Towards the Design of Estonia's M-Government Services

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ABSTRACT
Mobile technology is the next stage of the Information and Communication Technologies' revolution and mobile government will be the next inevitable evolution of e-government. Today in Estonia The State Portal eesti.ee is the main access point to e-government services in the country. Although not designed to provide any specific m-government services, the use of mobile devices among its users has been growing at a steady rate since 2009. In this paper, we introduce a study designed to reach out to the Estonian State Portal users and seize their expectations as an initial citizen-centered approach towards the design of Estonia's m-Government Services. Despite the fact that m-government services are a relatively unexplored field in Estonia, this study's results unveiled some of user expectations and their high level of experience with mobile technologies.

Categories and Subject Descriptors
H.5.2 [**User Interfaces**]: User-centered design;
H.1.2 [**User/Machine Systems**]: Human factors

General Terms
Design, Human Factors

Keywords
eGovernment, mGovernment, Requirements Elicitation

1. INTRODUCTION
The idea behind e-government is to use Information and Communication Technology (ICT) to deliver public services to every citizen in a modern, quick, secure and convenient way. As a benefit, people are given a possibility to access government-provided services worldwide wherever an Internet connection is available, around the clock and without waiting in line. On the other hand, e-government is beneficial for both the state and its taxpayers as it helps to reduce the load on state officials, improve speed and efficiency of relationships with inhabitants, and, finally, may contribute to economic development of the country as a whole.

There is known to be an increased demand worldwide for a longer and quicker access to government services. Such services should be available 24 hours a day, seven days a week. Governments are also required to have shorter life cycles and faster response times while delivering services to citizens [1].

E-government becomes especially important due to its potential of reducing costs and improving service compared to traditional communication modes like paper forms or phone calls. Online services are known to be cheaper, faster and are more reliable. This is especially important in remote areas. E-services avoid the multitude of human errors, which may occur during manual processing. E-government encompasses various technologies in order to provide citizens and organizations with a more convenient access to government related information and services, as well as provide public services to citizens, business partners, suppliers and those working in the public sector [2].

E-government can be seen as a key means of achieving the goals of dramatically minimizing communication and information costs, maximizing speed, broadening reach and eliminating the issue of distance [3].

People are constantly adopting new technologies in order to communicate with each other, participate in topical events and search for required information. This provides new opportunities as well as challenges to government institutions in providing public services. If public services are not represented in new environments they tend to be left out of peoples' common communication channels and this makes the provision and consumption of services time-consuming and inconvenient to a certain number of citizens [4].

The fast progress of e-government in Estonia started largely due to the development of the banking business. In the beginning of 1990s effective banking systems were not copied from existing ICT-solutions. Instead a modern electronic system was created from scratch to allow customers to manage their funds online without leaving their home or office.

In 2010, 98% of banking transactions were carried out electronically and the number of users of the Estonian Internet banks was more than 1.7 million clients.

The banks also created an infrastructure for identifying a person in an electronic environment. Soon other entities that wanted to offer their services in an electronic environment saw the potential of the proposed solution. The situation created a good basis for an emerging e-government in Estonia. One by one, the electronic Population Register, e-Tax Board, Land Register and others were created.

Soon after first generation of modern information systems were created, the need for interaction between them arose. In late 1990s the X-Road project was started with the objective of creating a secure and standard environment for establishing data communication between information systems. In practice, X-Road

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was ready to use in the beginning of 2002 when the Population Register was integrated into X-Road as a first database.

In 2000, a customer-ready view of e-Government services was launched and first results in this field were produced in 2002 in the form of the state portal eesti.ee. The goal was to create a uniform online gate for all public e-government services that Estonia provides to its citizen. Today the Estonian state portal aggregates different services from more than 150 government organizations, ministries and departments.

In 2001 the first nation-wide identity card was commissioned. The ID-card is the primary identity document for Estonian citizens both in the real and digital world.

