive Summary, http://www.itu.int/osg/spu/publications/sales/mobileinternet/exec_summary.html

[66] See for example „Who's to Blame for the State of European Telcos" in Europemedia.net, http://www.europemedia.net/showfeature.asp?ArticleID=13503

[67] See for example „Tele2 returns 3G licence following MVNO agreement with Telenor" , http://www.europemedia.net/shownews.asp?ArticleID=13580, Nov 11, 2002

[68] Source: Estonian Press

[69] Seppänen, Sami. 2002. „Kolm soovi kuldkalale". Postimees, Oct 11, 2002, http://www.postimees.ee/index.html?number=818&op=lugu&id=77600

business model, and even larger number of e-businesses have gone bankrupt without ever finding one, for a mobile services the business-model is simple: the revenue is generated by the end-users who pay for the service. The unclear part is the exact method how to pay for the particular service. There are several possibilities, each having their strengths and weaknesses.

Most mVAS today use the method where the cost of the value-added service is added to the monthly phone-bill of the user. This method has an advantage of being simple and convenient for the customer. The customer does not need to sign any extra contract to use the value-added service – a standard contract (or even a pre-paid card) from mobile operator is sufficient. However, adding the cost of the mVAS to the phone bill has a serious disadvantage when the payments get large or when the mobile is used to pay for physical goods instead of premium content. The fact that the consumer pays for the service after he has consumed it increases credit risk for the operator. Higher credit risk, in turn, raises transaction cost. If the payment method had no built-in credit risk, the operators would take a normal carrier cost (SMS-price or phone-call price), but due to credit risk, they are taking more, in some cases as much as 50% of the end-user price. Credit risk also imposes a limit on the maximum amount of payment, as the credit risk increases exponentially with the rise of the price.

For the further development of mobile commerce, more sophisticated payment methods are needed. There are three ways to develop such mobile payment infrastructure: bank-driven methods, mobile operator driven methods, and third-party driven methods.[70] Bank-driven methods usually include taking the money directly from the bank-account instead of adding it to the phone-bill or creating a special mobile payments account. An Estonian m-commerce project, described above, is an example of such a method in action. Mobile operator-driven methods usually include creation of a special account, where the clients of an operator can load money, for example from their bank-account. Mobile parking solution of EMT is an example, where such a payment model is used. Third-party driven methods vary[71], but generally they also include a special account where money has to be loaded. The main difference compared to operator-driven methods is the third-party methods' openness to the clients of all operators, which operator-driven methods rarely achieve.

So far, none of these methods has become so dominant that it would form a basis for a widely accepted world or even regional standard. Swedish wireless researcher Hallsenius notes that[72]:

> "The players in the wireless payment arena – the telecom operators, banks, credit card companies and retailers, the device manufacturers and software developers all agree that a standard is needed if the mobile devices are to become widely adopted means of payment. But while it is difficult to agree on technical prerequisites, agreeing on the business terms is even harder. New and unproven value chains have to be created, based on new and unproven business models. Each payment transaction creates a very small margin. And in wireless payments more players than in traditional payments want a share of the pie."

Yet, in an area where there are many conflicts of interests, it is difficult to imagine that a standard would emerge which does not have a strong involvement of banks and credit-card associations.[73] In the future, bank-driven methods are supposed to have the strongest position compared to the operator-driven and third-party driven methods.

4.2. Service design

[70] Hallsenius, Johan. 2001. „The Virtual Bank 2001: Operators Lead the Way but Banks Will Prevail" in BrainHeart Magazine, Summer 2001; and Vahisalu, Raul. 2001. „EMT nägemus m-kaubandusest"
[71] An overview of some of them, BrainHeart Magazine, Summer 2002, http://www.brainheartmagazine.com
[72] Hallsenius, Johan. 2001. „The Virtual Bank 2001: Operators Lead the Way but Banks Will Prevail" in Braveheart Magazine, May 2002, page 19.
[73] Ibid, page 63.

The following section discusses some of the good design principles that the service providers have kept in mind while designing successful services.

4.2.1. Focusing on the niches with most potential

Technology visionary Geoffrey Moore has outlined a modified version of technology adoption lifecycle, which consists of six stages[74]. First stage is the *early market* when a new technology or product arrives. Its customers in the early market stage are visionaries and technology enthusiasts, who want to be the first to get the new product and are willing to tolerate some inconveniencies of using it.

The second stage is *the chasm*, "a time of great despair where the initial interest wanes but the mainstream market is not yet comfortable with the immaturity of the solutions available".

The chasm can be overcome, though, by adapting to a *bowling alley* strategy of focusing on a specific niches and not trying to sell the product for everybody right away. Third stage, the *bowling alley*, Moore calls "a period of niche-based adoption in advance of the general marketplace, driven by customer needs and the willingness of vendors to craft niche specific whole products"

Fourth stage is *the tornado*, where the mass market embraces the technology or product, followed by *main street*, where the potential of a technology is fully exploited. And finally, *end of life*, where new technological paradigms take over the old ones and the product dies.

