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# Mobile Government: 2010 and Beyond

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## White paper

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The paper introduces the emerging need for m-government, classifies m-government services, provides a list of existing m-government services worldwide, analyses their potential in the public sector, evaluates the needs of the public, discusses researches about m-government, and presents a discussion of challenges and benefits for m-services and recommends actions for all stakeholders.

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## Table of Contents

Introduction .....	5
Abstract .....	9
Part 1 - Relevance and Trends .....	10
I. Reasons behind: Why m-government? .....	10
1. Socio-economic impacts of m-services, cases and expectations for the future .....	11
2. Measurement and theories behind m-services .....	26
Part 2 - Best practices .....	40
II. Main areas where m-government services are in use .....	40
III. International Case studies .....	42
1. m-Health .....	43
1.1. SMS for Health .....	43
1.2. Health Data Collection and Transmission .....	45
1.3. Health Education and Peer Support Group .....	47
1.4. Health SMS Infolines .....	48
1.5. Medication Reminders .....	49
1.6. Health advice .....	50
1.7. Remote Data Collection .....	53
1.8. Communication and Training for Healthcare Workers .....	55
1.9. Disease and Epidemic Outbreak Tracking .....	56
2. m-Agriculture .....	56
2.1. SMS for Agriculture .....	56
2.2. Agricultural alerts and advice .....	58
3. SMS for Education .....	59
3.1. SMS for Educational Institutions .....	59
3.2. Parent communication .....	60
3.3. Exam results by SMS .....	62
3.4. Testing students by mobile phone .....	62
3.5. Mobile phone technology for non-formal distance education .....	63
4. SMS for Emergency .....	64
5. SMS for Humanitarian Relief .....	67
6. SMS for Tax service .....	68
7. M-Banking .....	69
8. Other SMS services .....	71

9. Special notifications by SMS .....	73
10. SMS for Transport .....	74
IV. Case study - Estonia leading in m-government.....	75
1. The success of Estonia .....	75
2. KPMG report shows Estonia as CEE leader in mobile payments.....	75
3. Estonian best practices .....	76
Part 3 - User Feedback.....	83
V. User satisfaction .....	83
VI. End-user study.....	84
VII. Target-group study.....	87
VIII. Public sector Study.....	90
Part 4 - Future Scenarios .....	94
IX. Future government .....	94
X. Challenges for a future of m-Government: .....	98
Conclusion.....	102

# INTRODUCTION

"Mobile communication technologies are a key catalyst for transformational change," stated Jim Fitzpatrick, the Parliamentary undersecretary. <sup>i</sup>

In 2008 the total mobile subscriptions crossed 4 billion.<sup>ii</sup> Mobile phones have emerged from being a luxury product to a mass necessity.

The journey of the last 10 years of mobile technology has been ascensional, where a lot has been accomplished in a short period of time. In 1998, the global mobile penetration was around 5%, it crossed 50% mark in 2008 and it is expected to have almost the same number of mobile subscriptions as the number of global citizens by 2018. <sup>iii</sup>

Between 2000-2009 the World Internet Usage has grown 362.3%.<sup>iv</sup> Internet is used by almost all the cultures of the world and it is embedded in everything in the world. The same trend is already being recognized with mobile devices and applications.

With the implementation of internet into mobile devices, with the combination of these two, the ubiquitous connectivity has become a reality. The opportunity that mobile phones offer, has pulled more people into the wireless world, and also more citizen-related services are offered via mobile devices. Year after year mobile devices, primary used for voice communication, have been included in improving health system, transportation, governance, public safety, enterprises etc. Innovation around the mobile phones interests lots of governments, NGOs and private sector companies, where the new services are mainly born out of necessity rather than from empty space.

It has been realized that mobile technology is crucial to finding solutions to some of the world's greatest challenges. As the number of mobiles has grown in many times, it is difficult to measure the amount of change that mobile phones have made in the social and economic spheres. Private sector applied mobile technology in its work much earlier than the public sector.

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). In case of both the 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. 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.

Today we witness that mobile technology explosion is affecting all the fields of life and is changing the functioning of old institutions such as journalism into social media. But studies and statistical evidence demonstrate that mobile phones and SMS alerts have a measurable effect on government services. Therefore, governments have contacted with mobile telecommunication companies and private sector businesses to bring ICT services to the public level. Governments have realized that with the help of ICT services people can participate in the country's development process and vice versa, the government can improve the livelihood of people and meet their expectations.

The main benefit of the m-government is that it truly helps to create an integrated digital nervous system for government. The advancement of ICT explains why new m-government applications emerge and why government has many opportunities through the wireless channels. Its immediacy and convenience reduces the previous barriers to public service operations, encouraging citizens or service providers to make use of the technology. Digital systems enable public service personnel to gather data more efficiently and improve its delivery, also encourage citizens to utilize public services more easily and be more cordial in the city's or government's decision process.

The need to engage modern ICTs in the public sector was first realized by some governments as a possibility at the end of the 1990s. Government services moved to the Internet where the electronic government enabled an access to the information and services 24 hours a day, 7 days a week, 365 days a year.

It is said that e-government is more about government than about 'e'. E-government is more convenient, gives more participatory opportunities and it simply is a better government to its citizens.

The rise of information society with the approach related to social responsibility increased the expectations and needs of the citizens and officials, so that government started to find complementary ideas.

The "e" in front of the government hasn't been removed, but replaced with "m". M-government initiative is to enhance the opportunities that ICT enables and engage these with government processes - simply put; it has to do more for less. So, the viability of m-government can only be explained within the context of e-government, where one is the subsidiary of the other. The concept of m-government is currently maturing, raising the expectations to improve the social and economic situation and encouraging thinkers to develop new ideas of how to apply mobile phones to better lives.

Though, m-government is still in its early stages, it has begun to transform the delivery of public services. There is a growing body of evidence that demonstrates the potential of mobile communication.

In Estonia, mobiles are used to manage parking system and improve communication between home and school.

Bangladesh government sends text messages to warn people of natural disasters, including floods and cyclones.

Project M-Pesa is a mobile phone based money transfer service that also allows customers to send remittances home across the country and make payments.

Deloitte (2008) explained that mobile phones can also have a positive impact on the economic welfare. It is highlighted in his analysis that this is through a range of factors, e.g., the number of workers reliant on a mobile phone and the revenue or time savings that access to a mobile phone (instead of fixed line) may bring.

Another report showed that the impact of mobile phone penetration is positively linked to Foreign Direct Investment (FDI) with a 1% increase in mobile penetration rates associated with 0.5-0.6% higher rates of FDI and GDP (Williams 2005).

Long-term goal and expected trend is that m-government programs worldwide will make the functioning of government more effective and demonstrate positive impact on people's lives.

# **ABSTRACT**

The goal of this paper is to understand the mobile phone as a value-adding device in government services. In this report we use theories such as the priority matrix, long tail of social mobile etc. to develop a framework for understanding mobile technology and its engagement for m-government applications.

The report explains the purposes of m-government, classifies m-government services, provides a list of existing m-government services, analyses their potential in the public sector, evaluates the needs of the public, discusses researches about m-government, and presents a discussion of challenges and benefits that m-government carries within.

It also highlights the results of a survey about mobile technology in Estonian education system where 90 per cent of the parents rated M-Teacher service to be a useful intermediary between home and school.

Our intention is also to achieve a paradigm change in government services: from the current paradigm, wherein governments manually collect and accumulate knowledge, to a paradigm consisting of "humans," "information," and "technology," where government procedures are more transparent, engaging and fostered by integrating several levels of services.

Mobile Government: 2010 and beyond is a discursive reasoning for public sector organizations, NGOs and individuals who are planning to improve their services by applying mobile technologies.

Therefore, the report builds a framework for them to evaluate and to realize the potential of the technology in m-government.

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# PART 1 - RELEVANCE AND TRENDS

## ***I. REASONS BEHIND: WHY M-GOVERNMENT?***

Why are we talking about m-city and m-government services? There are the following main reasons:

- **Wider reach.** 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.
- **Always carried, always on.** 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 is especially important in case of urgent messages and crisis communication.
- **More personalization for targeting users.** Computer is shared among different users, but mobile devices are designed for a single user. Information reaches to the preferred addressee at any time through one specific device. <sup>vi</sup>
- **Cost-effective.** M-government provides many cost saving opportunities for the government as well as for the citizen (data gathering; sending a stamped letter vs the price of one SMS etc.)
- **Better management.** New technology can help government officials to better manage allocated financial and human resources.
- **Faster information flow.** Mobile technologies enable government staff to save time and assure that there will be a decrease in time for transferring data results in better decision in shorter time. It also enables to access data in service site so that they can spend time on their job rather than travelling around for information. <sup>vii</sup>
- **Increased democracy.** Every public official should know the real and authentic opinions of the general public. As a subset of e-government, m-government is also about

transforming the relationship between citizens and governments. Beyond just providing information to citizens and electronic service delivery, e-government and m-government, should involve the use of ICT to incorporate citizens' deliberation into policy development and the selection of leaders. In the long-run, indicative of an effective m-government is the proactive participation of citizens in decision-making, policy formulation and towards the end, nation-building.

- **Solution to digital divide.** The adoption rates of mobile phones are faster than those of PCs. Potentially mobile applications can bring a part of the solution to the digital divide. Moreover, computers do not travel along with citizens, but information and public services can because of the instant availability of mobile devices and/or services. Moreover, m-government is particularly suited for the developing world where the Internet access rates are low, but mobile phone penetration is growing rapidly (especially in urban areas).

- **Better the lives of disabled.** SMS can be helpful for those who are hearing-impaired. Many hearing-impaired people find text-messaging to be an ideal form of communication, as no audible conversation is needed. However, those who are visually impaired are less likely to use text-messaging. As with other factors, multiple channels of message delivery therefore must be considered.<sup>viii</sup>

## **Overview of global trends: Main findings from former studies**

Many researchers, organisations and governments are interested in mobile technology, its evolution and possibilities in the public sphere. Several studies came to the conclusion that illustrates the actual benefit that mobile phones bring. This paper presents only some of the findings.

### **1. Socio-economic impacts of m-services, cases and expectations for the future**

#### **1.1. Evolution in mobile technology promises more innovative services and increasing global use expected by 2018**

To see where the mobile technology is heading, it is worthwhile to take a note of the journey of the last 10 years and what has been accomplished in a short period of time.

In 1998, the global mobile penetration was around 5%, it crossed 50% mark in 2008 and it is expected to have almost the same number of mobile subscriptions as the number of global citizens by 2018. Table below summarizes the key performance metrics from 1998, 2008, and the estimates for 2018.

**Table 1: Mobile Evolution 1998-2018**

	<u>1998</u>	<u>2008</u>	<u>2018 (estimated)</u>
<b><u>Mobile Penetration</u></b>			
<b><u>Global</u></b>	<u>5%</u>	<u>55%</u>	<u>96%</u>
<b><u>China</u></b>	<u>2%</u>	<u>48%</u>	<u>100%</u>
<b><u>India</u></b>	<u>&lt; 1%</u>	<u>28%</u>	<u>82%</u>
<b><u>High GDP per capita nations/Total Mobile Subscriber base</u></b>	<u>75%</u>	<u>24%</u>	<u>15%</u>
<b><u>China + India/Total Mobile Subscriber base</u></b>	<u>8%</u>	<u>26%</u>	<u>36%</u>
<b><u>Mobile Data Services Revenues as %</u></b>	<u>4%</u>	<u>19%</u>	<u>40%</u>
<b><u>Main data Applications</u></b>	<u>SMS</u>	<u>SMS, Browsing, Search, Video, Music, Navigation, Enterprise</u>	
<b><u>Networks</u></b>	<u>Primary 1G and 2G</u>	<u>Mostly 2.5G and 3G</u>	<u>Mostly 5G and 6G</u>
<b><u>3G+ penetration</u></b>	<u>0%</u>	<u>18%</u>	<u>90%</u>
<b><u>Network Speeds</u></b>	<u>&lt; 50kbps</u>	<u>Up to 2Mbps</u>	<u>Up to 1Gbps</u>
<b><u>Devices ASP</u></b>	<u>\$200</u>	<u>\$130</u>	<u>&lt; \$20</u>
<b><u>Smartphone penetration</u></b>	<u>&lt; 1%</u>	<u>10%</u>	<u>40%</u>
<b><u>Average Battery Life</u></b>	<u>2 hours</u>	<u>2.5 hours</u>	<u>24 hours</u>

Results: As indicated in table 1, global mobile penetration grew 10 fold in the last 10 years and is likely to reach almost 100% by 2018.