In connection with the ID-card and the enactment of a digital signature, preconditions for first nation-wide electronic elections were created. The 2009 nation-wide elections of local governments and 2009 nation-wide elections of the European parliament were brought to pass. Over 100 000 e-voters took part in the election of local governments.

2. M-GOVERNMENT

Mobile technology appears to be the next stage of the ICT revolution with the main advantages of mobility and wireless. Mobility is to be considered the most important as it frees users from *"physical ties to the desktop."* The wireless characteristic refers to the ability of transmitting information between the data source and the recipient device without a physical connection [5].

Almost every present-day mobile phone allows access to the Internet. The constant reduction of Internet access tariffs along with growth of areas where wireless Internet connectivity over GSM networks is available increase demand for the service among customers.

The penetration ratio of mobile phones in the European Union reached approximately 120% in 2010 [6].

Other research conducted in the United States shows that in December 2007 24% of Americans used Internet on their mobile device at some point. In April 2009 that number increased to 32%. For 46% of respondents mobile access is considered very important for getting information on the go [7].

In many developing countries mobile Internet has become the only means of providing Internet connectivity to the end user. This means that the so-called regular Internet and computer do not reach mainstream adoption due to high cost of devices and weak infrastructure [4].

In order for the mobile Internet to be successful, customers should be provided with the highest-quality information. The benefit of the Internet in general can be significantly enhanced if it could be made available anywhere and anytime through a mobile device. The number of people using mobile Internet access devices has already exceeded that of stationary Internet users. A similar trend is expected worldwide as well [8].

As the number of mobile device users grows worldwide, the capabilities of mobile devices grow in parallel. In addition, mobile communications can provide Internet access in regions, where traditional phone and broadband are hard to get [4].

Mobile government can be seen as a strategy and its implementation in providing information and services to government employees, citizens and businesses by the means of mobile devices [5].

Mobile government can be considered the next inevitable evolution of e-government. The main goal is to modernize public sector organizations, their business processes, work and workers by the means of mobile phones, applications and services. Thus, m-government is not only about technology, but rather how technology can be used to revolutionize public sector activities and how the society adopts these technologies [9].

The anytime and anywhere mobile access is steadily becoming a natural part of daily life and forces governments to modify their activities to address this growing demand for convenient and efficient interactions of all involved parties [10].

M-government should be seen as value added to existing e-government and thus will be more advanced in regions, where a solid e-government foundation already exists [5].

Implementing m-government should be seen as more complex compared to implementing e-government as organizations need to identify the relevant mobile technologies and applications in order to provide efficient services [1].

In Estonia, almost everyone has a mobile phone. This gives the state an opportunity to impact a large percentage of citizens. In addition, mobile services can reach a broader population when compared to traditional e-services. Mobile technologies allow addressing different target audiences, from those who experience difficulties in using relatively complicated personal computers, like elderly or less educated people, as well as early adopters and technocrats who prefer to use services on the go via their smartphones [4].

As the mobile device stays with its owner all the time it can be seen as a suitable means for transmitting critical information to the citizens. Consequently, a mobile device may become a more convenient way of communicating with the state and receiving state related information [11].

The successful examples of existing mobile services in Estonia and neighboring EU countries include m-parking, m-banking, m-payments, secure mobile authentication and SMS notifications from state institutions. Noteworthy m-library and m-hospital pilot projects were recently started in Tampere, Finland, which is some steps ahead compared to Estonia in adopting mobile technologies [12].

In order to provide a better service to citizens the Estonian government is planning to bring public e-services to mobile phones, as well as utilize the broadening capabilities of digital television [13].

Despite its significance, m-government should not be seen as a substitute to e-government. On the contrary, in many cases it is complimentary to existing e-government efforts, which provide services through a wired network via interactive and intelligent web applications. The value of m-government, on the other hand, comes from the capacity of applications to support mobility of citizens, businesses and government officials [10].

