



Mobile Services in Tartu

Existing services, best practices,
methodology and suggestions for future development

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1. Introduction

Tartu has been one of the leading cities in Estonia in introducing e-services. Therefore, it comes as no surprise that in 2004, the first Estonian m-city project was launched in Tartu. Since the beginning of 2005 the pilot projects of m-neighbourhoodwatch and m-library are working, and m-teacher is being introduced to all the schools in the city.

Why are we talking about m-city services? There are two main reasons:

- Because mobile penetration exceeds internet penetration, public services that are offered via mobile phone are available to a greater number of people than those offered on the Internet. At the end of 2005, mobile penetration in Estonia was over 100 per cent, while internet penetration was around 53 per cent. Similar patterns are present in all countries.
- Because people carry their mobile phones with them all the time, while most computers are connected to a specific location, public services that are offered via mobile phone are accessible everywhere and at all times. This especially important in case of urgent messages and crisis communication.

Mobile phones are cheaper than computers, they are more often in one's native language than computers and also easier to use than computers. However, computers do have a more convenient interface and much more possibilities. Therefore, mobile phones will not and cannot replace computers, but add value in places where e-services cannot reach.

In the present research we will:

- Describe existing m-services in Tartu
- Give a brief overview of citizens' interests towards existing and new m-services
- Introduce some best practices from abroad
- Recommend a methodology for introducing new m-services in Tartu (and other cities)
- Provide a recommendable list of services for the next two years (2006 - 2007) to introduce in Tartu.

The research is directed to public administrators, officials of city-related bureaus and organizations, businesses, citizens and representatives of other cities, as well as for anyone interested in innovative solutions.



2. M-services in Tartu

2.1. Existing services

As of December 2005, the following mobile services have been launched in Tartu:

Mobile parking

Clients of all Estonian mobile operators can pay for parking via their mobile phone³.

Mobile bus ticket

The pilot project of mobile bus ticketing was launched in Tartu from 2002 to 2004 by EMT and Connex. Since January 10th, 2004 there is an ID-card based ticketing system in Tartu, which also includes paying for bus tickets via mobile phone⁴.

T-number

T-number is a service created by Regio which allows one to receive information on Tartu's sightseeings via mobile phone: a person dials a certain number and is then provided with an audioclip about the sight. There are 90 audio-clips for different tourist attractions in Tartu today. The codes for different objects can be found in city maps given away in tourist information stands, from the web site of Tartu (www.tartu.ee) and in some cases they can also be found from signs placed next to the sights. In case a map cannot be reached, it is also possible to send an SMS to a short code 17120 and a mobile positioning device provides the sender with the codes of the closest objects⁵.

Mobile payments

Mobile payments make it possible to use a mobile phone for paying for products, services etc. The payment process is started by the client making a phone call from his mobile phone to the payment system service number of Card Center, inserting the merchants code and the sum on the mobile

³ For additional information, see:

<http://www.emt.ee/wwwmain?pageld=298&menuld=612&screenId=content.private&componentId=ContentProviderComponent&actionId=load>

⁴ For additional information, see: http://www.tartu.ee/?lang_id=1&menu_id=6&page_id=1269,
<http://www.elion.ee/wwwmain?screenId=html.citizen-profile.28325&locale=et>

⁵ For additional information, see: <http://www.regio.ee/?op=body&id=36>



phone keypad. The merchant then receives an instant message about the payment to his mobile phone.⁶ In Tartu, it is possible to pay with mobile in (some) taxis, shops and restaurants.

Tartu City Short Code 1789

Tartu city short code 1789 is currently used as a way for citizens to provide the city with information about broken traffic lights or street lamps, dangerous icicles, damaged traffic signs, stolen park-benches etc. The dispatcher service forwards the message to the bureaus or organisations dealing with the issues and also administrates a log-book about the problems and their solutions. Phone calls, text messages and e-mails are also accepted by SMS and e-mail (1789@tartu.ee)⁷

M-teacher

Since spring 2005, the service was first launched as a pilot project in some schools and then as a full-time service in all the schools in Tartu. The service provides teachers with an interface to send text messages to the parents when important information needs to be forwarded.⁸ The results of the pilot project „m-teacher” can be found on pages 10 - 13.

M-neighbourhoodwatch

The pilot of m-neighbourhoodwatch was launched in January 2005. Taxi and bus drivers, security companies and other active people can participate in making Tartu safer by receiving SMS-notifications on issues (missing persons, stolen cars) that require watchful eyes. Messages are sent by police control center and all Tartu taxi, bus and security companies are included in this project⁹. The project is currently at the pilot stage.

M-library

The pilot of m-library was launched in February 2005. Tartu City library sends out notifications about waiting lists to the readers' mobile phones. If a person wants to borrow a book, movie or audiotape which is currently not available, she can register and receive an SMS when it becomes available¹⁰.

⁶ For additional information, see: <http://www.estcard.ee/publicweb/html/est/mobilimaksed.html>

⁷ For additional information, see: http://www.tartu.ee/?lang_id=1&menu_id=6&page_id=2388

⁸ For additional information, see: http://www.tartu.ee/index.php?page_id=734&lang_id=1&menu_id=6&lotus_url=/teated.nsf/e48cc6563eceb522c2256c310022c9d4/8485c976980bd55dc2256f4700563d80?OpenDocument

⁹ See: http://www.tartu.ee/index.php?page_id=36&lang_id=1&menu_id=6&lotus_url=/teated.nsf/web/viited/E982EA5BA35E194AC2256F96002AA752?OpenDocument

¹⁰ Addenda: http://www.tartu.ee/?lang_id=1&menu_id=6&page_id=2690



Tartu symbolics on mobile phone

Through Tartu website www.tartu.ee, it is possible to download Tartu City logos, background images, graphics and ringtones etc. to one's mobile phone¹¹.