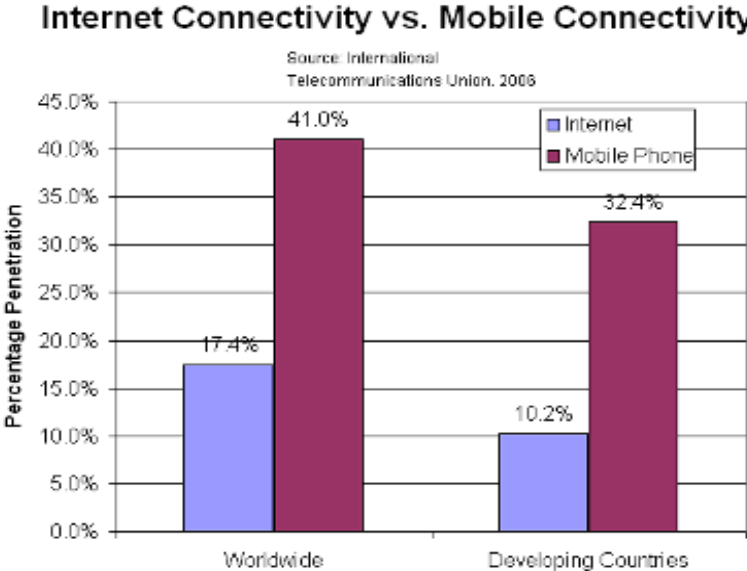
China and India will account for the most number of subscribers and will add a total of approximately 1.6 billion new subscribers in the next decade. Also, there will be a significant shift in mobile revenues from voice to data, the likes of which we have seen in Japan and similar trends are starting to emerge in Western Europe, Korea, and North America.

Flat rate pricing which is inevitable in every territory will foster growth and usage of new mobile applications where consumers don't have to worry about usage based tariffs. Newer business models, including mobile advertising will also help lower the cost of mobile data services to the users and encourage innovation and usage. (Mobile Penetration Evolution 2008).<sup>ix</sup>

**1.2.M-government is the new frontier in public service delivery**

According to the ITU, the total number of mobile users worldwide as of late 2006 was about 2.7 billion and the number of Internet users was just above 1.1 billion. This means that at least there is 23.6% of world population (and at least 22.2% of developing countries' population) who already have mobile phones but are not yet using the Internet. The figure below vividly illustrates the "M-Opportunity".<sup>x</sup>

**Figure1<sup>xi</sup>: Internet Connectivity vs. Mobile Connectivity**



### 1.3.SMS contributes to the use of e-government

In relation with the typical e-government use, Taylor Nelson Sofres Plc, one of the world's leading market research and information groups, found that the majority of e-government services can be accessed on the following level, for these purposes:

1. Information seeking
2. Downloading the public administration forms
3. Providing personal/household information to the government transactions such as paying for government services or products through the use of a credit card or bank account number (such as driving licence, traffic fines, recycle bins)
4. Consulting with government (*Dalziel 2004 p.6*).

Referring to the table below, the level of services, the e-government services at supply-side while using SMSs, will in general offer 6 categories: listening, notification, pull-based information, communication, transaction, integration.

**Table 2: SMS-based e-government services <sup>xii</sup>**

	Average offered categories of service levels for e-government	
1	Listen	
2	Notification	information request
3	Pull-based Information	information request
4	Communication	consulting with government
5	Transaction	providing personal information, doing transaction with government
6	Integration	

### 1.4.m-Government offers benefits to the citizen

The advantages for citizens in using m-Government have been defined by El-Kiki& Lawrence in 2006. Table 3 on page 16 shows the type of benefits that have been identified so far.

**Table 3: The benefits delivered by mobile government to citizens (El-Kiki & Lawrence, 2006) <sup>xiii</sup>**

<b>Benefits</b>	<b>Description</b>
<b>Value for Money</b>	<i>The content and service are worthier for the price paid, even better.</i>
<b>Quality of Service</b>	<p><i>Citizens (users) are aware that the services are in existence, know what it does, how it is relevant to them, and how to access it. (Awareness)</i></p> <p><i>All citizens have access to the services. (Accessibility)</i></p> <p><i>The services really work any time anywhere. (Availability)</i></p> <p><i>The services perform dependably, accurately, and consistently. (Reliability)</i></p> <p><i>The services are more accurate, minimal error possible. (Accuracy)</i></p> <p><i>The systems response any access and request fast. (Responsiveness)</i></p> <p><i>The services are more respectful, considerate, friendly, helpful, polite, and efficient. (Courtesy and helpfulness)</i></p>
<b>Efficient Transactions</b>	<p><i>The services are easier and more convenient to use. (Usability)</i></p> <p><i>The services are delivered on promised time and do play an important role in G2C relationship. (Timeliness)</i></p> <p><i>The services can be more trusted. (Trust)</i></p> <p><i>It protects the users' privacy. (Privacy)</i></p> <p><i>It has more secure service. (Security)</i></p>
<b>Strategic Data</b>	<p><i>Through the services, citizens can tell and ask who did what and when to the government, and government answers it by keeping their privacy and security. (Accountability)</i></p> <p><i>Using the services, government makes any decisions and actions open for citizens. (Transparency)</i></p>

### **1.5.Mobile communications bring change in the efficiency of government work**

A report from iReach commissioned by mobile operator O2 Ireland has found that many Government departments and public sector organisations are embracing mobile communications in innovative and cost effective ways.

Results: The study states that the three key drivers behind the development of m-Government programmes are:

1. cost savings to government agencies;
2. streamlining of internal processes for administrative tasks;
3. the facilitation of better access to public services for citizens.

A study conducted by the mobile messaging and data services provider Puca in December 2004 suggests that citizens would be interested in communicating with the Government and public sector using their mobile phones. Of those surveyed by Puca, 48% mentioned that they would be interested in receiving text message reminders about NCT tests, driving tests and hospital appointments from the public sector. Another 48% said they would like to be able to request information from the public sector via text message. <sup>xiv</sup>

### **1.6.Mobile industry and services revolutionize social and economic development**

The Mobile Development Report describes that mobile communication is revolutionizing economic and social life in rural India, spawning a wave of local entrepreneurs and creating greater access to social services according to study by The Center for Knowledge Societies (CKS) commissioned by Nokia.

The research identifies seven major service sectors including transport, finance and healthcare that could be radically transformed through mobile technologies.

Accessing information about public services remains a major challenge for many rural communities. Mobile phones provide a new platform through which rural communities will be able to access government information and services, using text, data, and audio browsing techniques. <sup>xv</sup>

### 1.6.1. The role of mobile phones in sustainable rural poverty reduction

Mobile telephony has a positive impact on the economic welfare in the following direct ways:

Productivity gains from the operation of mobile telephony can also be substantial. This is analyzed through a range of factors, e.g., the number of workers reliant on a mobile phone and the revenue or time savings that access to a mobile phone (instead of fixed line) may bring.

**Table 4: The productivity benefits of mobile phones (Deloitte 2008):<sup>xvi</sup>**

	<b>Categories</b>
1	<b>Business Expansion:</b> e.g., in the import/export & small trade business at Odessa Seaport, Ukraine, mobiles were a powerful tool to estimate demand and seek out new customers
2	<b>Employment Search:</b> This is particularly important in countries such as Serbia, which has high unemployment (20%) or Thailand, with its high level of temporary employment
3	<b>Entrepreneurialism:</b> Mobile phones reduce the cost of operating and starting up businesses. For example, beauticians in Pakistan and taxi drivers in Thailand.
4	<b>Mobile Banking:</b> Mobile phones reduce the need to meet face-to-face to conduct business. For example, Wizzit in South Africa offers the option of total substitution of banking.
5	<b>Transaction Costs:</b> Improvements in the information flows between buyers and sellers, allow for the exchange of information without travelling.

### 1.6.2. NGO are using mobile technology for social change

The objective of the research was to demonstrate how NGOs are using wireless technology to help reach various social, civil, economic, and political goals.

Results:

*A) NGOs' use of mobile technology is very widespread and indispensable.*

- 86% of NGO employees are using mobile technology in their work.
- NGO representatives working on projects in Africa or Asia are more likely to be mobile technology users than their colleagues in areas with more 'wired' infrastructures.
- 99% of technology users characterize the impact of mobile technology as positive.
- Moreover, nearly a quarter describe this technology as "revolutionary" and another 31% say it would be difficult to do their jobs without it.

#### *B) Applications of NGO Mobile Use Are Diverse*

- While voice and text messaging are still the most common applications of mobile technology among NGO workers, respondents report using wireless technology in a number of other ways, including photo and video (39%); data collection or transfer (28%); and multi-media messaging (27%).
- The survey also finds some NGO workers using mobile technology for more sophisticated purposes such as data analysis (8%), inventory management (8%), and mapping (10%). Importantly, the amount of money invested in mobile technology correlates to a higher diversity of application; those NGOs that spend more use this technology for higher-end functions.
- Users of mobile technology on projects with a health focus are also more likely to use mobile technology for data purposes.

#### *C) Perceived Benefits of NGO Mobile Use are Enormous*

- The survey reveals that the key benefits of mobile technology for all NGOs include time savings (95%); the ability to quickly mobilize or organize individuals (91%); reaching audiences that were previously difficult or impossible to reach (74%); the ability to transmit data more quickly and accurately (67%); and the ability to gather data more quickly and accurately (59%).
- Not surprisingly, then, 76% of NGO users said they would likely increase their use of mobile technology in the future. Many of these survey results are reflected in the case studies featured in this report. <sup>xvii</sup>
- Mobile phone penetration in developing countries has a positive influence on economy.

### **1.6.3. EU uses ICT to save hundreds of billions of taxpayers money**

European Commission's eGovernment 2010 Action Plan outlined that hundreds of billions of euros could be saved for European taxpayers every year as a result of administrative modernisation in the EU Member States. Information and communication technology is the key to modernising government services: making them more efficient and more responsive. 100% take-up of electronic invoicing and electronic public procurement is predicted to save 300 billion euros every year. All Member States already signed up to an ambitious agenda to achieve these goals. Action plan proposes concrete steps towards achieving these goals. <sup>xviii</sup>

### **1.6.4. Microeconomic impacts of mobile phones**

With regard to economic impacts, a few key studies have outlined the benefits of improved market information flows as a result of mobile phones, for example in the *fishing industry in Kerala, India, as well as the grain markets in Niger*.

In both studies the authors described how the use of cell phones to check prices across several markets led to reduced price discrepancies for various commodities, as well as less spoilage as a result of improved demand information.

In the study of the fishing village in Kerala, India, both consumer and producer welfare increased, with reduced waste (6% of the fish were unsold before cell phones), fishermen's profits up by 8% and consumer prices going down by 4%, directly driving a 20 rupee/person/month consumer surplus, the equivalent of a 2% increase in per-capita GDP from this one market alone (Abraham 2007; Jensen 2007).

In another similar study looking at grain markets in Niger, the evidence showed that cell phones reduce grain price dispersion across markets by a minimum of 6.4% and reduce intra-annual price variation by 10% (Aker 2008). Besides smoother price information, entrepreneurs who were interviewed generally felt that having a mobile phone provided them with more business opportunities, in terms of improved business contacts, better weather and market information for farmers, greater sales for small businessmen, and the ability to conduct business via a "mobile office," thus improving productivity and allowing some of the entrepreneurs to remain in the "informal" sector (Donner 2005; Kwaku Kyem, Kweku LeMaire 2006; Lane et al 2006; Molony 2005).

Users also cited the assistance mobile phones gave them in finding employment, whether of finding out about job opportunities without having to travel long distances, or being available and accessible via mobile phone in case that the prospective employers or customers need to reach them (Frost & Sullivan 2006; Samuel et al 2005)

#### **1.6.5. Macroeconomic impacts of mobile phones**

In terms of general macroeconomic impacts, there are a couple key studies that have demonstrated the positive influence of mobile phone penetration in developing countries.

One well-known study found that while mobile phones in less developed countries are playing the same crucial role that fixed telephony played in richer countries in the 1970s and 1980s, the growth impact of mobiles is around twice as important in developing countries, where there is also a critical mass effect, and that a *rise of ten mobile phones per 100 people boosts GDP growth by 0.6%* (Waverman, Meschi, Fuss 2005).

Another report showed that the impact of *mobile phone penetration is positively linked to Foreign Direct Investment (FDI)*, and that this impact has grown more significant in recent years, with a 1% increase in mobile penetration rates associated with 0.5-0.6% higher rates of FDI and GDP (Williams 2005).