In the mobile value added services, the early market was in the last years of 1990ies, when technology visionaries first came to see the potential of SMS and the possibility of using the 2nd generation mobile phones for more than just talking. A good symbol of this in Estonia is the lone Coca-Cola vending machine in the EMT lobby, that enabled to buy a drink with a mobile, but was far too immature to be put on market and used by anyone else than a few technology enthusiasts.

To avoid falling into the chasm of trying to mass-market m-commerce solutions for buying and selling everything before technology and infrastructure were in place and people were comfortable with using the new technology, EMT chose a wise niche-based strategy. The first niche to be chosen for a mobile commerce solution was parking.

In the early 2000, the only way to pay for parking in Estonia was using coins. There were no ticket machines that could be operated by credit-cards or other easy-to-use ways. Mobile parking, offered by EMT, filled that gap, and made parking payments dramatically easier for all who were ready to invest some time to learning a new technology. Parking served as a perfect first niche for EMT to start offering mobile commerce solutions, because in this area a need for improvement was most drastically needed.

In 2002, almost 50% of the parking payments in Tallinn were made by mobile phone. Service providers have found additional niches where to focus to offer mobile commerce solutions. The early success of mobile transport-ticketing in Tallinn and Tartu, as well as that of the mobile commerce solution developed by Estonian banks has given the service providers more experience to make the technology better and train users to use their mobile phones for more than just talking.

Only now, after having success-stories from the first niches, operators and developers are starting to talk about extending the mobile commerce to all possible spheres: all kinds of ticketing, buying goods, lottery and gambling, etc – whatever one can imagine. Using Moore's classification, mobile commerce in Estonia is starting to move from bowling alley to the tornado, a stage where mass market fully embraces the product and many different mobile commerce solutions start to emerge.

[74] Moore, Geoffrey. 1995. *Inside The Tornado.* Capstone, p 25.

Similar trends of crossing the chasm through bowling alley strategies can be observed in case of other mobile services treated in this study. For example, mobile positioning services reached their early-market status also in late 1990ies, but for them, the first niche where it was successfully adopted was the emergency phone-calls. So far, however, other niches have not been so easy to come, and for mobile positioning, reaching the tornado will probably take some more time.

4.2.2. Keeping the services simple, cheap and bringing them fast to market

According to Michael E. Porter, one of the four determinants of country's success in a particular industry are *factor conditions*, by which Porter means physical resources, infrastructure, knowledge resources, capital resources, human resources, etc, available for the industry[75]. Nations succeed in industries where they have a good starting position as well as where they are good at creating and upgrading the most important factors.

However, sometimes competitive advantage can grow out of disadvantage of some factors. Porter notes[76]:

> "What is a disadvantage in a narrow conception of competition can become an advantage in a more dynamic one ... The need for factors, particularly basic and generalized factors, can often be circumvented, eliminated by innovation. Innovations to circumvent selective disadvantages not only economize to factor utilization but can create new factor advantages, because nations firms will innovate to offset selective disadvantages in ways that play to local strength, such as using available local infrastructure, materials or types of labour. Most importantly, however, innovating around basic factor disadvantage leads firms to *upgrade* by developing more sophisticated competitive advantages."

With Estonian GDP per capita being 4474 EUR as compared to the EU average of 23 411[77], a basic factor that is often available in low quantities is no other than capital. Few service providers have large sums of money available to invest, especially when the home market is small and the return on investment can not be guaranteed.

This has made the service providers and operators to look for ways to innovate around the capital shortage and forced them to keep the services as simple as possible. Two most used patterns stand out:

First, none of the services in this study were made completely from scratch, but were built on already existing infrastructure that had primarily been used for other purposes. Mobile parking and ticketing relies on the wide user-base and already existing billing solution of mobile operators. Enhanced 112 was built on the existing positioning software of Regio. Mobile commerce solution of Estonian banks was built on the already functional credit-card infrastructure. While it would have been possible to do these services from scratch, and perhaps build a more sophisticated and tailored infrastructure just for them, this approach was not chosen, as it would have dramatically increased the cost.

And second, the number of advanced features was kept in control for the sake of reducing the cost as well as time-to-market. None of the services in this case study fell into the trap of making a "perfect product". All the products in this study contained exactly as much features as was minimally needed for them to fulfill their purpose, and not more. Mobile parking is not all that convenient, but it is still more convenient than traditional parking. Mobile car and house controlling solutions do not let the user control all aspects of the car or a house – yet they enable to control exactly as much features that is required to make them usable.