2.2. Research on the use of m-services

In early 2005, the research center Faktum carried out a research on e- and m-services in Tartu, ordered by the city government. The research focused on the citizens' level of knowledge on m-services, what they thought of the services and how often they used them.

Sample description

The sample consisted of 406 citizens aged 15-64. 25 per cent of the respondents were 15-24 years old and 26 per cent of the respondents were between 25-34, mostly consisting of students and young specialists. The sample divided almost equally between males and females (55 per cent were female and 45 per cent were male). 57 per cent of the respondents had at least secondary or vocational education. 81 per cent of the sample spoke Estonian as their native language. The social status of the respondents was as follows: 16 per cent of the respondents were entrepreneurs, managers or specialists, 28 per cent were students and 11 per cent were retired. 92 per cent of the respondents used mobile phones on a daily basis.

¹¹ Addenda http://www.tartu.ee/?lang_id=1&menu_id=6&page_id=2691



Survey results

The results of the survey showed that even though a lot of respondents had not had a direct experience with m-services yet, the importance of such services was considered to be high.

Among the m-services that had been launched in Tartu more than a year ago, **m-parking** was considered to be the most necessary one: 82 per cent of the respondents thought it was very necessary or rather necessary. **Tartu City short code 1789** was thought of as necessary by 80 per cent of the respondents. **M-tickets and mobile payments** were considered to be necessary by 72 per cent of the respondents.

A little less than half (**49 per cent**) of the respondents considered **T-number** to be necessary. (which can be attributed to the fact that the service is more directed to tourists than residents, but the survey sample was made up of residents only). 17 per cent of the respondents considered the possibility to download Tartu background pictures, logos on ring tones to the mobile as necessary.

Regarding the *knowledge* among the respondents about the new m-services (launched in 2005), the results were the following: 45 per cent of the respondents had heard about m-teacher, 34 per cent about m-neighborhoodwatch, 29 per cent about m-library and 20 per cent about the projects in m-medicine.

In regard to interest in *joining* some of these services in the future, people were most interested in m-medicine (37 per cent), m-library (35 per cent) and m-neighborhoodwatch (28 per cent).

All new m-services received high scores on the scale of necessity: **M-teacher** was thought to be very important or rather important by **85 per cent** of the respondents. **M-neighborhood** was thought to be important by **82 per cent**, m-library by **72 per cent** and m-medicine by **80 per cent** of the respondents.

New m-service ideas

Some of the new service ideas that the survey respondents suggested were:

- Information on car inspection via mobile;
- Information on city planning;
- Weather forecast;
- M-pediatrician;
- M-army;
- Information on events in Tartu;
- Ordering tickets via mobile phone (theater, cinema etc.)
- Information about available jobs on mobile ;
- M-kindergarten;
- M-notifications from libraries;
- M-traffic announcements
- Notifications on water or electricity interruptions;
- Mobile culture information;
- M-university (exam results, exam dates, cancellations etc.);
- M-tickets for sports events;
- M-bus information;

2.3. Feedback on M-teacher

M-teacher was one of the most successful m-Tartu pilot projects and is being implemented in the whole Tartu city. In summer 2005, the feedback analysis of the project was conducted. In the following pages, the results of m-Tartu pilot are presented.

Description of the pilot

The goal of m-teacher is to simplify and foster the dialogue between the school and home, teachers and parents. The pilot was first launched in two schools in Tartu - Tartu Kivilinna Grammar School and Tartu Descartes Lyceum in spring 2005. It included four teachers from both schools, total of 8.

The parents were sent a flyer with information about the project and also an application for joining. Among the eight classes with 222 students, 154 parents joined the pilot which is 69 per cent. A little more than 3300 text messages were sent during the first six months which makes about 22 text messages per parent in half a year.

Parents of earlier grade students joined more actively than the parents of higher-grade students (for example, in the two third-classes that participated, the level of participation in



the pilot was 100 and 89 per cent) of students, whereas in higher grades, the participation level dropped.

Most text messages were sent about class events - excursions, theater trips etc, as well as individual messages about child's progress: about good grades, bad grades, skipping school, etc. The m-teacher system was also used to inform parents about a longer message waiting them in e-school or in their e-mail. Also all kinds of greetings and congratulations were sent.

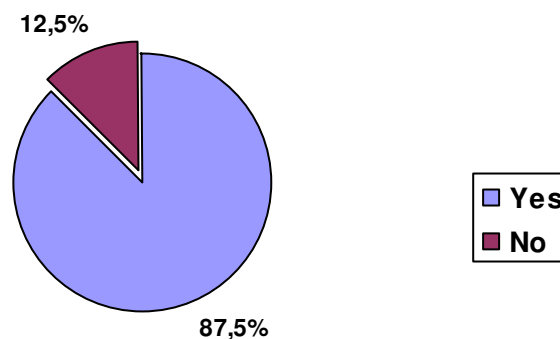
Feedback from teachers

All the teachers who participated in the pilot have sent notifications about school events and positive text messages to the parents. A lot of the text messages were also about urgent information and around half of the messages were about problems and the individual advancement of students.

The process of sending messages was thought to be quite simple. The teachers emphasized that sending messages individually would have taken a lot more time.

The usefulness of the m-teacher pilot was rated with 4.14 on the scale of 5. There were no marks under 3.

Seven teachers of eight wished to continue with the m-teacher project in the forthcoming autumn. Three of them answered "Yes, absolutely!":



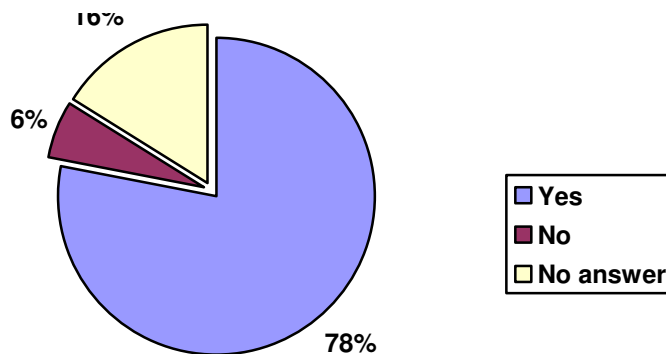
Graph – Interest of teachers in continuing with the project



Feedback from parents

From the parents' perspective, positive messages, individual messages and notifications about problems of their child were the most useful of the messages received.