#### **1.6.6. Low-income customers value mobile banking for its affordability**

The study conducted by CGAP, in partnership with the United Nations Foundation, the Vodafone Group Foundation with contribution from South Africa's FinMark Trust, looks at how low-income people view and use m-banking, finding that low-income WIZZIT customers value the m-banking service for its affordability, ease of use, and security, as compared to the use of bank branches and ATMs. As of a result, WIZZIT users conduct more banking transactions per month using the service than non-users conduct at all other channels combined. WIZZIT customers prefer to use their mobile phone over other channels to pay for pre-paid electricity, transfer money, buy pre-paid airtime, check account balances and pay store accounts. While the study shows that m-banking services are valued by poor people in South Africa and may be more affordable than traditional banking, it also suggests that m-banking providers must build greater awareness of their services and must find the right balance between a human touch and technology to appeal to more low-income customers.

### **1.6.7. A case study from Bangladesh shows remarkable economic and social benefits of using m-services**

The case study investigates economic and social benefits in Bangladesh.

Key findings from the study are as follows:

- Almost a quarter of a million Bangladeshi depend on the mobile industry, directly and indirectly, with the poorest citizens benefiting most from mobile services.
- Mobile services contribute US\$650 million to the economy every year.
- Mobile services are good value for money when compared with other countries.
- Mobile communications allow businesses to operate with greater efficiency.
- For every additional 10 percentage points of mobile penetration, the annual GDP growth rate is increased by approximately 0.6%.
- Higher mobile penetration will assist Foreign Direct Investment (FDI). Increasing penetration by 1% increases FDI as a proportion of GDP by 0.5%.
- Mobile services improve social cohesion, assist in reducing the digital divide, improve access to healthcare and can help improve users' quality of life.

At the same time a number of concerns are presented that need to be addressed to fully realise the benefits of mobile services, specifically around tax and interconnection policy, with recommendations for addressing these issues. <sup>xix</sup>

### **1.6.8. Mobile internet gives more opportunities for the government in engaging citizens**

Governments who develop e- and m-services, have more opportunities for citizen engagement.

"Future of the Internet III" study surveyed nearly 600 Internet experts about the role of technology in the year 2020, who emphasized the increasing role of mobile internet in the future.

Results: The combination of portability and relative affordability will turn the cell phone into the leading Internet gateway 12 years from now.

- By 2020, standard network connections will be around the world.
- Billions of people will have joined the Internet who don't speak English.

- They won't think of these things as 'phones' either - these devices will be simply lenses on the online world. Future mobile phones will function more as computers than phones. "By 2020 I don't think it will be so easy to distinguish between a mobile phone and a laptop," said Steve Jones, co-founder of the Association of Internet Researchers and associate dean at the University of Illinois-Chicago. "These will blend into a general 'mobile computing' category of device (for which we probably don't yet have a name)."
- An increase in consumer demand enhances mobile money services.<sup>xx</sup>

A report from Ovum reveals activity in mobile payment services - and more broadly mobile money services - is accelerating in many emerging markets.

The report, 'Mobile money in emerging markets', says the market is still in its infancy, yet it has the potential to become a mass-market service, penetrating one-third of all mobile users in emerging markets in five years' time. However, much will hinge on how well the industry addresses various market barriers, and its ability to nurture user demand with clear, simple and attractive propositions.

Whilst there is a range of alternative scenarios, Ovum predicts that the most likely one will be a market where service penetration reaches between 30% and 40% of the emerging market's mobile users in 2014. Where the industry resolves the market barriers more quickly than envisaged, an optimistic scenario is possible where strong user demand propels mobile money services to penetrate between 60% and 70% of the mobile users in the emerging market by 2014. <sup>xxi</sup>

### **1.7. The marketplace of mobiles, active mobile web users and spenders is growing: China and US**

The report examined mobile web markets in both the US and China, and found:

China is not only a much larger mobile web market, but the Chinese also are much more active mobile web users and spenders.

The report uncovered several key differences between mobile web users in China and the US:

- 28% of Chinese own two or more mobile devices, compared with just 18% of Americans.

- Chinese access more services and activities on the mobile web, including email, news, games, local information and financial accounts. Americans and Chinese differ in the top services they use and the frequency of use. For Americans, the top three services on the mobile web are e-mail, texting and weather. For Chinese, they are news, texting and instant messaging (IM).
- 58% of Chinese mobile web users post Web 2.0 content via their mobile devices, compared with 41% of those in the US.

**Figure 2<sup>xxii</sup>: Top 10 Mobile Web Activities in a Typical Month**



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36

- 64% of Chinese mobile web users purchased premium mobile web content in the last year, compared with 36% of US mobile web users
- Chinese mobile web users spend more than ¥1.2 billion (\$182.6 million) each month on premium services, compared with \$64.8 million in the US.
- Chinese mobile web users spend a higher proportion of their monthly incomes on mobile data services (3.4%), compared to 1.2% in the US.

- Despite the growing use of the mobile web, the study found that slow connections and extra fees are still the primary barriers to both increased use (among current users) and adoption (among non-users) in both countries.

Recommendations:

Based on the survey findings, Josh Crandall, president of Netpop Research suggested that the cellular industry and government agencies need to encourage broader consumer adoption of mobile web services in the US.

When web technology is based on open standards, freely available to anyone on the Internet, market momentum and user behavior will increasingly determine which markets are destined to lead, leaving others to follow.<sup>xxiii</sup>

## **1.8. SMS makes healthcare more flexible**

*A) The Finnish Ministry of Social Affairs and Health's national appointments project reports that patients change or cancel around a quarter of their appointments.*

Text messaging in the health sector can be used for:

1. advance enquiries
2. moving and cancelling appointments
3. contacting patients on waiting lists
4. sending appointment reminders.

The use of electronic services in Finland has grown by as much as 95% in some areas in the past year. Experience shows that e-services free up 30-50% of the time healthcare professionals spend on booking appointments with patients.<sup>xxiv</sup>

*B) In Rwanda, the Ministry of Health implemented a system that uses mobile phones:*

1. to register patients
2. order supplies
3. access lab results.

Meyer, co-founder, president and chairman of Voxiva, states there are 184 studies happening globally that show results for smoking cessation, improvement in diabetics, and even birth outcomes when programs were combined with mobile interaction. For example, in one study 28% of smokers receiving quit messages via SMS actually quit, versus 19% who did not. In another study, SMS reminders improved primary care attendance from 48% to 59%.<sup>xxv</sup>

*C) Observational study (London): Effectiveness of mobile-phone SMS reminders for ophthalmology outpatient appointments.*

Non-attendance for hospital outpatient appointments is a significant problem in many countries. It causes suboptimal use of clinical and administrative staff and financial losses, as well as longer waiting times.

The use of SMS appointment reminders potentially offers a cost-effective and time-efficient strategy to decrease non-attendance and so improve the efficiency of outpatient healthcare delivery.

During the period of the study, 11.2% (50/447) of patients who received an SMS appointment reminder were non-attenders, compared to 18.1% (1720/9512) who did not receive an SMS reminder. Non-attendance rates were 38% lower in patients who received an SMS reminder than in patients who did not receive a reminder (RR of non-attendance = 0.62; 95% CI = 0.48 – 0.80).

The use of SMS reminders for ophthalmology outpatient appointments was associated with a reduction of 38% in the likelihood of patients not attending their appointments, compared to no appointment reminder. The use of SMS reminders may also be more cost-effective than traditional appointment reminders and require less labour.<sup>xxvi</sup>

### **1.9. Students prefer SMS for communicating**

Only 12% of students currently check email on their mobile, but eROI predicts that number will increase quickly, especially given the recent explosion of smartphones on the market. In the meantime, though, it is text messaging that remains supreme with 37% selecting that

as their preferred method of communication. Email is second at 26% followed by social networking IM (15%), IM (11%), and social networking email (11%).<sup>xxvii</sup>

### **1.10. The young wish that more procedures would be available wireless**

Today's teenagers already make up a generation that rarely stays unplugged. Thus, the preferences of these future citizens must be taken into consideration to offer more available government services.

The object of the in-depth survey by CTIA-The Wireless Association in conjunction with Harris Interactive is to examine how today's teens feel about wireless products and services, how they are using them today and most importantly, how they would like to use them in the future.

Results:

- Only one in five (18%) teens care to pinpoint the location of their family and friends via their mobile phone, 36% hate the idea of a mobile phone feature allowing others to know their exact location. Texting is indeed replacing talking among teens. Teens admitted spending nearly an equal amount of time talking as they do texting each month.

Wish list for the wireless mobile applications and services in the future by teens:

- Guarantee secured data access to the user only (80%)
- Provide accessibility to personal health records (66%)
- Present opportunities to be educated anywhere in the world (66%)
- Bring users closer to global issues impacting teens' world (63%)<sup>xxviii</sup>

## **2. Measurement and theories behind m-services**

### **2.1. Mobile Readiness Index (MRI) evaluates the position of mobile technology**

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. Mobile Readiness Index uses the sources of quantitative and qualitative information that range from statistical data to qualitative judgments by leading regional experts and other references.

### **2.1.1. Maturity of technology: mobile in mainstream**

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

In 2009 of all the mobile technologies, only voice and SMS are globally widespread and can be considered as mature. Voice and SMS are the most popular mobile technologies in the world, as more than 70% of world population carry a mobile phone and are able to use these. In the developed countries SMS is even more prevalent as it sometimes costs less than a call.

With the market producing more smartphones and inventing new value added services, the number of mobile phones that support later technologies (such as WAP, GPRS, 3G etc.) and the number of mobile phone users who know how to use those technologies is increasing. When in the private sector the capability and availability has reached into the status of mature, the public sector approaches with precaution to new technologies.

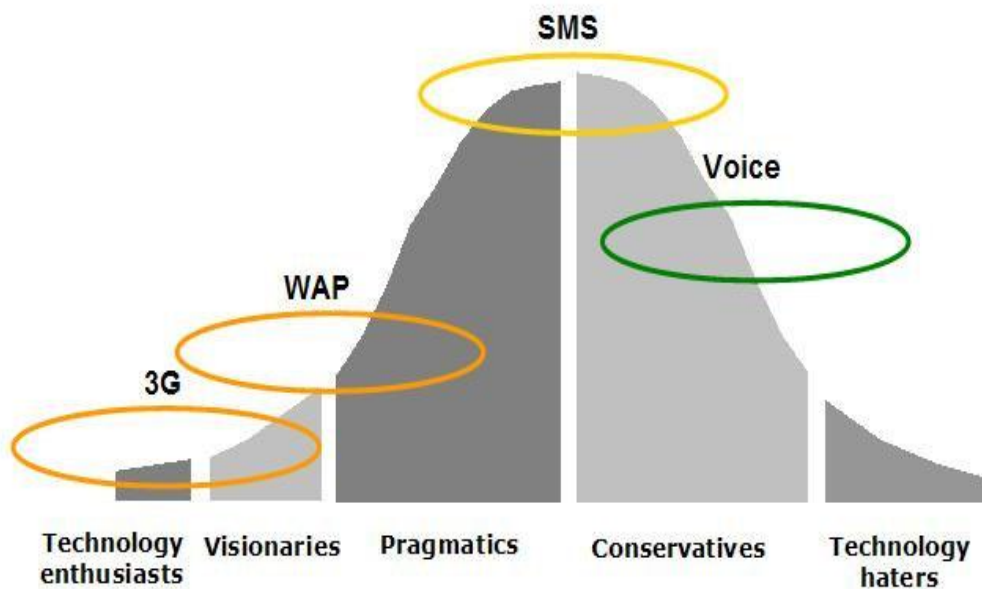
The lifecycle model of technologies and the position of mobile technologies (Figure 3) on it explain the acceptance and application of new technologies. Technology enthusiasts and visionaries, which is about 10 percent of the population, are the first ones to accept the new technologies as soon as they become available. About 40 per cent of the population is pragmatics who accepts a technology as soon as its utility level is clear. The third group of people is 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 is the technology antagonists who never accept any new type of technology. 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.)

**Figure 3: Mobile technologies life-cycle**

## Mobile technologies lifecycle



### 2.1.2. 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 the developed world users see mobiles especially necessary in crises communication and during occasions that need urgent response or distribution.

In developing countries users are even more interested in implementing mobiles in every field of life, often due to the high cost and insufficient availability of the Internet. People realize the benefit that mobiles bring to their every day operations and are interested in saving time and money with the use of ICT solutions.