3. USER EXPECTATIONS

The overview presented in previous sections demonstrates that mobile communications is a fast growing field and there is a challenge for the Estonian public sector to provide proper ICT solutions to address the emerging need in m-government.

As was mentioned above, one of the main contact points between the Estonian citizen and the government is the state portal eesti.ee,

which provides reliable state related information as well as e-services to citizens, entrepreneurs and state officials [14].

The state portal is maintained by the Estonian Information System's Authority – EISA, (formerly known as Estonian Informatics Centre), which was established by the Estonian government to solve *"main IT problems common for several state organizations and to arrange the work of the state's information systems."* [15]

The state portal usage statistics, made available to researchers by EISA, demonstrate that the number of users accessing the state portal from their mobile device started to grow since 2010. While there were no visitors with mobile devices detected in 2008 and 2009, for the period of four months from 1st of January 2010 to 1st of May 2010 781 visits were registered from mobile Internet access devices to different pages of eesti.ee. For the same period of 2011 2771 visits were registered. Thus, the number of users accessing the state portal eesti.ee with their mobile device has increased by 3.55 times. The researchers were also curious about particular devices and platforms used to access the eesti.ee portal, but results were not surprising: according to eesti.ee Google Analytics leading positions were shared among Apple iPad, iPhone and iPod devices, various devices on the Android and Symbian platforms were also in majority. Several other platforms, including Windows Mobile and RIM BlackBerry were also presented. Exact numbers are out of scope of this paper as such data becomes obsolete very quickly.

An upcoming challenge for EISA can be seen in providing a mobile version of the state portal. Available statistics show that there is a growing demand for it and the mobile portal with all its services should be accessible and usable on various flavors of mobile devices. As it is a complex and expensive task, the primary research question is: *what do users expect to see in the mobile version of the state portal?* The researchers suggest a questionnaire as the main method of gathering input data from current users of the state portal and its potential mobile users. Feedback analysis using statistical methods would give an initial understanding of the users' needs and expectations in regards to the mobile version of the state portal.

Recent research suggests that the biggest problem why people are not satisfied with public e-services is their complexity and poor user-friendliness [16]. On the other hand, various simple and easy to use mobile services, like the previously mentioned m-parking, are already adopted in Estonia without serious issues and are welcomed by users. User-friendliness and ease of use are important while developing mobile services. In addition, while creating mobile services one should take into account specific mobile platforms as well as differences in their technological capabilities. This assumes development of services that take into account most of mobile platforms that are currently in use [4]. In case the said above would be ignored by either product owners or developers, the result may become very poor and taxpayers' money would be wasted on solutions that need to be re-factored soon after launch.

Another precaution to be considered is the fact that it is easy to steal mobile devices because of their small size and portability. This puts the sensitive information stored on such devices at risk. This fact makes citizens more concerned with security and privacy issues in regards to m-government solutions [5].

3.1 Method

A semi-structured questionnaire was chosen in order to map users' habits of how they use their mobile Internet access devices and gain an understanding of the expectations of potential users in regards to m-government services, which might be provided by state portal eesti.ee.

3.2 Participants

The survey was conducted during a period of 48 hours using an open-source web-application LimeSurvey hosted at the Tallinn University official domain. The invitation to participate in the survey was delivered to an audience of roughly 3000 residents of Estonia. EISA provided researchers with a mailing list of the most active eesti.ee users that counts approximately 1300 contacts. All other contacts were randomly reached by compiling mailing lists of students and staff of Estonian private and public universities, several non-profit citizen organizations and a community of Estonian residents in social networking sites, such as Facebook and LiveJournal.

During 48 hours 520 responses were gathered in total with a reach ratio of approximately 17%. 497 fully completed questionnaires (95.6%) qualified for detailed analysis using *SPSS* software package and built-in analytical functions of LimeSurvey software.