On the same scale as the teachers', the parents rated the efficiency of the project with a 4.22. 78 per cent of the parents expressed their definite interest in continuing with the project.



Graph – Parents interest in the continuation of the project.

If the parents had to pay for the messages, 84 per cent of the participants would happily pay up to 10 EEK per month for the service. 43 per cent would pay 10 to 20 EEK per month and 14 per cent would pay more than 20 EEK per month. Only 16 per cent would have been willing to participate only if the participation remained free of charge.

Feedback from students

97 per cent of the students whose parents participated in the pilot had a positive or neutral attitude towards the project, with only 3 per cent having a negative attitude.



3. Best practices from other countries

3.1. M-cities

The first “mobile city” projects emerged in 2001. In this survey, we bring out two examples, Stockholm and Bremen, who both have a somewhat different approach to m-city:

Stockholm mCity¹⁰

The project was first launched in 2001 when an IT-commissioner of the European Union, Martin Bangemann, visited Stockholm and inspired the local city officials to try out some m-services.

The goal of the Stockholm mCity project is to find new solutions for using mobile services in the city. The first step of launching the project was doing a research of the needs of the citizens and the prospects of different m-services in solving their problems. The aim of the project was to create different ideas enough for at least ten separate pilots. The pilot is usually first launched in one part of the city, information on successful projects is then forwarded to other parts of the city, other cities and the representatives of information technology and telecommunications sector.

The choice of services is based on the needs of users. The solutions must be independent from operators and technology companies and they must give out **clear and measurable benefit** for the users. The most important thing is that the services would be useful also in the long term.

The priorities of the mCity are areas that demand a lot of resources and affect a lot of users: welfare of the elderly and the disabled, school and education and city environment. The pilots are created to help all target groups (citizens, businesses and tourists) and the reference groups of chosen fields are consulted before implementing the services. The people behind the project emphasize good co-operation with businesses: Ericsson, Telia and other mobile service developers are involved in the project.

¹⁰ Source and more information: <http://www.stockholm.se/mcity> and <http://technology.guardian.co.uk/online/story/0,3605,1234814,00.html>



Some of the most successful m-services offered in Stockholm are:

- There are two services in health and elderly care. First, there is an SMS-solution that simplifies getting additional temporary workforce in nursing homes when needed: instead of phone calls, they use group-SMS, and have achieved remarkable savings in time and cost. The second solution is based on an interface that allows the full-time welfare workers to compile their working schedule and allows them to synchronize the working schedule of full-time workers and the emergency staff.
- In the field of education, SMS-notifications on absentees and solutions for communication between teachers and parents via SMS have been put into practice.

Mobile City Bremen¹¹

A different approach to m-city services has been taken in Bremen, Germany. The main difference from Stockholm is that the city itself is not developing or purchasing m-services, but rather focuses on creating a good environment for those who do.

There are three key focus areas for “Mobile City Bremen”:

- *Mobile Test-market*: the city with its 1 million inhabitants is good testing environment for product launches and market acceptance tests in Germany. There are several organizations and businesses in Bremen that focus on providing market testing services.
- *Mobile Research center*: more than 100 academics from the fields of information technology, communication engineering, design and media constitute a high-quality interdisciplinary research network for the mobile future.
- *Mobile Solution Platform*: The platform came into being as a result of the activities of the Mobile Solution Group and since the year 2000, this group has combined the efforts of 40 companies and academic institutes for the development of mobile applications.

While in Stockholm, city actively participates in developing m-services in different fields of everyday city life, in Bremen, there are hardly any solutions of that kind: in Bremen’s case the

¹¹ Add: <http://www.mobilecity.org/>



solutions are normally offered by businesses and targeted to other businesses and Mobile City provides a supportive environment.

3.2. M-services in other countries

Education

In the field of education the following m-services have been launched in different countries¹²:

- **Institute of Chartered Accountants in Great Britain** sends out exam results via SMS¹³.
- Sending out exam results via SMS is already working in **Stockholm**. The possibility of signing up for getting the results via SMS is being weighed at the moment.¹⁴
- **The University of Bradford** sent text messages to all applicants the day before exams wishing them “good luck”. They found it a good way for the university to bond with new possible students¹⁵.
- In the **Stockholm m-City** project, SMS is used to inform parents about absentees.
- In **London** a campaign was held to advertise higher education. Students were sent an SMS promoting higher education.
- **The National Library of Singapur**: borrowers can extend their deadlines via SMS. They can also receive information on their account and all kinds of notifications from the library etc.¹⁶

¹² Source: „M-government: the feasibility of m-services in public sector”. Mobi Solutions, 2004

¹³ <http://www.uk.revolutionmagazine.com/news/view.cfm?r=1&id=83801>,
http://www.sabcnews.com/sci_tech/telecomms/0,1009,48267,00.html

¹⁴ Conversation with Sanna Koritz, the manager of m-Stockholm project.

¹⁵ http://www.ananova.com/news/story/sm_374521.html

¹⁶ http://www.lib.gov.sg/faq/faqs_sms.asp



- **Yorkshire, Great Britain; Dublin, Ireland** - similarly to M-teacher in Tartu, teachers of Yorkshire and Dublin use text messaging to inform parents about absentees.
- **France; South-Africa:** similarly to Estonia, exam results are sent to students via SMS.
- **Knowsley, Great Britain:** 9 weeks before the GCSE-test students receive sequential text messages about different success stories with the aim of increasing the students' motivation to study. All kinds of learning tips are also sent via SMS. As a result, the level of positive marks grew 3 per cent which is six times higher than the average national level. The school also sends out wake-up text messages to those who tend to be late for classes in the mornings.
- **The National University of Ireland; The National Students' Union of Australia; the University of Leeds and the University of London, Great Britain:** students can receive mobile information on scholarships, job offers, extra curricular activity, student campaigns and other events that might interest students and be of help.
- **The University of De La Salle, Manila, Philippines:** students can receive notifications on cancelled lectures, exam dates and places via SMS.