In Estonia's case, a good indication of interest is represented in the target-user study M-Teacher and end-user study by HeiVäl Consulting. The results of the surveys show that many of the respondents had not had a direct experience with m-services, yet the importance of such services is considered to be high. Among the m-services, m-parking is considered to be a "very useful" service. Also users are satisfied with several other mobile info services, m-payment and m-ID and value these very highly. Regarding the knowledge among the respondents about the new m-services, respondents are interested in these services and would like to hear more about the opportunities that mobiles offer.

### **2.1.3. 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. Many operators and developers are focusing on innovative applications and services in the private sector. In case of local governments and public agencies, the level of optimization is lower. Many governments are focusing on ICT for providing innovative and reachable services for the citizens. Regarding public sector the following aspects should be given consideration:

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

### **2.1.4. Conclusion**

The readiness of m-services is evaluated through the Mobile Readiness Index. It provides a comprehensive view of the readiness of technology, users and service providers in adopting and creating new solutions. The indicators of MRI show whether m-service is needed, adequate and ready to be published.

## 2.2. Matrix of m-services describes the ratio of service holders

No city is alike and the needs of every community are different. Therefore, copying solutions from other cities is not 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:

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.

**Table 5: Matrix of m-services**

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

### *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 the 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 the case studies 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 in Estonian case), some by businesses (m-parking, m-ticket etc.).

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

An example of Estonian m-city service directed to tourists is T-number, provided by a local technology company Regio. Another project T-number allows tourists to use their mobile phone to have a mounted camera to take a picture of oneself in front of Tartu sights, and have it sent to one's e-mail or via MMS.

### *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.

## **2.3. 'Long Tail' of Social Mobile by Kiwanja gives benefit to individuality**

### **2.3.1. Background**

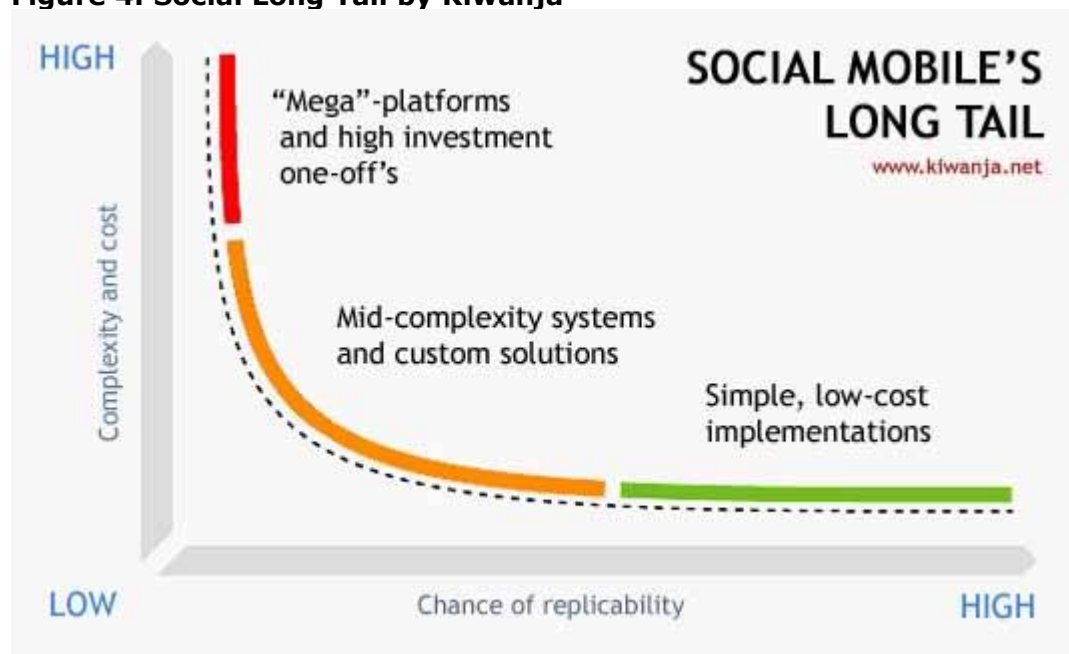
Long Tail was first mentioned in an article "The Long Tail" by Chris Anderson in an October 2004 in *Wired* magazine which described the niche strategy of businesses, such as Amazon.com or Netflix, that sell a large number of unique items, each in relatively small quantities. A frequency distribution with a long tail has been studied by statisticians since at least 1946. The distribution and inventory costs of these businesses allow them to realize significant profit out of selling small volumes of hard-to-find items to many customers, instead of only selling large volumes of a reduced number of popular items. The group that purchases a large number of "non-hit" items is the demographic called the Long Tail.

As a rule of thumb, for such population distributions the majority of occurrences (more than

half, and where the Pareto principle applies, 80%) are accounted for by the first 20% of items in the distribution. What is unusual about a long-tailed distribution is that the most frequently-occurring 20% of items represent less than 50% of occurrences; or in other words, the least-frequently-occurring 80% of items are more important as a proportion of the total population. <sup>xxix</sup>

### 2.3.2. Social Long tail by Kiwanja - the virtue of mobile phones in promoting social and environmental good

Figure 4: Social Long Tail by Kiwanja



Social Long Tail is divided into three categories.<sup>xxx</sup>

Firstly, there are high-end high-cost solutions running SMS services across national or international borders, with little chance of replicability for your average grassroots NGO. These are represented by the **red** part of the curve and generally get the highest amount of exposure.

Secondly, then there are lower-cost custom solutions, developed by individual (often mid-level) non-profits to solve a particular problem in a particular country or region, or to run a specific campaign. These have a *slightly* better chance of replicability for grassroots NGOs, are represented by the **amber**, and generally get a medium to high level of publicity.

Finally, there are the simple, low-tech, appropriate technology solutions with great opportunities for rapid, hassle-free replicability among grassroots NGOs, represented in **green** give them the tools to do the work, a gap FrontlineSMS is working hard to fill). These projects generally get the lowest level of publicity, if any, since few have an international profile of any kind. Notoriously hard to communicate with, and with little or no money, it's perhaps no surprise that most of the attention on the long tail is elsewhere.

In order for the mobile revolution to truly become a revolution, we need to be inviting infinitely more non-profits to the party. So much can be done, but so few are active. Going by my thinking, that means we need to be working on the **green**, because that's where most grassroots NGOs sit, and that's where help is needed the most. <sup>xxxix</sup>Firstly, wherever the tool sits on the graph, there is no right or wrong place for it. It's all about the context of the user.

There is just as much a need for \$1 million server-based, high bandwidth solutions as there are for free, SMS-only tools. In your typical scenario, national governments would likely go for the former and grassroots NGOs for the latter, but not always. Both are valid, and tools shouldn't ever be described as "being better" than another because of it. This is a big mistake. We need there to be solutions all along the tail so that the users have a healthy applications ecosystem to dip into, whoever and wherever they may be. If you're trying to park a car into a small space, a Mini is much better than a Rolls Royce.

Secondly, let's not get all hooked up on scale. Just because a tool in the long tail might not run an international mobile campaign does not make it irrelevant. Just as a long tail solution might likely never run a higher-end project, expensive and technically complex solutions would likely fail to downscale enough to run a small communications network for farmers from a small NGO office with no mains electricity, for example.

Thirdly, we don't yet have any complete, polished mobile tools. Kiwanja would argue that everything that we see in the social mobile applications ecosystem today is "work in progress", and it will likely stay that way for a very long time. He relies on his experience with the FrontlineSMS, and states that we're probably only about 40% there with that solution right now. There is much to do, and the mobile technical landscape never stands still. Our challenge is how we all move with it, how we stay relevant, and how we all work together to share technical resources and know-how. A fragmented mobile landscape is a problem for all of us.

## **2.4.Hype Cycle by Gartner separates reality from technological illusions**

A hype cycle (Figure 5) is a graphic representation of the maturity, adoption and business application of specific technologies. The term was coined by Gideon Gartner, an analyst/research house based in the United States that provides opinions, advice and data on the global information technology industry.

Since 1995, Gartner has used hype cycles to characterize the over-enthusiasm or "hype" and subsequent disappointment that typically happens with the introduction of new technologies. The same way CIOs and CEOs use in businesses to decide whether or not a particular technology is ready for adoption, the cycle is a meaningful tool to guide governments in implementing new technologies.

Hype cycles also show how and when technologies move beyond the hype, offer practical benefits and become widely accepted. According to Gartner, hype cycles aim to separate the hype from the reality, and enable CIOs, CEOs and government officials to decide whether or not a particular technology is ready for adoption.<sup>xxxii</sup>

### **Five phases**

A hype cycle in Gartner's interpretation comprises five phases:

*"Technology Trigger"* — The first phase of a hype cycle is the "technology trigger" or breakthrough, product launch or other event that generates significant press and interest.

*"Peak of Inflated Expectations"* — In the next phase, a frenzy of publicity typically generates over-enthusiasm and unrealistic expectations. There may be some successful applications of a technology, but there are typically more failures.

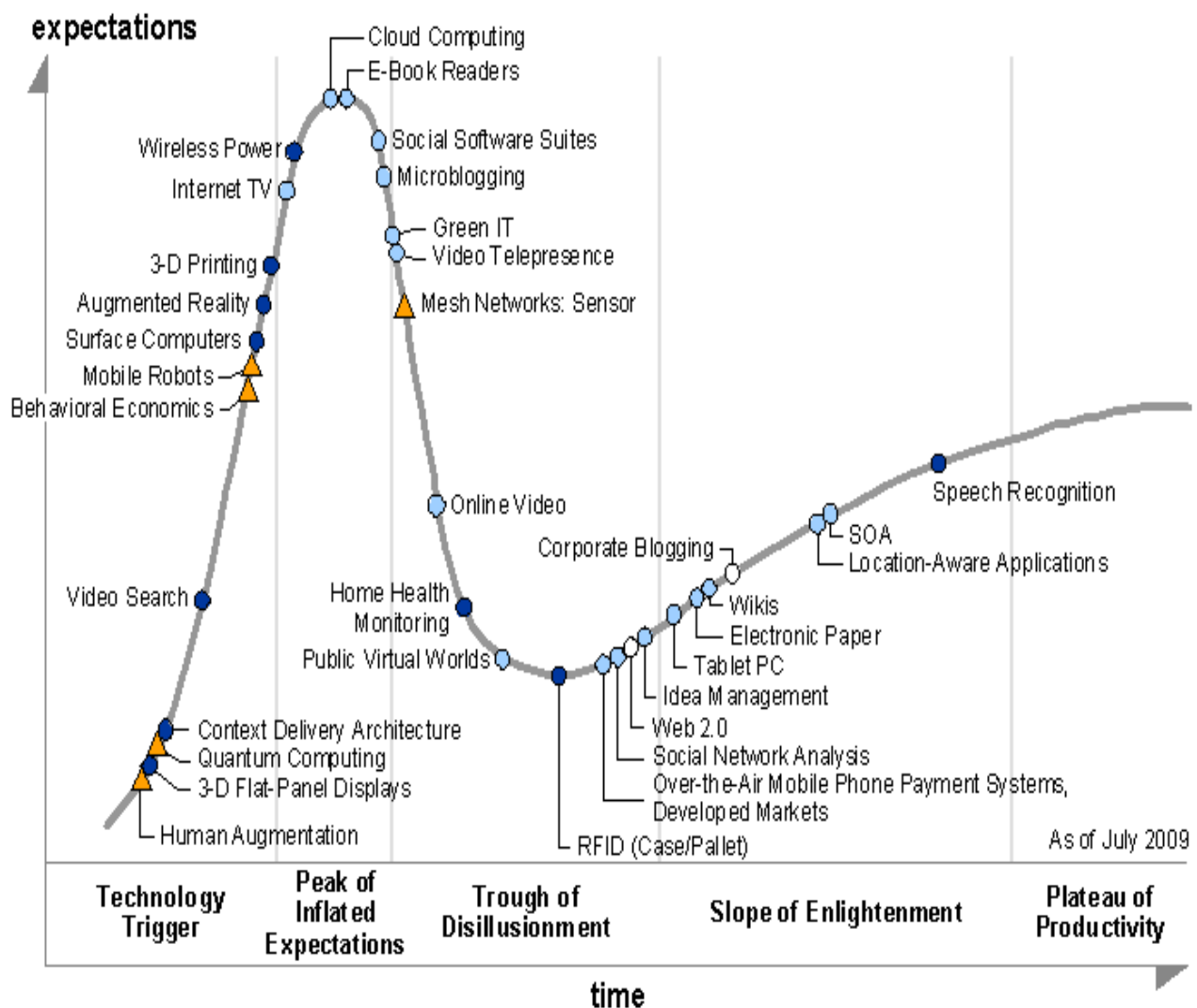
*"Trough of Disillusionment"* — Technologies enter the "trough of disillusionment" because they fail to meet expectations and quickly become unfashionable. Consequently, the press usually abandons the topic and the technology.