3.3 Apparatus

The questionnaire consists of 16 questions divided into three sections:

1) Section 1 – smartphone usage experience, preferences in mobile applications and web-services (6 questions);
2) Section 2 – experience with the state portal eesti.ee and expectations of government services, which should be available on mobile Internet access device (5 questions);
3) Section 3 – personal information (5 questions).

Along with the Estonian version the survey was also available in Russian, which is widely spoken in Estonia. Before submission to actual respondents the questionnaire was successfully tested on several experts from Tallinn University and EISA, as well as by a few randomly selected state portal eesti.ee users.

3.4 Procedure

As the state portal eesti.ee offers more than 100 different e-services, the researchers used Google Analytics statistics to select the most frequently accessed pages. Seven groups were formed out of services being used the most:

- Educational services (Education Information System, national examinations and certifications);
- Healthcare related services (family physician, prescriptions, health insurance);
- Driving related services (drivers license, vehicles and small boats, driving insurance)
- Requesting one's information and informing of changes;
- Social welfare services (benefits, allowances, pension);
- Real-estate related services (my real estates, land tax, building register);
- Business-related services (registrations, licenses, sole proprietors, taxes).

Most of the quantitative data was collected by the means of Likert scales that had up to five options. Participants were asked to

estimate if they would benefit when particular services became available via a smartphone in regards to each group.

In addition the questionnaire had three open questions. Two of them asked respondents to recall several applications and web pages they had used last time on their smartphone. The third open question provided the possibility of sharing ideas about any other government services the respondent would like to access from his or her smartphone.

Full anonymity was granted to every participant by default. As further work foresees interviews and focus groups for in-depth investigation of the users' requirements, respondents were asked if they agree to help the researchers and would like to take part in further activities. In case of a positive answer respondents were offered to share their contact details, such as e-mail address, Skype or phone number. That information will remain confidential.

The respondents were independent while filling in questionnaire. They were not provided any assistance by the researchers and could not contact them during the course of completing the survey. Still, respondents were aware about the institutions conducting the survey, as well as the names and positions of the researchers.

3.5 Results

The requested personal information included participants' age, sex, nationality and occupation. Most of the respondents (65.1%) were between 26 and 45 years old. The youth group (under 26) is represented by 16.9% of the sample. Only 12 responses (2.4%) came from respondents aged 65 and over, that is why no generalization would be done for this particular subgroup. Sex distribution of the sample showed male majority (57.9%). Ethnic nationalities of respondents are correspondent to actual proportions in Estonia: 64.4% of Estonians and 35.6% of non-Estonians (compared to 68.8% and 31.2% respectively[1]). Statistically significant groups by occupation are employed people (65.6%), entrepreneurs (12.9%) and students (9.3%).

Results show that audience is well equipped with mobile Internet access devices: 270 respondents (54.3%) answered they own a smartphone. The following statistics are applied only to those, who named themselves as permanent smartphone user.

Mobile Internet usage: 94.1% have Internet access in their smartphone and use the mobile Internet at least once a month.

Stand-alone vs. web-based applications: additional applications were downloaded and installed at least once by 83% of smartphone owners. However, most of the users (37%) remained technology-neutral and have no strong preference about the types of applications to use. Nearly the same quantity (35.6%) strongly preferred stand-alone mobile applications, while only 14.1% showed their clear preference of web-based applications. The minority of the sample (13.3%) confessed to inability in differentiating application types.

Popular stand-alone applications: 67.2% shared a list of applications used lately on their smartphones. Among the most frequently named were well-known e-mail clients, Skype, social networking and navigation applications, sport trackers, weather widgets, e-book readers and games. About 10% of respondents were able to name local Estonian applications they use: m-parking, m-banking (SEB and Swedbank), Sõnar dictionary and Postimees news feed. No state-related mobile application was named as nothing exists so far in Estonia.