The following m-services in education have been launched in Estonia:

- Since 2004, students of secondary schools can order the results of their national exams on their mobile phones. In order to do that the student has to enter the portal "www.eesti.ee" and insert their phone number. In 2004, 18 000 text messages were sent and in 2005 the number was 27 000 which is almost 50 per cent of all students who took the exams¹⁷.
- Since 2005, the pilot of m-teacher has been working in Tartu and since 2005 the City library of Tartu is piloting with its m-library service.

¹⁷ Source: Mobi Solutions



Medicine

Some examples of m-services in the field of medicine from other countries¹⁸:

- In Great Britain sending out reminders two days before the doctor appointment via SMS is being tested. It is hoped to reduce cancelled appointments by 30 per cent¹⁹
- Similarly to the British hospitals, Norwegian dentists send out reminders of appointments via SMS.²⁰
- Smartmed.com has developed an SMS-based system to remind people to take their medicine on time (the system is out of use at the moment)²¹
- An outpatients' department in Italy has created a mobile based system for contacting voluntary blood donors.²²
- An Irish doctor sends out notifications of the high level of pollen to his allergic patients.²³
- Stockholm has tested two types of services. First, a mobile based service for people who need extra care to order a nurse in case of an attack or a critical condition. Stockholm has also developed a mobile based communication and coordination system for welfare workers to synchronize their working schedules with emergency staff.²⁴

An expert of m-government, prof. Kuschku, argues that portable connected appliances (mobile phones or PDA-s) help doctors and nurses receive important information at the right time. Examples of such information include:

- Patient's data
- Test results
- Databases of medical information, etc.

¹⁸ Addenda: „M-government: feasibility of m-services in public sectors”. Mobi Solutions, 2004

¹⁹ <http://www.health-news.co.uk/showstory.asp?id=91341>

²⁰ <http://www.xiam.com/news/business-gets-the-message/b2c/healthcare.shtml>

²¹ http://www.mobileinfo.com/News_2001/Issue18/Smartmeds_phones.htm

²² <http://www.xiam.com/news/business-gets-the-message/b2c/healthcare.shtml>

²³ <http://www.xiam.com/news/business-gets-the-message/b2c/healthcare.shtml>

²⁴ <http://www.stockholm.se/mcity>



Law enforcement

Some examples from other countries' m-services:

- **Malta:** citizens may send an SMS to number 5061 1899 with the registration number of the vehicle emitting excessive fumes. The authority will call the owner of the car for an inspection of the vehicle within three days.²⁵
- **Amsterdam, the Netherlands:** after a mobile phone has been stolen, the police will send out text messages to the missing phone with the interval of just 3 minutes. Since the system is based on the IMEI code, the mobile phone can receive those messages even if the SIM card has been removed.
- **Manila, Philippines:** citizens can inform the police about suspicious activities via SMS. They can also order notifications from the police about the growth of criminal activity.
- **Ireland** - citizens can send photographic evidence of a criminal act to the police via MMS.
- **Great Britain, Leicestershire** - similarly to the m-neighbourhoodwatch project in Tartu, police sends out text messages to the local neighbourhoodwatch coordinators who then distribute the information in the area.
- **Germany** - police sends out descriptions of missing persons to taxi drivers and bus drivers in the hope of finding the persons quicker.

Crisis communication

Some examples of m-services in the field of crisis communication:

- Since 2003, mobile positioning in the cases of emergency calls is compulsory for the member states of the European Union. In Estonia it was launched in 1999.
- **London, Great Britain:** after the terrorist attacks in the London subway, the police send out notifications on possible terrorist attacks via SMS.

²⁵ <http://www.textually.org/textually/archives/2005/08/009667.htm>



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- **Italy:** people in a disaster area receive a text message with a request to inform the embassy on their location and medical status. This system was used during the tsunami in Phuket for receiving information on the Italian citizens who survived.
 - **Great Britain:** it is possible to send a text message to an emergency number which helps the emergency center to locate the person in need and respond quickly to the request. It is mainly directed to people with hearing disabilities.
 - **Amsterdam, the Netherlands:** in case of fire, a text message is sent to people who are hard of hearing (i.e. go home and close the windows).
 - **Hong Kong:** people with hearing and/or speaking disabilities can send a text message in case of an emergency²⁶.
 - **Malaysia:** appliances for measuring flood levels have been installed in 313 critical areas. In case of flood, those appliances send a signal to the monitoring center which alarms local citizens via SMS.
 - **Great Britain:** information on flood danger is sent via SMS, fax and digital TV.

Public administration services

- **New York, USA:** a similar service to the Tartu's direct number 1789 has been launched in New York (the direct number is 311). Mayor Bloomberg praises the service (in a book published by Cisco) and says that instead of the 40 000 city phone numbers, memorizing only one is easy and that the two million phone calls received during the year have helped to find solutions to numerous problems in New York.

²⁶ <http://www.textually.org/textually/archives/2004/10/005795.htm>



- **San Francisco, USA:** the citizens of San Francisco can register to vote by sending a text message “ivote” to 80837. The sender will then receive a message with different options: voting in the station, having a registration paper sent home, voting via post and all the information one might need about voting²⁷.
- **Manila, Philippines:** since 2001, the citizens of the Philippines can submit complaints, comments and questions about the work of the public service via SMS. The Civil Service Commission will then respond²⁸.
- **London, Great Britain:** twice a year there is a meeting called *People’s Time Initiative* that gives Londoners the chance to ask the Mayor and the London Assembly about their plans, priorities and policies for the Capital. Londoners will be able to request tickets to attend the meeting and submit their questions to the panel via text²⁹.
- **Bellevue, Washington DC, USA:** the city council provides the construction inspectors with PDA-s which allows them to send and receive construction licenses on the spot.
- **Hong Kong:** it is possible to book appointments with public servants, enquire updated news, government press releases and government telephone directory, search available timeslots for filing marriage notice using GPRS and 3G phones etc. via mobile phones. It is also possible to receive weather and air pollution information and traffic information through mobile devices³⁰.