*"Slope of Enlightenment"* — Although the press may have stopped covering the technology, some businesses continue through the "slope of enlightenment" and experiment to

understand the benefits and practical application of the technology.

"Plateau of Productivity" — A technology reaches the "plateau of productivity" as the benefits of it become widely demonstrated and accepted. The technology becomes increasingly stable and evolves in second and third generations. The final height of the plateau varies according to whether the technology is broadly applicable or benefits only a niche market.

**Figure 5: Gartner Hype Cycle for Emerging Technologies 2009: What's Peaking, What's Troughing?**<sup>xxxiii</sup>



**Years to mainstream adoption:**

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau

## 2.5. Priority Matrix by Gartner discloses the potential of technology

Governments do not usually approach technology with such enthusiasm as enterprises do. Although, the public sector is the late adopter, in order to achieve common acceptance it has to count upon the level of return its implementation in the public system. The Priority Matrix (Figure 6) is a tool for prioritizing emerging technologies by forcing technology planners to look beyond the hype and assess technology opportunities in terms of their relative impact on the enterprise. The same way it is a tool for assessing mobile technology and its impact on the public and government.

The Priority Matrix answers the questions:

- What level of benefit can an enterprise gain from a technology?
- When will the technology be mature enough for an enterprise to derive this benefit at an acceptable level of risk? <sup>xxxv</sup>

The Priority Matrix supplements the vertical visibility or "hype" axis of the Hype Cycle with a focus on the potential benefit of the technology, rated as transformational, high, moderate or low. The pairing of each Hype Cycle with a Priority Matrix will help to determine the importance and timing of potential investments based on benefit rather than hype. <sup>xxxvi</sup>

**Figure 6: Gartner's Priority Matrix**

<sup>xxxvii</sup>

benefit	years to mainstream adoption			
	less than 2 years	2 to 5 years	5 to 10 years	more than 10 years
transformational	Invest aggressively if not already adopted	Conservative (Type C) investment profile	Moderate (Type B) investment profile	Aggressive (Type A) investment profile
high	Conservative (Type C) investment profile	Moderate (Type B) investment profile	Aggressive (Type A) investment profile	Invest with caution
moderate	Moderate (Type B) investment profile	Aggressive (Type A) investment profile	Invest with caution	Invest with extreme caution
low	Aggressive (Type A) investment profile	Invest with caution	Invest with extreme caution	Invest with extreme caution

## 2.6. The classification of SMS-based e-government services

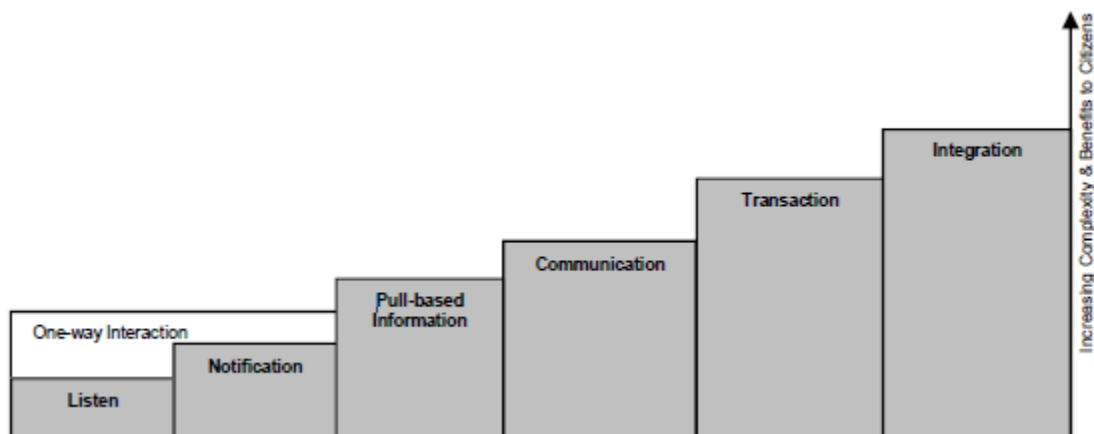
M-government is the extension of e-government. It forwards e-government beyond the barriers of location and time. SMS-based e-government services are part of the m-governments' idea.

SMS-based e-government can be classified into six levels based on the service offerings: Listen, Notification, Pull-based Information, Communication, Transaction, and Integration.

The proposed model uses the term level since it represents the available service offering and not the direction of the systems' evolution, each level is independent of the others and can be complementary each other (one/more level can be added into another level). It ranks the levels according to the complexity of the system and benefits received to citizens.

xi

**Figure 7: A six-level model of SMS-based e-government services**



### **Listen level**

On the first level, we classify current SMS-based e-government applications which have been widely used by governments to listen to citizens' opinions, reports, and complaints. Most of the systems in this level use SMS to enable citizens to send messages directly to mayors, councillors, the council, and the local authority. However, these systems are not designed to reply to the input-messages or to inform the sender of the following actions.

This one-way communication mode from citizens to government is categorized as the Listen level.

### **Notification level**

In the second level, current SMS-based e-government systems have enabled one-way communication from government to citizens. The government is able to notify citizens about their personal information and to broadcast important public information. This model classifies these applications as Notification level. Services in this level use Push-based mechanism, which sends the messages to citizens activated by data on the server, not by a user's request.

### **Pull-based information level**

Current SMS-based e-government systems also provide two-ways communication that enables citizens to access public or personal information by sending a request-message. The services use the pull method: citizens send a 'request SMS' to the service and the replied service is sent back to the sender's handset via SMS. The information options provided by services in this level are limited and the request-text must be in a certain format.

### **Communication level**

There are some existing SMS-based e-government systems that provide two-way communication between government and citizens in which the people can inquire, complain or report about anything (without worrying about the text format) and get responses/replies immediately. This level is the Communication level.

### **Transaction level**

Some SMS-based e-government systems can process transactions. Through these systems citizens can pay bills and send or update their personal data through SMS. Since citizens can do any transaction (money and data) with the government agencies any time any where in a secure channel, this level offers more benefits in the accessibility, availability, accuracy, responsiveness, courtesy and helpfulness, timeliness, trust, privacy, and security. However, trust and security are still the dominant issues.

### **Integration level**

Finally, the ultimate level of this model is when all the SMS-based systems are integrated and organized in a single portal so people just send messages to a single service number for all services. This level predicts the integrated-SMS systems will be also integrated with the

Internet/web-based e-government systems so citizens have options whether accessing the services by sending SMS to one number or through the Internet at one web address. The SMS and the Internet may complement each other in a service, for example: a citizen may send form or pay a public service electronically by Internet and get notification via SMS, or pay the services through SMS and get the receipt by email. <sup>xli</sup>

## **2.7. "Batho Pele" Principles gives great value to the role of m-Government**

Governments should be committed to maximize service delivery to citizens and this process is based on the Batho Pele principles. Its embedded values remind civil servants about the need to be citizen customer focused. The Batho-Pele Principles are synonymous with the "customer is king" philosophy in private sector marketing approaches.

To guarantee a satisfied citizenship, the government has to offer people-centered, high quality, value-added services in a timely fashion. Changing entrenched mindsets of public officials who view citizens as "inferior", "subordinates" and or "an unnecessary burden" is a key element in making m-government a reality. The expected flexibility, timeliness, and the anywhere, anytime access will enhance the service m-government experience of citizens and business. Citizens just like ordinary customers are likely to provide loyalty when they derive greater utility in service provided by government. Traditional impersonal government has been abandoned in favour of responsive modern government as citizens become more articulate about their rights and demand better and improved service delivery. In order to fulfil its obligation to deliver top quality services governments have to adopt "Batho-pele" principles. <sup>xlii</sup>

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## **PART 2 - BEST PRACTICES**

### **II. MAIN AREAS WHERE M-GOVERNMENT SERVICES ARE IN USE**

Mobile technologies are part of governments' strategies to optimize their processes and to improve their services.

*M-government services can be used for several purposes: for improving public transport services, public health services, relationships between citizens and public authorities, mechanisms of democratic participation, social services and support to businesses.*

#### **Health**

One of the most important areas that mobile technologies are primed to have an impact on in both developing and developed countries is healthcare. M-health can be defined as the application of emerging mobile communications and network technologies for health care systems. Mobile does two things really well - compress time and distance - and thus connect, enable, and empower participants in the healthcare ecosystem to reduce costs and errors, and increase productivity, access, and efficiency. The communication advantages of m-health mean that it has broad-ranging - and potentially lifesaving - clinical and practical applications. <sup>xliii</sup>Projects throughout the developing world are demonstrating concrete benefits from mobile phones, including:

- Increased access to healthcare and health-related information, particularly for hard-to-reach populations
- Improved ability to diagnose and track diseases
- Timelier, more actionable public health information
- Expanded access to ongoing medical education and training for health workers

#### **Education**

Communication between parents and school authorities is integral to the education system. In this respect, mobiles or the internet could be used for more efficient communication between the two parties. Widely used technologies do not guarantee direct and efficient

communication channels between parents and teachers. This communication between parents and schools is needed at a time when people are occupied with work demands and are unable to attend school meetings as regularly as they would like.

M-education provides schools with opportunity to send direct messages (SMS) to mostly parents, but also pupils. Messages can be sent either to a predefined group or to a single contact. Content of the message is not restricted, so teachers have the opportunity to send messages on different occasions. Few examples: teacher is sick, class can be re-scheduled, reminders, a pupil is missing school without notice, information on child's progress, etc.

## **Security**

No country, whether in advanced state of development or in an emerging state of evolution, is immune to natural and man-made disasters. Mobile will have a significant impact on how we detect, monitor, respond, and analyze small and large-scale disasters. One of the areas where mobile will have the most significant impact is emergency response. The always-on capability of mobile will allow a channel of communication with the populace in an emergency situation. The channel can not only be used to inform but also be used to guide the affected in a very personalized way and in the process save millions of lives.

## **Agriculture**

The sector of agriculture benefits more from mobile phones in the developing countries as it saves money, time and offers accurate advantage for farmers. The mobile phone system can be used to alert villagers about disease outbreaks and other important agricultural information. Many of the farmers suffer from a lack of up to date, accurate market price information because of their remote location, or simply because they don't know how and where to get trustworthy information. SMS is used to send out the data to groups of producers, government officials and others working in the agricultural sector, according to the type of information they require, which could be produce prices, prices of fertilizer and pesticides, or even weather forecasts.

## **Banking**

Mobile Banking refers to provision and availment of banking and financial services with the help of mobile telecommunication devices. The scope of offered services may include facilities to conduct bank and stock market transactions, to administer accounts and to access customized information. Especially for clients in remote locations, it will be important to help them deposit and withdraw funds at banking agents, i.e., retail and postal outlets that turn cash into electronic funds and vice versa. The feasibility of such banking agents depends on local regulation which enables retail outlets to take deposits or not. <sup>xliv</sup>

## **M-citizen**

Government and Local Authorities are engaging citizens with the welfare of their living environment. The development of SMS based mobile projects that allow citizen complaints or enquiries with Local Authorities would allow citizens become more personally involved in taking care of their town or city.

Location based applications would be ideal to migrate across to an m-Government platform, particularly in terms of Transport and Tourism. They would facilitate a greater efficiency in terms of public knowledge of transport timetables and would allow the public to more effectively plan their travels. (iReach booklet 2008)

## ***III. INTERNATIONAL CASE STUDIES***

Many examples of successful m-Government projects that have been rolled out by Government Departments and Local Authorities can be used as examples to assert the benefit of mobile technologies.

In the following chapter case studies are presented to illustrate the difference that 160 characters can make. Case studies are classified according to the sector, outcome and geographic region.

## 1. m-Health

### 1.1.SMS for Health

Mobile phones have shown to be a promising tool in the field of health.

#### **FrontlineSMS:Medic**



One of the largest and most ambitious m-health programs in the world is FrontlineSMS. In the developing world, lack of infrastructure prevents health workers from delivering efficient healthcare to rural areas. As health workers travel from clinics to reach isolated patients, they are often as disconnected from central clinics as the patients they are trying to serve.

The mission of FrontlineSMS:Medic is to advance healthcare networks in the developing world by building and distributing innovative, appropriate mobile technologies. The centerpiece of the system is FrontlineSMS, a free, open-source software platform that enables large-scale, two-way text messaging using only a laptop, a GSM modem, and cell phones. It allows NGOs to run awareness-raising campaigns and competitions, and carry out text-based surveys, or to simply keep in touch with fieldworkers and supporters.