Popular web sites: 88.6% named at least one page they recently visited via their mobile browser, from search engines to adult sites. Roughly a third of participants named pages within Estonian context: banks, news, forums, university sites, business sites, online shops, etc. Some state and public-sector web pages were mentioned several times: intercity bus and train schedules, airport timetable, homepage of Tallinn city and its public transport ticket system, the State Gazette web-site (database of legislature documents). However, the state portal eesti.ee was never named among popular and frequently used web-sites.

State portal eesti.ee usage: the majority of participants (84.7%) mentioned they have used eesti.ee at least a couple times a year. Exactly 80% stated that they are familiar with the services provided by the portal either at a very good or good enough level (see Table 1). In total, 62.2% of state portal users agreed or agreed strongly that they could benefit from accessing eesti.ee services by the means of their smartphone if this would be possible. Another 38.8% disagreed or strongly disagreed with it.

Requested services: the health protection service group received the most user requests (81.1% agreed or strongly agreed that they would benefit from using services from this group on their mobile device); accessing and updating personal information stored in state registers was the second popular service group to become available as a m-service (71.1% of respondents either agreed or strongly agreed with it), services for car drivers and boat owners formed the third popular group (with 68.5% respondents shared the opinion that they would rather use such services on the go). Other groups were less demanded, with educational services named as lowest priority when going mobile (only 36.7% would like to use those services from their smartphones).

Readiness for future cooperation: 23.3% of respondents shared their contact details with the researchers and confirmed their willingness to contribute their time and experience for future study of users' requirements in the form of interviews and focus groups.

3.6 Discussion

The survey unveiled that Estonian residents are in general well informed about government services currently available via the state portal and would like to use some of them on mobile Internet access devices as well.

As there are two big ethnic groups living in Estonia – Estonians and non-Estonians – the state portal eesti.ee is translated simultaneously into three languages: Estonian, Russian and English. That is why the researchers decided to compare expectations for m-government services based on nationality of the respondents. As can be seen on Table 1, there is some difference between Estonians and non-Estonians in their demand for mobile web services. However, it is unclear if this difference is statistically significant, as current data is not enough to make such an integrating conclusion. For example, the survey sample has only 25 students among all respondents regardless of nationality, who confirmed they use smartphones and are more or less familiar with the state portal eesti.ee services. That is why a more in-depth study is required in order to understand if requirements of Estonians and non-Estonians are equal or not. Current results suggest there is some divergence between ethnic Estonians and non-Estonians in their relation to upcoming m-government services: ethnic Estonians appear to be more progressive and open

[1] Retrieved 09.05.2011, from http://www.stat.ee/34278

to innovation, whereas non-Estonians are more conservative or cautious. This hypothesis should be checked if future research.

Table 1: Current eesti.ee state portal users' preferences over mobile services (270 respondents, in the context of nationality)

		Esto-nians, %	Non-Estonians, %
Education services (Education Information System, national examinations and certifications)	Would use	52.1	26.6
	Would not use	47.9	73.4
Healthcare related services (family physician, prescriptions, health insurance)	Would use	87.3	80.4
	Would not use	12.7	19.6
Driving related services (drivers license, vehicles and small boats, driving insurance)	Would use	78.7	65.6
	Would not use	21.3	34.4
Requesting ones information and informing of changes	Would use	80.5	66.7
	Would not use	19.5	33.3
Social welfare services (benefits, allowances, pension)	Would use	61.0	49.5
	Would not use	39.0	50.5
Real estate related services (my real estates, land tax, building register)	Would use	66.0	41.2
	Would not use	34.0	58.8
Business-related services (registrations, licenses, sole proprietors, taxes)	Would use	64.6	44.4
	Would not use	35.4	55.6

Ideas for other state services: 39 respondents (7.8%) shared more than 50 ideas for mobile services that some day could be provided by government or local authorities. Following is a list of ideas mentioned at least twice:

- Applying for a fishing permit;
- Traffic services (traffic jams, maintenance works, temporary speed limits and cameras);
- M-elections (voting and real-time results);
- A list of debtors;
- Register of legal companies;
- Status of one's requests to the police, courts, ministries, departments and local authorities;
- A database of laws currently in use and their commented texts;
- Tax and customs board, tax returns;
- Land board and a geo-portal with the possibility to detect the owner of a land property by its coordinates obtained from a mobile device GPS data;
- Public tenders and purchases;
- Power supply disturbances.