Notifications to citizens

- **Virginia, USA:** since 2002 the state’s citizens receive information on the senators’ and other representatives’ telephone directory by using PDA-s and mobile phones. The citizens can also file complaints to Customer Service, receive tourist information etc.

²⁷ More info: <http://www.personaldemocracy.com/node/740>

²⁸ More info: <http://www.egov4dev.org/txtcsc.htm>

²⁹ More info: <http://www.textually.org/textually/archives/2005/11/010634.htm>

³⁰ More info: <http://www.info.gov.hk/digital21/e-gov/eng/init/mgov.htm>



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- **Malta:** citizens will be notified about renewing their license via SMS.
 - **Chelmsford Crown Court, Great Britain:** - witnesses will be notified about cancellations or delays of hearings via SMS. The aim of this system is to increase efficiency and reduce costs.
 - **New-Zealand:** citizens are notified about unpaid tickets via SMS.
 - **Fife, Great Britain:** citizens are notified about unpaid rent via SMS.
 - **Australia:** the unemployed can order job offers, tips on how to book appointments and renew one's data etc. via SMS.
 - **Chenan, China:** citizens are notified about upcoming bad weather via SMS.

M-democracy and m-elections

- **Bülach, Switzerland:** in October 2005, the first mobile based voting took place in a small city called Bülach. More than 11 per cent of the electorate (445 people) used the Short Messaging System (SMS) to cast their vote in a local poll. 25.7 per cent voted over the internet. The new technology was tested for safety by the local Hewlett-Packard development team³¹.
- **Great Britain:** local administrations have used a non-binding m-polling system to receive public opinion³².
- **Estonia, Tallinn City Council** used m-polling in 2005 for public opinion on the new city logo. The logo that turned out to be the public's favourite, was taken into account by the experts.

³¹ More info: http://www.swissinfo.org/sen/swissinfo.html?siteSect=106&sid=62012_50&cKey=1130692769000

³² More info: http://www.swissinfo.org/sen/swissinfo.html?siteSect=106&sid=62012_50&cKey=1130692769000



4. Methodology for creating new m-services

The aim of the methodology is to simplify the introduction of new mobile services by presenting some guidelines to follow. It is quite difficult to present a single methodology because m-services are new and there are few well-developed practices. However, in this section, we propose some aspects and models that have proven to be useful in developing new m-services in Tartu:

4.1 Readiness of technology, users and service providers

A suitable framework for evaluating the readiness for m-services has been provided by mWatch Mobile Readiness Index (MRI), which was commissioned by the Baltic Development Forum in the autumn of 2003 in Sweden. The MRI is a counterpart to the Network Readiness Index (NRI) which has been in use for years: while NRI measures various Information Society indicators, MRI measures readiness for mobile services.

The MRI analyses the readiness of a society on the basis of three aspects - **the maturity of technology, the capacity of service providers and the level of interest among users.**

Maturity of technology

Technologies are *mature* when a critical mass of users has been reached, and the technology can be considered as mainstream.

In Estonia in 2005, of all the mobile technologies, only voice and SMS can be considered as mature: all mobile phone users know how to use voice, and two thirds know how to send and receive SMS. The number of mobile phones that support other technologies (such as WAP, GPRS, MMS, 3G etc.) and the number of mobile phone users who know how to use those technologies is less than 20 per cent of the entire population and since the critical mass of users has not been achieved, we cannot consider those technologies as mature yet.

Mobile technologies lifecycle

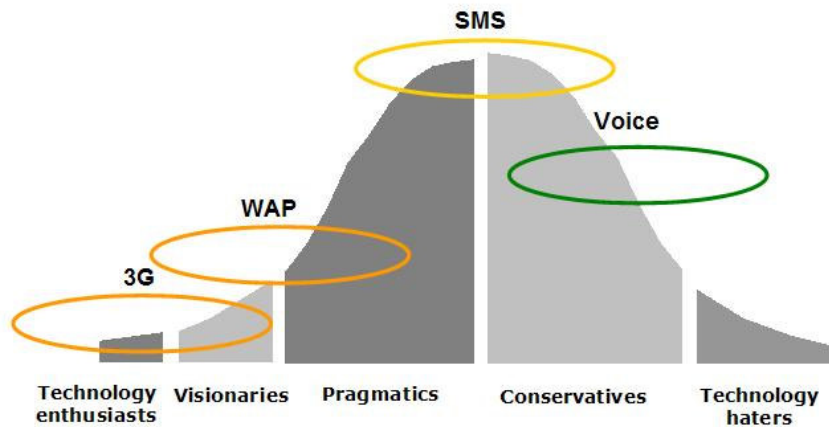


Figure - lifecycle model of technologies and the position of mobile technologies on it. Technology enthusiasts and visionaries, which is about 10 per cent of the population, are the first ones to accept the new technologies as soon as they become available. About 40 per cent of the population are pragmatics who accept a technology as soon as its utility level is clear. The third group of people are conservatives who make up 30 per cent of the population and they start using the new technology when it's absolutely necessary - unless they want to miss the train. The last group of people are the technology antagonists who never accept any new type of technology³³.

Thus it is more reasonable to focus on voice and SMS services when creating new services. WAP, 3G and other new technologies should be used to offer:

- a) **Niche services** in areas, where the penetration level of technologies is high enough (or where it is possible to “raise it”: i.e. a GPRS-based PDA for intercommunication among public servants)
- b) **As additional channels for delivery** (i.e. providing city information over the Internet and additionally via WAP).