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[75] Porter, Michael E. 1992. "The Competitive Advantage of Nations", pages 73-86.
[76] Porter, Michael E. 1992. "The Competitive Advantage of Nations", p. 82
[77] GDP per capita figures are for year 2001. Source: PwC Consulting "1st Report on Monitoring of EU Candidate Countries (Telecommunication Services Sector). July 25, 2002

Relying on existing infrastructure and keeping the number of advanced features down has enabled most of the services to have been developed in an extremely short time-frame. It took the Estonian banks less than 6 months to develop mobile commerce solution, EMT about 4 months to develop mobile parking, Regio, Ericsson and EMT about 3 months to develop e112, and Regio and Mobi about 1 month to develop the ticketing solution for public transport.[78]

4.2.3. Maintaining the easiness of usage

While several mobile services discussed in this study do exist in elsewhere, their usage rates in Estonia have often been bigger than in any other country. Almost 50% of all the parking payments in Tallinn are made via mobile, which is far greater than in Sweden and Norway, where mobile parking also exists. Mobile bus-ticketing, during its first testing-month in Tallinn, had 10 000 users, which is, considering the population and a number of public transport lines, relatively more than in Helsinki, Finland's capital.[79]

The high usage figures have been partly attributed to the general positive attitude of Estonians towards new technologies. Report from 2002 notes that:

> „Societal inclination towards a fast acquisition of modern technologies, willingness to experiment with new solutions and internationally successful promotional campaigns have introduced Estonia on the international arena as a rapidly evolving information society"[80].

This technology-friendliness often even disregards potential risks involved. In case of some of the services, security of the solutions has been left to the background, which has enabled service providers to design more user-friendly solutions. Two examples of practices of Estonian service providers to increase ease of use are:

1. Not asking clients to sign an extra contract to use the service in addition to the standard contract of the mobile operator. This has enabled all clients of the operators to pay by mobile for parking and transport tickets instantly, without even having a contract for payments.

2. Even for payment services, in case of small sums, there is no identification-check, and in case of larger sums, security features, like PIN-code check, have often been made optional. For example, in case of mobile commerce project of the banks, clients can choose the level of security they are comfortable with, allowing them to choose the amount of the payment at which they are asked to type in the security code. For lower payment amounts, no security code is asked.

Usage can also be increased, if steps are taken for the service to be open and work in the same way for the clients of all mobile operators.

One important factor contributing to the uniformity of the services across operators in Estonia is the decision by the regulatory authority National Communications Board to issue service short codes itself, instead of letting the operators issue short codes, as it is in many other countries[81]. So whenever someone wants to start a service, he licenses a short code from the government, and automatically gains the right of the short code to be opened in all of the networks. Instead of a confusion created by the same service having different short codes in different mobile networks, all Estonian services enjoy the simplicity of working exactly the same way for the clients of all operators.

[78] Source: EMT, Regio, Mobi Solutions
[79] Source: „Mobiilipilet on Tallinnas edukam kui Helsinkis" in Eesti Päevaleht, http://www.epl.ee/artikkel.php?ID=210665
[80] Kalvet, Tarmo, Pihl, Tarmo., Tiits, Marek. 2002. *Analysis of the Estonian ICT Sector Innovation System*. Executive Summary. Archimedes: Tartu, p. 4.
[81] See http://www.sa.ee

Especially common in the early days of mobile value-added services was the habit of operators to try to keep the service open only for their clients. Operators viewed value-added services as their competitive advantage over other operators, and treated with hostility all attempts of making services open to all operators, except in cases where they could license their own service to others. As far as usage is concerned, however, it is crucial that a service is open to the clients of all mobile networks. For mobile parking or transport ticketing, it makes little sense to distinguish between citizens according to the mobile operator whose clients they are. In the services discussed in this study, most were open in all networks, and some additional would have been, if the technological platforms (i.e. mobile positioning) had been supported by all. Openness of services in all networks has been an important factor in achieving the high penetration figures that the services have.

4.3. M-Government

Technology life-cycle model divides the people and organizations into early adopters (who adopt any technology as soon as it becomes available), pragmatics (who adopt it when they see its practical benefits), conservatives (who adopt only when they feel that otherwise they miss the train) and laggards (who never adopt, but often criticize)[82]. In case of both Internet and mobile technologies, it seems that the youth are among the early adopters, businesses are pragmatists, who wait until the benefits become clear, and governments are conservatives, who jump on the train once a technology has proven itself in the private sector.

There is a good reason, why governments are usually behind private sector to adopt e-stuff - it is more risky to experiment in the public sector than in private sector, because if something goes wrong, much more is at stake. American public administration scholar Guy B. Peters has noted, that experiment as a method is not suggested in public administration, as the public sector is too important to allow manipulating institutions and laws in order to find out, what are the consequences of planned changes[83]. It is less risky to wait until a technology is successfully implemented in the private sector and only then start to use it in the public sector.