In addition to the mentioned ideas, many respondents accented security and privacy issues of mobile services while answering this open question. For example, here are several comments received from participants (original comments are translated from Estonian and Russian into English by the researchers):

- "The quality of m-services is far more important to me than the quantity of available services", (female, aged 26-45);
- "I would not use any m-service until I am sure they are safe enough", (female, aged 26-45);
- "I would not use any m-service until I see that current bugs on the state portal eesti.ee are fixed", (male, aged 46-65);
- "I would not use any state mobile services because I don't believe the government can handle their security", (female, aged younger than 26);
- "I would like to only use local m-services with urgent information, like traffic jams or problems in the power supply. Everything else is much better accessed from a desktop computer rather than a smartphone", (male, aged 26-45).

Finally, a few respondents asked if a dedicated helpdesk or call-center is planned in case users of mobile services come across issues they can't solve.

4. CONCLUSION

Since the 1990-s public sector organizations around the world were applying Internet technology to deliver services, engage citizen and improve state efficiency. This set of practices is now commonly known as e-government [5].

In order for e-government to be effective it requires appropriate ICTs to be integrated in a seamless and successful way as well as have quality information, engaged public employees and good administrative processes. E-government provides great new opportunities for improving public services and enhancing the efficiency of government operations [17].

The rise and fast growth of mobile communication technologies forces governments to adapt to change and start providing services through this new medium. Governments that are not able to embrace the change are facing the risk of losing connection with a large percentage of citizens. On the other hand, m-government services should be designed with even greater care in order to provide solutions, which are easy to use and understand, but also take into account the capabilities and technical limitations of mobile devices currently found in circulation with privacy and security issues being properly addressed.

The purpose of this research is to establish an initial understanding of the users' needs and expectations in regards to the mobile version of the state portal. To accomplish this goal, a semi-structured questionnaire was provided to Estonian residents who use the Estonian state portal eesti.ee. The results of the current study will serve as the foundation for future research as well as contribute to the design of a mobile version of the state portal that should better correspond to users' expectations.

Current research results allow making several recommendations for institutions involved in the development of m-government services:

- Stand-alone mobile applications should be preferred if possible, as 35.6% respondents strongly preferred stand-alone mobile applications, while only 14.1% showed their clear preference of web-based applications;
- When selecting particular services for mobile implementation, the healthcare services group (including family physician,

prescriptions and health insurance services) should be preferred, as 81.1% respondents either agreed or strongly agreed that they would benefit from using those services on their mobile device;

- Real users should be involved in the design and testing process from early stages, as they have lots of ideas and are ready to share them (23.3% of respondents shared their contact details with the researchers and confirmed their willingness to take part in future study of users' requirements);
- Requirements and expectations of different user groups (non-Estonians, elderly, students, entrepreneurs, those who live in rural areas) should be analyzed in more detail, as the current sample does not have enough responses from those subgroups to make statistically significant conclusions about preferences of smaller groups of potential users (for example, only 25 student responses qualified for further multidimensional analysis);
- Privacy and security issues should be put in focus and explained to potential users, as there are some very critical (or biased) opinions about security of m-government among respondents.

As m-government services are a relatively unexplored field in Estonia, more complex research should be conducted to ensure public mobile services would be developed in order to satisfy user requirements. This research unveiled concrete user expectations and a high level of experience with mobile technologies. The authors will continue to interview and conduct focus groups with participants who showed willingness to help in these activities. The aim of the next phase of this research is to design an architecture and core functionality of mobile services provided by the Estonian state portal eesti.ee.