Level of interest among users

Preference should be given in areas, where the level of interest among the target group of the services is the biggest. In Tartu's case, a good indication of interest can be found on pages 8-10.

³³ Percentages are estimates, they differ by technology and community



Capability of service providers

Capability of services providers refers to the ability of mobile operators, technology companies, value added service providers, local governments and other organisations to implement and manage the services.

In case of local governments and public agencies, the following aspects should be given consideration:

- Experience in managing e-government projects
- Willingness to start and implement innovative projects
- Staff or structural entity directly responsible for managing e-projects

4.2. Matrix of m-services

No city is alike and the needs of every community are different. Therefore, copying solutions from other cities is not be enough, even though in a lot of cases, it gives a good indication on what works and what does not. In search for necessity-based m-solutions, it is advisable, however, to use a framework that focuses on the target groups of each service.

The following matrix (where the left column marks the *service provider* and the first row the *recipient*) can be used as a framework:

	Government	Business	Citizen	Tourist
Government	G2G	G2B	G2C	G2T
Business	B2G	B2B	B2C	B2T
Citizen	C2G	C2B	C2C	C2T

The grey-shaded boxes mark the areas where most services have been considered and implemented; and where arguably lay the greatest possibilities for new m-city services.



Government to government (G2G) and business to government (B2G)

Government to government services are designed to make the internal functioning and communication within a public agency more efficient. For example, a public servant working outside the office (i.e. field inspectors) can use PDA to send information to the office. Such services can be developed by the government itself (G2G) or by businesses (B2G).

Government to business (G2B)

M-city services from government to businesses aim to answer the following questions: “how to provide businesses with city information in the most timely manner” and “can mobile technologies contribute”. In most cases, businesses have a good access to Internet, which makes it reasonable to focus on such services where mobile phones have a clear advantage over the Internet.

Government to Citizen (G2C) and business to Citizen (B2C)

Most of the m-services that are launched in Tartu and described in chapter 2 are government to citizen or business to citizen services. Such services are aimed at making the communication between citizens and city government (or a public agency) more convenient or, to use mobile technologies to provide some government service in a better way. Some of the services have been initiated by the government (i.e. short code 1789), some by businesses (m-parking, m-ticket etc.).

Government to tourist (G2T) and business to tourist (B2T)

An example of a m-city service directed to tourists is T-number, provided by a local technology company Regio. In parallel with the present research, another service, where tourist can use her mobile phone to have a mounted camera to take a picture of herself in front of Tartu sights, and have it sent to her e-mail or via MMS, is being launched.

Citizen to citizen (C2C)

Citizen to citizen services are launched by residents on their own initiative, with the aim of doing a small and cool thing, which makes city life better. A good example of such a service is from a few years ago, when students of Tartu university created a public information system,



where you could access all public transport timetables in Tartu, and offered it through Internet and SMS, free, and without any compensation from City Government.

4.3. The process of introducing new services

Introducing new things is generally considered to be more risky in public sector than it is in private sector - there is more at stake. Therefore, the following **four-step process** in introducing new mobile services in public sector is recommended:

Round table of ideas

Representatives of different stakeholders interested in implementing new m-services (city government, city officials, public service organisations, non-profit organisations, businesses, etc.) gather together for a meeting with the aim of brainstorming new ideas and selecting the ideas worth develop further. The frequency of such roundtables should be about once or twice a year.

Analysis

M-services project team (can be internal or external, temporary or permanent) analyzes the ideas, prepares expense and income calculations, specifies the list of activities necessary for implementing the (pilot) project, recommends possible partners and subcontractors, and presents it for the decision to the responsible government official.

Conducting the pilot

The next step is to conduct **pilot** projects of the selected services. Pilots usually have three general characteristics:

- Limited **duration**: usually three months to one year
- Limited **functionality**: in order to reduce expenses, pilot project only have the basic functionality.
- Limited **scope**: the services are first introduced only in one or two organizations, areas, fields etc.

After the pilot comes **the analysis**, and final report, which contains direct feedback from all involved parties, including the end user and the organization that manages the service. The results of the final analysis are presented in writing and usually also discussed in a round table involving all the stakeholders.



Implementation

The service implementation is coordinated usually by the organization in charge of the specific field (i.e. in education, it's the department of education, in law enforcement, its police, etc).

It is necessary to keep the following aspects in mind:

- Implementation model (off-the-shelf, adapting existing applications, customization, development through outsourcing, etc)
- Relative costs (cost-effective relative to traditional method, similar to traditional method, expensive relative to traditional method).
- Time (a month, several months, half a year, a year etc.) refers to whether the solution should be implemented at once or step by step.



5. Ideas for Tartu

Next, some new ideas for the City of Tartu are presented. The services have been divided into category by function (education, medicine, transportation). We focused on fields that have had most success stories and positive feedback from other countries, users and stakeholders in Tartu, and that are technologically most feasible.

5.1. Ideas from m-Tartu brainstorming session

In April 2005, a roundtable of mobile services took place, where the representatives of Tartu City Council, public organisations, non-profit organisations and businesses participated³⁴. Among other ideas, the following suggestions for new mobile services in Tartu were made by the participants:

- **Giving tourists a possibility to photograph themselves next to a sight in Tartu** and then send the picture to friends or family. A person should be able to direct the camera and by sending an SMS, order a photograph of oneself. At the same time the user sends the e-mail address he/she wants the picture(s) to be sent to and after a little while the picture would be sent to that address³⁵.
- **Information on theater, cinema, concert times to mobile phone.** User could order information on today's plays or tomorrow's concerts, etc. to her mobile phone. There could also be a database to where one could send information on available tickets or discounts.
- **M-kindergarten.** A notification to parents (i.e. to pay monthly fees; a notification on a vacant spot at a chosen kindergarten etc), similar to already implemented m-teacher service.