Estonia is in the forefront of the world with its e-government initiatives[84] often because Estonian government has not chosen to be conservative, but has shown willingness to quickly adopt new technologies. This is why Estonia has a paperless e-cabinet, several national level e-democracy initiatives and will be perhaps one of the first in the world to have e-elections. So far, Estonia has had several e-government successes and no serious failures.

Some public sector mobile value-added services are also already operational. The most successful example from Estonia as well as elsewhere is enhanced112, which in Estonian case showed that private sector can work together with public sector in providing a top quality service[85]. Mobile parking and mobile transport ticketing are also almost public services, offered in co-operation with private sector and local government.

With numerous mobile services having proven themselves in the private sector, as well as some already in the public sector, it is time to study more deeply the possibilities of mobile technologies to be used in the government sector. M-government services could potentially be complementary to e-government services first and foremost in two key areas of e-government[86]: electronic information-based services to citizens and new forms of electronic participation.

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[82] Moore, Geoffrey. 1995. *Inside The Tornado.* Capstone, p. 14-16
[83] See: Peters, Guy B. 1998. *Comparative Politic: Theory and Methods.* New York University Press.
[84] See for example: Rannu, Rain. 2002. "E-democracy: Case of Estonia". BA Thesis. University of Tartu, Department of Public Administration
[85] Conteras, Cristian and Kasemaa, Gertrud. 2001. „Mobile Telecommunications Sector in Estonia and Latvia: Drivers of development". Master Thesis in International Business. Stockholm School of Economics, p. 30
[86] As described in Bertelsmann Foundation 2002. "Balanced E-Government: Connecting Efficient Administration and Responsive Democracy", www.begix.de

A short list of possible m-government services[87] include provision of emergency and other time-critical public information to citizens via mobile phones, more specifically via SMS; possibility to request information via mobile from government information databases; traffic information, police information about runaway criminals and stolen cars; extension of mobile payment systems from parking and public transport to other kinds of payments, for example the payment of government fees; sending notifications about child's absence from school notifications to parents' mobiles; mobile polling and voting; mobiles as access devices for government portals; using mobiles for giving digital signatures, etc.

As current generation of mobile phones has several limitations, like small screen-size and some issues of privacy, mobile technologies are not likely to become a serious competitor for Internet as far as most government e-services are concerned. People will never fill tax returns via SMS. Also, mobile voting on national elections with binding results should not be considered yet, because with current technology, it is less secure and much less tested than e-voting. Yet, as some early successes with services like e112 show, there are several areas where mobile technologies can give a unique contribution to e-government.

Conclusion

As a conclusion, the following key points from the study need to be stressed out:

- Advanced telecommunications infrastructure is a prerequisite of mobile services. While some operators, based on short-term financial goals, prefer waiting with building a 3G network, service providers of a country can only be internationally competitive if the operators keep their telecommunications infrastructure up-to-date and embrace 3G technology at least at an equal pace with neighboring countries.

- Mobile operators are experts in mobile communications, banks are experts in transactions and value-added service providers are experts in customers non-voice service needs. A good mobile payment infrastructure relies on these strengths: distributes the roles between banks and operators according to competency, and is open to all service-providers.

- While many mobile services are hyped to great heights and then failed to deliver, the successful ones have been those that have taken one step at a time and managed to find a few niches, where the new technology can add the most value. Knowing this helps to develop more successful mobile services.

- Lack of capital is not always a showstopper, but it can sometimes be innovated around by relying on existing infrastructure that is already built for other purposes and keeping the number of features in a service down. In addition to low cost, services designed in such a way have also an extremely short development time.

- While easiness of usage is sometimes a reverse-function of security, it is sometimes worth sacrificing some security features to attract the largest possible user-base. Usage can also be

[87] Service descriptions are based on: Engel-Flechsig, Stefan 2001. „Radicchio and the use of mobile devices as a delivery channel and authentication devices in e-Government", http://www.radicchio.org/downloads/stefan_presentation.pdf; National Electronic Commerce Coordinating Council 2001 „M-Government: The Convergence of Wireless Technologies and e-Government", http://www.ec3.org/InfoCenter/02_WorkGroups/2001_Workgroups/Research_&_Development/m-Government_ED.pdf ; Zalesak, Michal. 2002. „The Future of M-Government", http://www.europemedia.net/shownews.asp?ArticleID=11768; Henderson, Andrew. 2001. "The mobile handset as a smart card / reader - Vodafone / DTI case study", http://www.radicchio.org/downloads/andrew_henderson_presentation.pdf

increased, if the service is open and works in the same way for the clients of all mobile operators.

- Mobile technologies have a potential to contribute to several areas of e-government. The potential of m-government services to supplement e-government services should be more closely studied.

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