FrontlineSMS gives access to 'bulk' SMS technology designed specifically with the NGO sector in mind. Although other bulk SMS systems do exist, almost all require reliable Internet connectivity—not an option in many developing countries. FrontlineSMS does not require an Internet connection and works with any GSM network. The software communicates via a mobile phone or modem, which can be attached to a computer with a USB cable. FrontlineSMS has been used for many healthcare campaigns worldwide. <sup>xlv</sup>

### **SMS-powered rural healthcare in-a-box**

Frontline SMS has been successfully implemented all over the world. Josh Nesbit, a Senior in the Human Biology Program at Stanford University, travelled to east Africa where he spent the best part of his summer introducing FrontlineSMS into a rural hospital in Malawi. St. Gabriel's Hospital, where Josh worked, is located in Namitete. It serves 250,000 rural Malawians spread throughout a catchment area one hundred miles in radius. With a national HIV prevalence rate of 15-20%, children orphaned by AIDS will represent as much as one tenth of the country's population by 2010. With tuberculosis (TB), malaria, malnutrition and pneumonia ravaging immuno-compromised populations, the health system - including St. Gabriel's Hospital - faces a disquieting burden. Malawi's health challenges are compounded by its devastatingly low GDP per capita, by some measures the lowest in the world, and with just two doctors and a handful of clinical officers, St. Gabriel's Hospital is also strikingly understaffed.

With woefully inadequate communications exacerbating the problem, Josh - with the help of the Haas Center for Public Service at Stanford University and the Donald A. Strauss Foundation - implemented FrontlineSMS software to connect the hospital with its community health workers (CHW). Now, drug adherence monitors are able to message the hospital, reporting how local patients are doing on their TB or HIV drug regimens. Home-Based Care volunteers are sent texts with names of patients that need to be traced, and their condition is reported. The "People Living with HIV and AIDS" (PLWHA) Support Group leaders can use FrontlineSMS to communicate meeting times. Volunteers can be messaged before the hospital's mobile testing and immunization teams arrive in their village, so they can mobilize the community. According to Josh, FrontlineSMS has essentially adopted the new role of coordinating a far-reaching community health network.

Not only has FrontlineSMS enabled a significant improvement in healthcare delivery for St. Gabriel's, the project is infinitely scalable and replicable. Coming in at just \$2000, Josh has clearly demonstrated what is possible with just three basic ingredients - a single laptop, one hundred recycled mobile phones, and local ownership and engagement. Now, with his step-by-step user guide and the minimum of investment in time and money, rural hospitals in the developing world can easily implement their own SMS communications network.<sup>xlvi</sup>

## **1.2. Health Data Collection and Transmission**

### **Kenya-Bloodbank SMS**

An application called BloodbankSMS allows health workers to communicate blood type levels via text message. In Kenya, blood allocated for transfusions is stored in several centralized blood banks throughout the country. The job of a central blood repository is to ensure the dozens of neighbouring local district hospitals are always stocked with an adequate amount of blood to meet the transfusion needs in the event of an emergency. However, most of these local district hospitals lack reliable electricity and phone lines. Without a consistent method of communicating with the local district hospitals, the central repositories are unable to stay updated about where blood is most needed.

BloodBank SMS was developed by University of Nairobi student Eric Magutu to improve the communication between local district hospitals and Kenya's centralized blood banks. The system enables medical workers at the local district hospitals to provide information about their remaining blood stock directly to their centralized blood bank. Medical workers from each district hospital can simply send a free text message to the service detailing the amounts of each blood type remaining. Real-time blood levels for each local hospital are graphically displayed on a web-based interface designed for administrators at the central blood repositories. Additionally, should the blood levels at a local hospital get below a critical threshold, the system automatically sends SMS alerts to the appropriate individuals at the centralized blood bank. <sup>xlvii</sup>

### **Africa- The Cell-Life**

The Cell-Life uses mobile phones to transmit data about patients who have HIV/AIDS. Cell-Life is a Cape Town based NGO that develops applications used by home-care workers to transmit HIV/AIDS data. Home-care workers in the Cell-Life Aftercare program are each assigned 15-20 patients who are monitored in their homes. The health worker transmits necessary data - such as medication, socio-economic factors affecting treatment, or symptoms - via mobile to a central server, where the data is recorded and necessary responses are sent.

### **Kenya - MDSS**

The Mobile Demographic Surveillance System (MDSS) is a project that allows medical workers in Kenya to transmit data via SMS. The Mobile Demographic Surveillance System (MDSS) is an attempt to enable these medical field workers to conduct these surveys on

mobile phones that can remotely interface with local hospital's database. Shifting the system from paper-based surveys to mobile phones has the potential to allow the field workers to remain in the field for longer periods of time while bypassing the time consuming and potentially error-prone data transcription process.

### **Ghana-mPedigree**

mPedigree is an initiative that uses SMS to identify whether drugs are legitimate or counterfeit. A consumer will be able to text a serial number that is written on the drug to a short code. A short code is a 5-digit number that functions as the mobile equivalent of a URL or website. The short codes that mPedigree uses for common drugs mimic the codes that are used to recharge pay-as-you-go mobile accounts in Ghana, so the codes are easy for people to remember. The consumer will then receive an SMS response about the drug's authenticity.

### **Malawi-RapidSMS Child Malnutrition Surveillance**

RapidSMS Child Malnutrition Surveillance enables health practitioners to share children's nutritional information by SMS, supporting efforts to enhance children's health and vastly reducing the time necessary to detect famines. <sup>xlviii</sup>

### **Africa - CelloPhone**

CelloPhone is a revolutionary diagnostic tool that will be able to perform basic diagnostics such as Complete Blood Count, diagnosis of Malaria and TB, and CD4 T Lymphocyte count on the back of a camera cell phone. The diagnostic results will be communicated from the device to a central location using FrontlineSMS, and viewed with Patient View app and/or sent to OpenMRS with this medical records app.

### **Amazonas state of Brazil - Data gathering**

The state health department of Brazil must warn households constantly about the dangers of behaviours that encourage mosquito proliferation. The Nokia Data Gathering system enables fast and effective data collection, which is essential to containing the spread of the dengue virus. Data Gathering allows the creation of customized questionnaires, which are distributed to the mobile phones of health agents in the field. When the field workers finish their surveys, they send the data back to the server via a wireless connection, from which it can be integrated into the organization's existing systems for immediate analysis. Data Gathering also provides GPS location information for each record, which would otherwise require dedicated instruments.

### **1.3. Health Education and Peer Support Group**

#### **Africa - Text to Change**



A nonprofit called Text to Change uses mobile phones to educate people about HIV/AIDS. The Text To Change (TTC) project which was being pioneered in Uganda is an initiative aimed at increasing awareness on HIV/AIDS through information giving by use of mobile phone text messages, with the desire that this will increase HIV/AIDS awareness and encourage participants to access HIV Counseling and Testing (HCT) services.

As a whole the TTC pilot program in Mbarara could be called a success. First of all it needs to be stipulated that mobile phones have never been used before on such a large scale for educational purposes (first of it's kind in Africa), so for this reason they have proven that the concept works and that already is a success on it's own. The response level of the pilot Quiz was on average 17.4% per question. The Mbarara staff of the Aids Information Center were informed that the TTC pilot project would ran for six-eight weeks targeting Celtel Uganda subscribers from the Greater Mbarara region. The target group was 15,000 participants with AIC Mbarara Branch being the HCT service provider. Participants were to receive interactive text messages in form of multiple choice questions on their mobile phones. When they answered correctly, they would automatically be guaranteed a participant free HCT services and at the same time qualify to enter into the draw to win various prizes including mobile phones and millions in airtime.

In 2009, TTC started a new program in Arua, Uganda. With the lessons learned from the first program, Text to Change is now aiming at setting up a perfect mHealth program in Uganda and hopes to make it nationwide in Uganda and expand to other countries in 2009 and 2010.

### **Mexico - The Zumbido**

Mobile phones are creating connections between people living with HIV/AIDS in Mexico. The pilot project Zumbido was a type of peer-education and support group initiative, connecting via mobile phone a network of diverse people who had HIV/AIDS. The Zumbido allowed its 40 test users of diverse backgrounds to communicate about the daily challenges they face in a meaningful and lasting support network. Unlike other hotlines or support mobile phone services, where a user calls one person for help, Zumbido functioned as a network, with each text message sent to every member of the support group. The Zumbido project has certainly touched and made a tangible difference in the lives of its 40 participants. In a follow-up survey by Zumbido, participants reported feeling less isolated, having better support networks, and having improved relationships with their families.<sup>xlix</sup>

### **Nigeria - Learning about Living**

The project was created for young Nigerians with an anonymous forum to learn about health, AIDS, sex, relationships, personal development, and living skills. The program includes an interactive eLearning tool based on the Nigerian Family Life and HIV/AIDS Education (FLHE) curriculum, as well as the mobile phone-based programs MyQuestion and MyAnswer. With MyQuestion, Nigerian youth can submit questions via text message, a telephone hotline, or online. Questions are promptly answered by trained volunteers. MyAnswer sends out a monthly question (e.g., what is the difference between HIV and AIDS?) and selects winners based on responses submitted via the web or text message.<sup>1</sup>

## **1.4. Health SMS Infolines**

A variety of infolines offer health information via text messages. Infolines can be particularly useful for sexual health information because they provide anonymous, just-in-time information about sensitive subjects, and don't require the user to go in person to a clinic or doctor.

### **UK - Ask Brook**

Ask Brook is a sexual health infoline. "Ask Brook" information service is providing young people with sexual health knowledge and support via telephone, the Internet, and text message. To access the service via mobile phone, young people text "BRK", followed by

their postcode, to "81222". Subsequently, they receive information regarding sexual health services in their area. They can also select standardized responses to questions relating to contraception, pregnancy, sexually transmitted disease, and other sexual health issues.

### **Africa - HIV Infoline**

An infoline in South Africa gives users the locations of HIV testing centers. A mobile phone service launched provides HIV testing station locations through the use of SMS. South Africans can send an SMS to the short code "31771" with the word "HIV" followed by the name of their town or postal code. The service then responds with the location of the two nearest travelling testing units.

### **USA – HealthyToys**

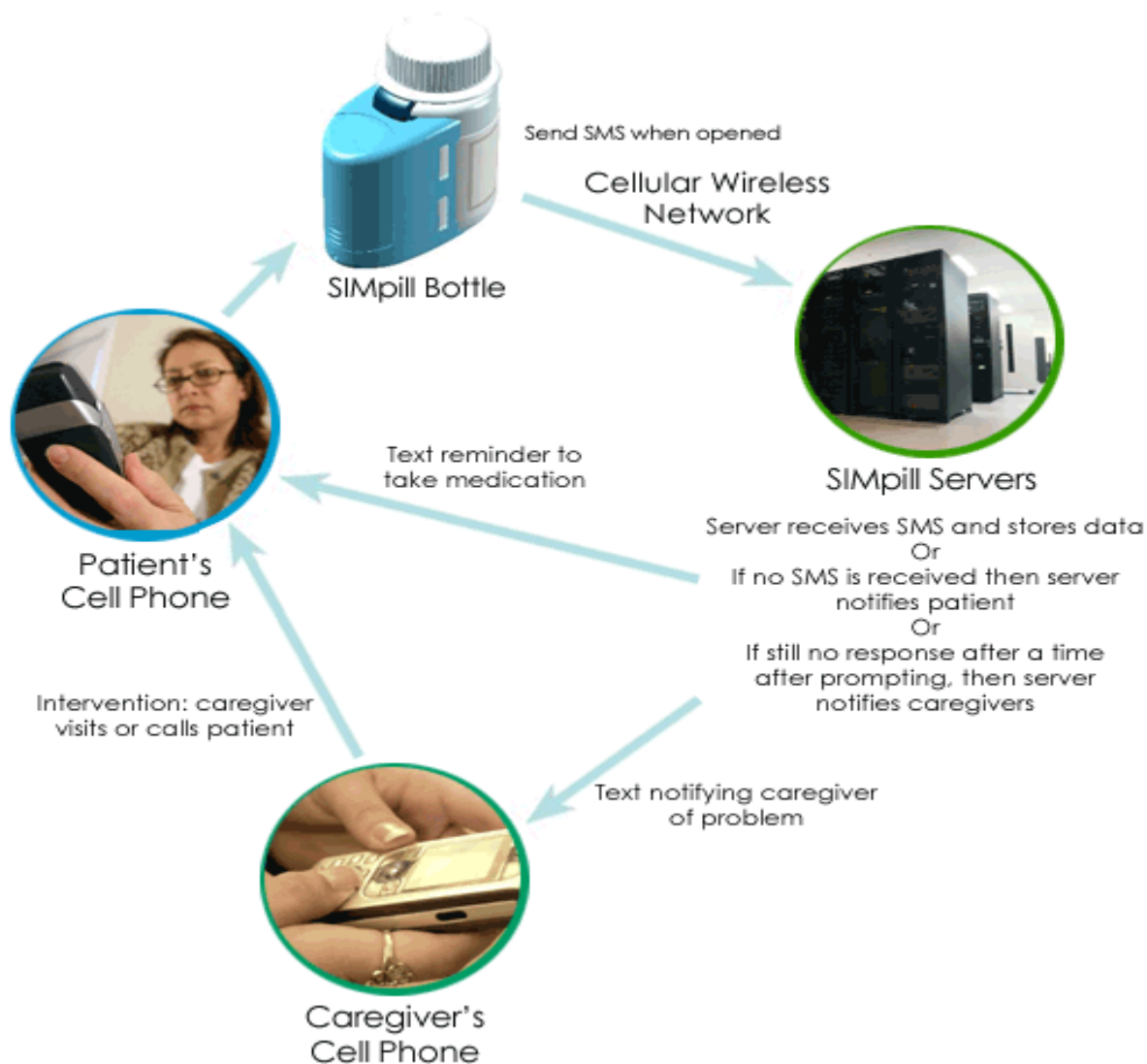
HealthyToys is a service that tells users whether toys contain high levels of toxic chemicals. The customer has to send a text message to 41411 with the text, "healthytoys [search term/toy name]" - where [search term] is the name of a toy, type of toy, manufacturer, or retailer. This will let you know if a toy contains toxic chemicals or not.