³⁴ Participants included Georg Aher, Aune Visnapuu, Lilian Lukka (Tartu Linnavalitsus), Ivar Tallo (E-Riigi Akadeemia), Linnar Viik (Eesti IT Kollodz), Teet Jagomägi (Regio), Rain Rannu, Siim Saksing (Mobi Solutions).

³⁵ By December, 2005 the service has been developed and is prepared to be launched



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- **Notifications to citizens over SMS.** A web-based environment should be created which allows the citizen to choose the types of notifications he wants to receive from the city, as well as the region he is especially interested in receiving information about. Also, he should be able to choose between different channels (e-mail, mobile phone etc.) he wants to use for receiving the information.
 - **Sending information the families of people under special care.** An example of a Swedish hospital was given, where the staff of the hospital updates the families about the situation of their relatives. The same type of service could be piloted in Tartu as well.
 - **SMS-lists of public servants:** similarly to the existing crisis communication processes on the state level, there should be SMS-lists of different officials (members of city government, city officials, board members of schools and hospitals etc.) in order to exchange quick information via mobile phone and SMS, especially in case of a crisis.
 - **Adding mobile positioning to city number 1789.** The mobile phone from which a call is received could be positioned in order to determine the spot of the problem quicker.
 - **Possibility to contact city officials over Skype.** In addition to the short code 1789, the city could have a Skype account, where citizens could call and leave a voicemail message. Or, reach the official directly.
 - **Volunteer co-ordination via SMS (and/or e-mail).** Citizens can sign up for voluntary work and then receive a SMS-notification when they are needed.
 - People who often drive between Tartu and Tallinn could sign up for a list and those interested in hitchhiking the same way could inform the members of the list via SMS. This would be a way for hitchhikers to contact drivers with vacant seats and find transportation³⁶.

³⁶ This kind of service has technologically been launched in Everybody's M-business (<http://mari.mobi.ee>). It still needs more advertisement in order for the drivers and hitch hikers to use the services.



- There should be a certain period (i.e. every Saturday between 1 am and 2 am) where people can send a premium-SMS to make the Town Hall bell to play a tune. One should be able to choose among different melodies and all the collected money should go to charity.

5.2. Recommendations

Education

In the field of education, we recommend the implementation of the following services, all of which were brought up in the round table in April, all of which can be implemented quickly and with low costs, and all of which fall into the G2C segment in the m-city services matrix:

- **M-kindergarten** - a system similar to m-teacher, allowing kindergarten teachers exchange urgent information with parents over mobile.
- **M-training** - allows the trainers to contact the parents over the mobile.
- **M-university** - a service for university students to order exam results to their mobile phone (voluntary, opt-in, and possibly for pay), as well as for the faculties contact students and send them different kind of information (exam dates, cancellation of lectures etc) over SMS.

Medicine

In the field of medicine, the following (G2C) services are recommended for implementation by the local medical institutions:

- **Notification for blood donors:** Currently, the Blood Center of Tartu University informs the voluntary donors by calling them. In 2002, the North-Estonia Blood Center tested the SMS-notification system. As a result, the number of donors on that day was around 170 instead of the usual 30. The length of one phone call is around 45 seconds and the cost of one SMS is about three times less than a voice call, so SMSing instead of calling is also more cost-effective.



- **Notifications of doctor appointments:** since the waiting lists for doctors are often several months long, and a lot of the appointments are cancelled because the patient has forgotten the appointment time, or does not wish to go to the appointment anymore. SMS-notification a day before the appointment would (judging by the successful example in the UK mentioned earlier in the survey) reduce the amount of cancelled appointments. The possibility of cancelling an appointment by answering the notification message allows the doctor to book another appointment instead.

Law enforcement and crisis communication

The best mobile crisis communication system would use mobile positioning to identify all the people (mobile phone owners) in the area and would enable to send them messages. Considering that developing and establishing such a system in Estonia would take some time, it might be reasonable to pilot a little bit different crisis communications systems on the local level:

- **A system for city government to send messages to their subordinates:** similarly to the existing crisis communication processes on the state level, there should be SMS-lists of different officials (members of city government, city officials, board members of schools and hospitals etc.) in order to exchange quick information via mobile phone and SMS, especially in case of a crisis.
- **A registration-based notification system for citizens in crisis situations,** in order to increase residents' perception of safety that in case of a crisis (flooding, fire) they receive important information quickly. Citizen gives the city his phone number and permission to send messages in case of a crisis.

Two different ways for signing up are recommended: a) over the Internet: on Tartu webpage, one can enter her phone number; b) over the phone. To the Tartu City short code 1789, an option for signing up to the crisis system is added, which is turned on, when the possibility of a threat emerges. By calling the number, citizen signs up and agrees to receive notifications about this particular threat.



City info over mobile

When making city info available to public, it should be kept in mind that different information can be made available through different channels (e-mail, web, SMS, WAP, etc) and not all information should be made available through all channels. Over the mobile channel, the info that one needs while on the road and out of office, should be made available, and care should be taken to avoid situations, where it is hard to find it among irrelevant information.

Considering the growing usage of mobile internet, we recommend:

- **Renewing Tartu's WAP-portal (wap.tartu.ee).** At the moment:
 - Most of the information there is not relevant for the mobile user.
 - The necessary part of the information hard to navigate
 - A lot of important information is missing
 - Bookmarks are not valid
 - Inconvenient interface

Since there are many limitations to mobile phones (small display, slower speed etc.) the WAP-page should give only the most important information for the mobile user.