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6. REFERENCES

[1] Mansoor Alrazooqi and Rohan De Silva. 2010. Mobile and wireless services and technologies for m-government solution proposal for Dubai government. *WSEAS Trans. Info. Sci. and App.* 7, 8 (August 2010), 1037-1047.

[2] Warkentin, M., Gefen, D., Pavlou, P.A., and Rose, G.M. 2001. Encouraging Citizen Adoption of e-Government by Building Trust. *Electronic Markets 12,* 157 — 16

[3] Jaeger, P.T., Thompson, K.M. 2003. E-government around the world: lessons, challenges, and future directions. *Government Information Quarterly 20*, 389 –394

[4] Noor, K., Mahlakõiv, T., Astok, H., Uudelepp, A., Kinkar, L. 2011. *Digi-tv ja mobiiltelefoni kasutusvõimalused avalike teenuste osutamisel [Digital TV and mobile phone uses for providing public services]*. Retrieved 05.05.2011, from http://www.praxis.ee/fileadmin/tarmo/Projektid/Valitsemine_ja_kodanike%C3%BChiskond/DigiMobi_uuring_2011_final.pdf

[5] Silvana Trimi and Hong Sheng. 2008. Emerging trends in M-government. *Commun. ACM* 51, 5 (May 2008), 53-58.

[6] International Telecommunication Union 2010. *Key Global Telecom Indicators for the World Telecommunication Service Sector.* Retrieved 06.05.2011, from http://www.itu.int/ITU-D/ict/statistics/at_glance/KeyTelecom.html

[7] Horrigan, J. 2009. *Wireless Internet Use.* Retrieved 05.05.2011, from http://web.pewinternet.org/~/media/Files/Reports/2009/Wireless-Internet-Use-With-Topline.pdf

[8] Minhee, C., Jinwoo, K., Hoyoung, K., and Hosung, R. 2001. Information Quality for Mobile Internet Services: A Theoretical Model with Empirical Validation. *Electronic Markets 12*, 38 — 46

[9] mGCI 2005. *Mobile Government Consortium International.* Retrieved 08.05.2011, from http://www.mgovernment.org/

[10] Kushchu, I., Kuscu, M.H. 2003. From E-government to M-government: Facing the Inevitable. In *Proceedings of European Conference on E-Government (ECEG 2003).*

[11] Mobi Solutions. *M-riik & m-linn [M-state and m-city].* Retrieved 05.05.2011, from http://www.mobi.ee/teenused/m-linna-m-riigi-teenused

[12] Rossel, P., Finger, M., and Misuraca, G. 2006. "Mobile" e-Government Options: Between Technology-driven and Usercentric. *The Electronic Journal of e-Government 4*, 79 – 86.

[13] Vabariigi Valitsus [Estonian Government] 2011. *Isamaa ja Res Publica Liidu ning Eesti Reformierakonna valitsusliidu program [Union of Pro Patria, Res Publica and Estonian Reform Party union's government program].* Retrieved 05.05.2011, from http://valitsus.ee/UserFiles/valitsus/et/uudised/taustamaterjalid/Valitsusliit%20I.pdf

[14] State portal. Retrieved 06.05.2011, from http://www.eesti.ee/eng

[15] Estonian Informatics Centre. *About Us*. Retrieved 06.05.2011, from http://www.ria.ee/about

[16] TNS Emor 2010. *Kodanike rahulolu riigi poolt pakutavate avalike e-teenustega [Citizens' satisfaction with public sector e-services].* Retrieved 08.05.2011, from http://www.riso.ee/et/files/kodanike_rahulolu_avalike_eteenustega_2010.pdf

[17] Sang M. Lee, Xin Tan, and Silvana Trimi. 2005. Current practices of leading e-government countries. *Commun. ACM* 48, 10 (October 2005), 99-104.