## **1.5. Medication Reminders**

SMS messages have been used to remind patients to take their medication. These messages have been most commonly used with tuberculosis (TB) and HIV/AIDS patients.

### **US, UK, Canada and The Netherlands - Simpill<sup>li</sup>**

Simpill is a special pill bottle that, when opened, delivers an SMS to a central server. If the server doesn't receive the SMS, it can then be programmed to send a message to the patient or to various support services, like family, friends or community health organizations. Simpill has been shown to be effective in reminding patients with tuberculosis to take their medicine. According to the report, feedback from users of Simpill has been positive, and 100% of survey respondents said they would like to use Simpill if they were to contract TB again.<sup>lii</sup>



## 1.6. Health advice

### Uganda - Clinic Directory and Health Tips (Powered by Google SMS)

AppLab's health application provides users with timely, trusted, accurate, and actionable information on sexual and reproductive health. AppLab works with Marie Stopes Uganda, a leading international service provider for sexual and reproductive healthcare, and Straight Talk Foundation, a Ugandan NGO specializing in health communication, to offer health information services. In Uganda there is high demand for information about HIV/AIDS, sexually transmitted infections and reproductive health more generally. People expressed a need for accurate information, to dispel local myths and help them make informed

decisions. AppLab's health application provides users with timely, trusted, accurate, and actionable information on sexual and reproductive health. This information helps healthy individuals stay healthy, assists sick individuals in locating and accessing treatment, and supports recovering patients who have been diagnosed and are receiving treatment. In efforts to promote prevention, the health application provides information on sexually transmitted diseases, family planning methods, and maternal health best practices. To assist those who have, or think they may have, contracted an illness, the Clinic Finder offers a directory providing the details of local clinics, including the types of services offered as well as days and hours of operation for outreach services. The application also enables patients to find answers to questions that arise after treatment.<sup>liii</sup>

### **USA - Text4Baby**

Text4Baby is a maternal health initiative. The United States has one of the worst infant mortality rates in the world, which is highly concentrated in lower-educated, minority populations. However, the technology penetration in this demographic shows that 85 per cent use SMS. The Text for Baby initiative will provide free tips to mothers three times a week before the birth, such as reminders to take a multi-vitamin, to get a flu shot, and so on. After the birth, the mother is reminded about vaccinations, and other health issues.<sup>liv</sup>

### **Africa - OpenMRS**

OpenMRS is an open-source, free software package developed to implement electronic medical records in developing countries. Currently most CHWs must carry paper records long distances to data managers at central locations. This app will vastly increase the access and usage of electronic medical records by community health workers, with correspondent health improvements.

### **Ushahidi's Mapping Application**

Ushahidi's Mapping Application is a platform that crowdsources crisis information, allowing anyone to submit crisis information through text messaging using a mobile phone, email or web form. They also recently produced an application for the FrontlineSMS platform, enabling anyone with a cell phone to send text messages to a local installation of FrontlineSMS, and have information aggregated to a map. Already people are using these maps for everything from tracking the swine flu epidemic to monitoring medicine stock-outs. The team of Ushahidi's Mapping Application hopes to take this to the clinical setting, enabling clinics and hospitals to monitor the distribution of their health services and emerging disease outbreaks.<sup>lv</sup>

One of the projects that is using Ushahidi Engine is the Swine Flu reports coming in from official and unofficial sources at Swineflu.Ushahidi.com. <sup>lvi</sup>



### **South -Africa - Project Masiluleke**

Project Masiluleke is designed to harness the power of mobile technology as a high-impact, low-cost tool in the fight against HIV/AIDS. Project Masiluleke is currently sending one million text messages per day throughout South Africa that encourage people to be tested and treated for HIV/AIDS.

### **South-Africa - For the Smile for You campaign**

Hundreds of thousands of children in the developing world are afflicted with the condition known as cleft lip and palate, a relatively common birth defect that is all but invisible in rich countries where surgery to correct it is widely available and affordable. In 2007, the Netcare Group, a private medical hospital group in South Africa, and Vodacom teamed with the Praekelt Foundation to offer 50 free cleft lip and palate surgeries to children too poor to afford them. A previous campaign to raise awareness of

this service had relied on traditional media such as print and radio but yielded disappointing results, with only about 12 candidates identified for the surgery.

For the Smile for You campaign, the sponsors shifted to a mobile technology solution to improve response levels. In South Africa, 'Please Call Me' (PCM) text messages, which mobile phone users can send for free with a request to the sender to call, have become an enormously popular service, and operators subsidize them through the sale of advertising space in the unused character space of the text message.

Over the course of five days, Vodacom donated space in one million PCM text messages for a message asking recipients if they knew of children in need of free cleft lip and palate surgery, using Praekelt's SocialTxt technology (also used in HIV/AIDS outreach efforts). The results of the campaign demonstrated the effectiveness of this concept. Calls made to the call center, which hovered in the single digits in the weeks before and after the campaign, averaged nearly 35 per day, while staff received over 355 text messages during the three days that responding via text message was an option. In all, 42 children were identified as surgery candidates, more than three times the number identified during a traditional media campaign lasting six weeks. The sponsors note that 203 people who did not know anyone with a cleft lip or palate responded, indicating that broadening the campaign to include languages other than English might yield even more promising result.<sup>lvii</sup>

## **1.7. Remote Data Collection**

When it comes to effective data collection in remote areas of the developing world, less is often more.

### **Peru - Cell-PREVEN**

Cell-PREVEN was created to allow access to real-time data to members of the healthcare ecosystem in Peru. This interactive voice response system enables health workers in the field to collect and transmit data via basic mobile phones. The data is aggregated in a centralized database and made available to medical professionals, and the system is designed to send SMS or e-mail alerts if certain symptoms are recorded.<sup>lviii</sup>

### **Philippines - Community Health Information Tracking System (CHITS)**

CHITS is an open source program that helps to 'train the trainers' by facilitating data collection and transmission in rural areas. The system allows community health workers to

send SMS messages to report injuries and receive training on health surveillance via their mobile phones. <sup>lix</sup>

### **South-Africa - The Dokoza System**

The Dokoza System is an SMS-based mobile system designed to fast-track and improve critical services to HIV/AIDS and TB patients. Dokoza relies on SIM cards that can be used across networks, which interact with a more complex back-end system that integrates with existing hospital information systems. <sup>lx</sup>

### **Kenya - Map of Medicine for Kijabe Hospital**

The project gives Kenyan health workers at Kijabe Hospital access to the Map of Medicine, a medical information database. The Map of Medicine is a web-based tool that provides comprehensive, up-to-date information on diagnosis and treatment, presented in easy-to-use flowcharts or 'care pathways.' Doctors participating in the pilot study were given PDAs and access to data on HIV/AIDS, TB, malaria, abdominal pain, diarrhea, and typhoid fever. Results are promising as hospital staff reported that the data access and entry via the PDAs has led to greater efficiency, more time with patients, and reduced administrative costs. <sup>lxi</sup>

### **Africa - Phones for Health**

Phones for Health program enables health workers in local communities to use a standard handset equipped with a downloadable application to collect and enter health data. Once the data is entered and transmitted, it can be integrated into health information systems and accessed by health officials in real time at all levels using the Internet. The system also allows workers to order medicines, send public health alerts, and download treatment guidelines. The Rwanda pilot follows the successful deployment of a related system—TRACnet—that manages the country's HIV/AIDS program. Rollouts are planned for other areas of the health sector in Rwanda and other African countries. <sup>lxii</sup>

### **China - Chinese Aged Diabetic Assistant (CADA)**

CADA is a smartphone-based self-management and support system for elderly diabetics in China. The project will use smartphones to send elderly diabetics recommendations and guidelines related to physical activity, glucose and blood pressure monitoring, weight measurement, and diet. Patients will be trained to enter and send data on glucose levels, and doctors will be able to track patient data and graphically display data for patients. <sup>lxiii</sup>

### **Kenya and Tanzania - Mashavu**

Mashavu is a computer-based system that enables doctors to connect with children in developing countries via mobile phones. Essential medical data (e.g., height, weight, blood pressure, and lung capacity) are collected at Mashavu stations in developing communities and sent by mobile phone to a remote server. Medical professionals can then 'electronically adopt' children by logging on to a web portal to monitor the children's health, provide feedback or advice to the child's caregivers, and collect health statistics.<sup>lxiv</sup>

### **Brazil - Virtual Health Pet**

Virtual Health pet has taken advantage of the popularity of the Japanese Tamagotchi virtual pets to improve medication compliance and patient health in Brazil. The virtual health pet, a J2ME software application running on the patient's mobile phone and linked to an electronic health records system, interacts with the patient to remind them to take their medications on time and to monitor their overall health. Alerts are sent out to caregivers or emergency services if the patient does not respond to its pet's messages in a timely manner. Because the software is linked to an electronic health records system, the Virtual Health Pet is able to both collect patient data and to provide the patient with near real-time information from their medical team.<sup>lxv</sup>

## **1.8. Communication and Training for Healthcare Workers**

### **Caribbean - Enhancing Nurses Access for Care Quality and Knowledge Through Technology (ENACQKT)**

ENACQKT empowers nurses by providing training and other services via PDAs. A key component of ENACQKT is building nurses' capacity through technology instruction, giving them the means to access healthcare applications through the PDAs provided by the program. This enhances professional development and improves quality of care for patients. Project principals report several achievements, including time savings for nurses and greater access to information, particularly in the areas of medication and treatment support.<sup>lxvi</sup>

### **HealthLine**

HealthLine is a speech recognition-based information system that was made for semi-literate community health workers to ensure that they have access to critical information. The solution is based on Microsoft Speech Server2007 beta software. The menu-driven

program can be accessed via landlines or mobile phones. Callers specify a topic (or disease) and are walked through a set of menus until they reach the information they are seeking. The information is then read to them—from a prerecorded message—in their local language.<sup>lxvii</sup>

## **1.9. Disease and Epidemic Outbreak Tracking**

### **India - Acute Encephalitis Syndrome Surveillance Information Management System (AESSIMS)**

AESSIMS is designed to build health capacity at the field level by enabling front-line health workers to report disease incidence through an innovative combination of telephone and web based technology that leverages available infrastructure. AESSIMS enables health officials to better understand the scope of disease impact and strategically allocate resources to areas with the highest prevalence and need.<sup>lxviii</sup>

### **Mozambique – The Diagnostic and Treatment Support Project**

The principals of the project have created a suite of applications that can run on standard mobile phones. The applications provide Mozambican health workers with diagnostic and analytical tools including reference material in the phone's memory, a calculator for determining drug dosage, and a program for analyzing inputs from medical sensors (e.g., low-cost pulse oximeter probes or a simple electrocardiogram).<sup>lxix</sup>