Recommendations are:

- Updating the interface (better navigation, colors etc.)
- Changing the most important parts ("Where to go/ what is happening in Tartu" etc) into a mobile-friendly form.
- Adding new sub-divisions:
 - List of Wifi hotspots in Tartu
 - Transport information
 - Ordering logos and ring tones of Tartu directly to mobile phones
 - Tartu news
 - Chance to leave a message to city officials.
 - Increasing the visibility of Tartu web page in the portals of EMT, Elisa and Tele2



- **Offering bus information via mobile phone in addition to Internet:** one of the highest valued e-services in Tartu is the portal of city transport timetables. Unfortunately, bus information is often needed in situations where Internet is not accessible. SMS-service would not be the best solution, as it is hard for citizens to remember the syntax to type to SMS, and it is equally hard to communicate instructions to a person on the move. A WAP-service, that would allow the access to the timetables database would be more suitable. However, it is important to make some adjustments to the interface, in a way that it would fit the needs of a mobile user.
- **„Tartu in pocket“:** a special Java-based program that works in mobile phones could be an even more convenient way (as compared to WAP) for accessing city information on the move.

Notifications to citizens

We recommend to start with the following:

- **Instant notifications when citizens application is processed:** City document management system should be connected with an SMS-service to allow a citizen to order a notification when his application has been dealt with, approved or rejected. Citizen can sign up during filling in the application form and leave his phone number and the system would automatically send out an SMS, when application is ready. Of course, this kind of notification should only be complementary to a formal written answer.

M-democracy

M-democracy services are divided into two: non-binding opinion polls and binding m-voting in local elections or referendums. Although the Swiss example showed that safe m-voting is technically possible, we would not recommend implementing m-elections in Estonia (yet). However, we would recommend to increase the use of non-binding opinion polls, whenever there is an interesting issue that would engage the citizens to answer.



6. Annexes

Annex 1. Some examples of m-services in other countries on central government level

M-government in Malta³⁷

In 2003 the Maltese government started to send out exam results to students. Today this has grown into a mobile based information exchange system among offices and officials out of office. The following is a list of different m-services provided by the Maltese government (<http://www.mobile.gov.mt/services.asp>):

- Customer service complaints
- Notification on time changes of court hearings
- Notification on drivers license renewal
- Exam results to mobile phones
- Notification for blood donors.

The wireless portal of the Canadian government³⁸

The mobile based portal of the Canadian government was launched in 2002. Users can register via mobile phones that support Internet or via PDA-s. The following services have been established by today:

- Economic Indicators, Currency Converter and Exchange Rates
- Government of Canada Employee Phone Numbers
- Government of Canada news releases, media advisories, background news, and more.
- Border wait times
- Information of Canadian Hurricane Center

³⁷ http://www.mobile.gov.mt/default_g.asp?mb:lang=en

³⁸ http://canada.gc.ca/mobile/wireless_e, addenda: <http://www.informationweek.com/story/showArticle.jhtml?articleID=20000010>



Annex 2. Benefits and risks of m-voting³⁹

M-voting is an extension of e-voting that allow citizens to give their vote via mobile phone. Unlike opinion polls, the results of m-voting on local or national elections would be binding and the vote given by mobile phone equal to the vote given on paper. According to a small survey conducted a few years ago, about 50 per cent of the potential users would prefer m-voting to traditional ballots and e-voting when guaranteed safety and simplicity⁴⁰.

As the main benefits of m-voting, the following has been brought out:

- **More people would vote.** Making voting easier would increase the percentage of people going to vote, especially among the young. According to a survey made in Great Britain, about 50 per cent of the young voters would prefer an m-voting system.
- **Saving time.** Regular voting process takes about 30 minutes on average (together with walking or driving to polling place), m-voting (similarly to e-voting) only takes a couple of minutes.

As the main problems, risks and challenges of m-voting, the following issues have been mentioned:

- **Technological:**
 - Issues concerning secure identification over mobile devices.
 - Creating a secure system that would guarantee the secrecy and honesty of m-voting and explaining its working principles well enough to the general public.
- **Political and social:**
 - The readiness of citizens to vote over mobile
 - The legitimacy of m-voting: getting people to have confidence in the honesty of m-voting
 - Similarly to e-voting, with m-voting it is equally hard to guarantee the privacy of the voting process and reduce the possibility to buy votes.

³⁹ See „M-government: the implementation of mobile services in the public sector“. Mobi Solutions 2004.

⁴⁰ 50 Estonian citizens between 15-74 were questioned in January 2004.



- **Economical:**
 - The costs of creating an m-voting system are considerably higher than creating other m-services, and in an equal range with the cost of creating e-voting system. However, given that m-voting is only an alternative and not a replacement to the regular voting system, then the entire cost of elections would increase.

Since the challenges and risks of m-voting are significantly greater than the benefits of m-voting (especially as compared to e-voting), the authors of the present study do not recommend it for binding elections of representative bodies and referendums.

Annex 3. For further reading: some studies on m-city and m-government

- *The E-government handbook for developing countries.* A project of InfoDev and The Center for Democracy & Technology, Bruno Lanvin, InfoDev Program Manager, The World Bank. Nov. 2002 - <http://www.cdt.org/egov/handbook/2002-11-14egovhandbook.pdf>
- *M-government Case Studies: SMS messages for education. SMS citizen safety. Other interesting m-government services.* Michal Zálešák, Web Projects Ltd. - <http://topics.developmentgateway.org/e-government/rc/ItemDetail.do-369723>
- *Government unplugged: mobile and wireless technologies in the public service.* Centre for Public Service Innovation in partnership with Technology Research (State Information Technology Agency) Council for Scientific and Industrial Research - icomtek. Arthur Goldstuck, World Wide Worx - http://www.cpsi.co.za/contentfiles/tblFile/5_filFilePath_Government%20Unplugged.pdf
- *Development modules to unleash the potential of Mobile Government: developing mobile government applications from a user perspective.* Klas Roggenkamp, Institution of Electronic Business - topics.developmentgateway.org/egovment/rc/filedownload.do-itemId=403277



- *From e-government to m-government: facing the inevitable.* Ibrahim Kushchu, International University of Japan; M. Halid Kuscü, Southwestern College, School of Business and Information Systems - topics.developmentgateway.org/egovernment/rc/filedownload.do-itemId=396584