## **2. m-Agriculture**

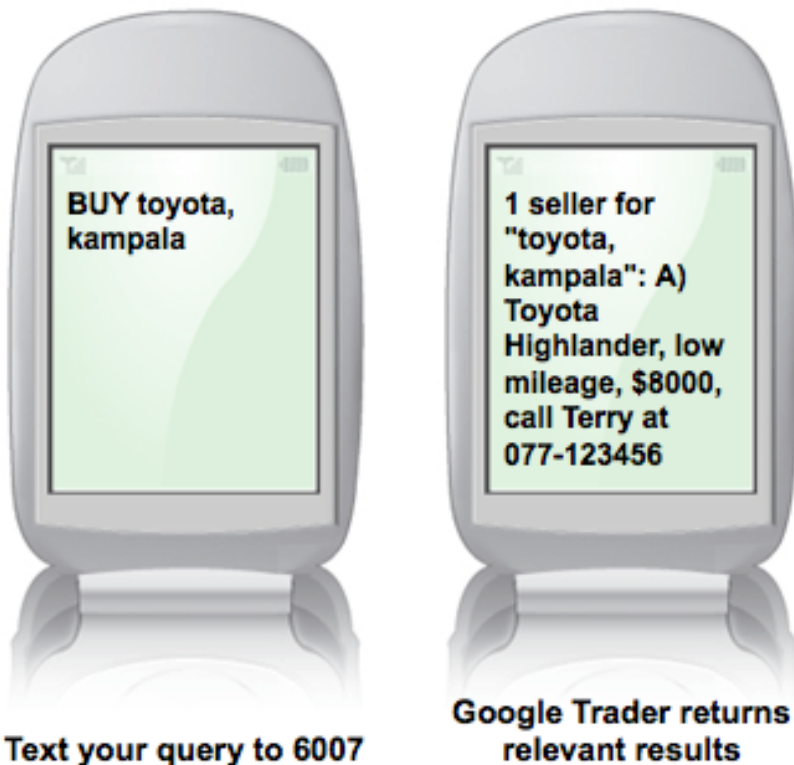
### **2.1. SMS for Agriculture**

#### **Uganda - Google Trader**

Google Trader is a marketplace application that allows to buy and sell goods and services on your phone using SMS. This application was developed in response to discussions with Uganda's rural producers and consumers where it was revealed that they face challenges linking with markets. Transport networks are inefficient, and knowledge of market conditions, even those nearby, is lacking for most small producers. To address this need, AppLab (the Application Laboratory is an initiative of the Grameen Foundation to promote innovation in the provision of services and information using mobile phones and other ICTs to alleviate poverty in the developing world) deployed a simple market system for buyers and sellers to find one another with fewer transaction costs by using the mobile phone to list

their offerings and search for those with whom they are likely to transact business. Akin to a classified ad system or bulletin board, this application will increase transparency and enable small producers to realize higher prices when dealing with larger traders, thus increasing their incomes. Google Trader is primarily in English but will respond to the primary commands in three local languages. The initial pilots of Google Trader in banana-producing regions in Western Uganda confirmed the appeal to small producers, who told that they feel more confident about their ability to reach buyers and receive better compensation for their produce. The founders of this project believe that widespread adoption will lead to lower transaction costs, greater efficiencies and higher price transparency across various markets, bringing increased incomes to smallholder farmers. It may also increase efficiencies and lower transaction costs for other traders and buyers in the value chain, enabling them to save time and transport costs, which results in greater wealth for all involved, especially the producers who tend to be among the poorest.<sup>lxx</sup>

You can start searching for items to buy on Google Trader.



lxxi

### **Salvador - Farmer to farmer**

Through its 'Farmer to Farmer' program, social enterprise Winrock has been active in El Salvador in recent years providing volunteer technical assistance to smallholder farmers, especially to increase productivity and profitability in the horticulture and dairy subsectors. Sustainable approaches to achieve this objective are to strengthen agricultural sector institutions and improve sustainable use of natural resources. Both strategies tend to strengthen national trade institutions.

The system envisioned by this project allows producers and buyers to post buy/sell offers through SMS messaging directly to mobile phones or through a call center managed by the project where operators will log information obtained from semi-literate or illiterate farmers. Then summaries of these "classifieds ads" will be sent through SMS and e-mail to service subscribers. Additionally, communities of buyers/sellers with Internet access will be able to see these offers on a project web site as well as through RSS feeds via other web sites. Thus producers and buyers will be able to interchange information and directly develop commercial activities without total reliance on intermediaries.<sup>lxxii</sup>

### **India – Mobile phones for fishermen**

The introduction of mobile phone in the coast of Kerala (South India) allows improved flow of price information that results in a more efficient functioning of the market. Mobile phones enable price information from other markets to be available while the fishermen were still at sea. The fishermen would divert his boat to the market that offered the highest price for his catch. After mobile phones were introduced, the practice of "dumping" fish overboard stopped; fishermen's profit rose by 8% and consumer prices fell on average by 4%; the "law of one price" came into effect where single rate for sardine was obtained along the coast.<sup>lxxiii</sup>

## **2.2. Agricultural alerts and advice**

### **Uganda - The CELAC Project**

In Uganda, the CELAL (The Collecting and Exchange of Local Agricultural Content) project is using cell phones to send farmers valuable farming tips by text message. The scheme is also helping farmers focus on growing lucrative export crops. The development experts behind the effort say sharing knowledge between – and among – farmers will help increase food production and reduce poverty.

As part of the project, a team of information and communications experts collects information on improved farming methods and updates on agricultural commodities – and circulates the information to farmers through cell phone text messages. Farmers say the project is helping improve their earnings and food security by sharing knowledge and also telephone and computer skills.

Besides sharing knowledge, the CELAC project also encourages farmers to specialize in new and potentially more lucrative ventures, including raising livestock. <sup>lxxiv</sup>

### **India -SMS Service**

The state agriculture department uses a message service to inform farmers. The department has acquired a written consent from around 4,000 farmers in Maharashtra for sending them four messages every month. The messages are about new pests, initial stages of pests, fertilisers, pesticides and weather forecasts. The messages are available in Marathi and English scripts and are sent as per the requirement of the farmer as well as the handset configuration of the user. The advice comes through an SMS to the farmers' on their mobile handsets. While a single message costs 14 paise to the government, farmers get the service free-of-cost. <sup>lxxv</sup>

## **3. SMS for Education**

### **3.1.SMS for Educational Institutions**

Top Ten Uses of SMS in Schools and Universities are:

1. Emergency Student / Faculty / Parent Notifications
2. Exam Time Tables and Results via Text Message
3. SMS Class Schedules
4. Admission Test Results via Text Message
5. Absenteeism Alerts via SMS
6. Interdepartmental Notifications
7. SMS Student Reminders and Alerts
8. Progress Reports via Text Message
9. SMS Community Notifications
10. Teacher-Parent Communications <sup>lxxvi</sup>

## **3.2. Parent communication**

### **USA - e2Campus**

Public and private K-12 schools use e2Campus text and voice messages to communicate with parents, teachers, staff and others during emergency situations and routine events. e2Campus adds a layer that genuinely helps kids stay connected in a way that keeps them safer.

George Romanowski, Superintendent of Smethport Area School District said, "For school emergencies, e2Campus text and voice messages eliminate the need for a phone tree. The most invaluable piece is notifying parents during the school day of emergencies and early dismissals. We can quickly get the message to them at work so they can make arrangements for sons and daughters arriving home a couple hours early. The parent's feedback has been very positive. e2Campus is the most straight forward, simple-to-use system that we reviewed. I've had no problem using my laptop from home to close school at 5:30 a.m. It's been very effective with instantaneous messages. We can alert one elementary school's staff and parents or alert the general population. The principals find it easy to use for cancellations and rain outs." <sup>lxxvii</sup>

### **Ireland - TextaParent**

TextaParent is a website ([www.textaparent.ie](http://www.textaparent.ie)) for school principals to communicate quickly and easily with parents, staff and community services. IPPN principals simply access and manage the SMS system by logging onto the website and registering their school community for an account. Immediately, those heads of schools can notify groups of unpredictable events like changes, closures and cancellations due to severe weather. Additionally, the service can deliver important reminders, updates and even motivational messages to better organize and prompt large and often diverse populations. And in worst-case scenarios, text messaging may prove to be the fastest, widest and most reliable way to disseminate emergency information during a school or community crisis. <sup>lxxviii</sup>

### **India - Mulyeum.net**

Website [www.mylyceum.net](http://www.mylyceum.net) organizes parents and students for SMS information. Each child will be allotted a unique ID which will enable the parent to log on to the website and get the latest on their wards. More than 60 schools in Bangalore have tied up with Pac Soft Solutions Ltd to offer this facility. Schools will post the information on the portal. There are options whereby parents could receive an SMS which would be a reminder to go to the

website and access complete information or an entire message is sent on SMS itself, like declaration of results or about a new circular.<sup>lxxxix</sup>

### **Australia - MGM Wireless**

School services company MGM Wireless provides SMS and parent communication services to the Sydney Region NSW. A school administrator or teacher with appropriate authority will be able to use School News Channel on the web to keep parents, caregivers and students informed with alerts about attendance, reminders, emergencies and other important information of interest to the school or college community. Each automated SMS text takes into account the families unique circumstances, history, culture, language (if non English) and many other unique characteristics of the relationship.<sup>lxxx</sup>

### **New Delphi -SMS against absenteeism**

The school principal in New Delphi approaches to tackle student absenteeism by sending SMS: if a child fails to turn up, class teachers send an SMS to his or her parents, ideally just after the morning attendance is registered. Schools also uses SMS alerts to keep parents informed about other issues concerning its students. Messages are sent to inform parents about date changes to the weekly test, or about timings for the winter uniform.<sup>lxxxix</sup>

### **UK - Call Parents**

St.Michael's School, an independent school in Otford, Kent, is engaging parents and safeguarding pupils with Call Parents, an automatic parent notification system from Truancy Call Ltd. The service enables staff at the school to send messages on school closures, upcoming events and school trips to parents via text message. The system can also send messages via e-mail and automated phone calls. Messages sent to parents range from the date of parent's evening, cancellation of events, emergency notifications and school trips. Call Parents ensures that these important messages are sent directly to parents, rather than being sent via the pupils which may result in the message not being delivered.<sup>lxxxii</sup>

### **USA, China - SMS for university students**

Berkshire College of Agriculture (BCA), have applied SMS OnLine from SMS solution providers M:SCience. With SMS OnLine, the college can achieve 2-way communication between staff and students. SMS OnLine represented an easy to use, web-based application that delivered BCA a 'Hotmail-like' service for SMS. SMS OnLine has been used for appointment reminders, which has led to an increase in attendance. As SMS OnLine is web-

based, providing there is an internet connection, the account can be accessed from anywhere in the world <sup>lxxxiii</sup>

**In China, the University of Macau** sends important notices to students through SMS or emails. <sup>lxxxiv</sup>

### **3.3.Exam results by SMS**

#### **India – mVaayo**

The board and university examination results in India will be delivered using mVaayo: IMImobile's innovative two-way web based SMS service. mVaayoo combines leading web and mobile technology in an interactive and cost effective communication platform. While results will be published as usual on NNE's dedicated portal: ExamResults.net, candidates now have the opportunity to learn of their results by sending a SMS with 'RESULT' to '56263'. Students will then receive an immediate reply with their examination results. <sup>lxxxv</sup>

### **3.4.Testing students by mobile phone**

#### **New Zealand - Ultralab**

Ultralab at Anglia Polytechnic University is trying innovative ways of assessing what students know. Pupils enter their coursework "milestones" on a website which can be accessed and marked by teachers and commented on by fellow students. At the end of the course they dial a freephone number to answer questions posed by computer. A voiceprint checks their identity to prevent cheating. A "robot" asks them questions similar to those they said at the outset of the project that they would be able to answer by the end of it. They can re-record the answers as often as they wish, provided they do it in one sitting. The answers from thousands of students are stored centrally and can be marked at any time by examiners - all of which saves having to timetable numerous face-to-face meetings. <sup>lxxxvi</sup>

### **3.5. Mobile phone technology for non-formal distance education**

#### **Philippines and Tanzania - The BridgeIt project**

BridgeIt project is providing teachers in primary school with access to a variety of digital video content in Maths, Science, English and life skills for use in their classrooms. This is done through the use of mobile phones which activate digital files on the server to be delivered to a mobile phone or a DVR, and later viewed on TV during a class session. This technology is helping schools to have study materials which in most cases are not available.

lxxxvii

#### **Africa, Kenya -The Games4Life**

The Games4Life is a programme being implemented in Kenya by a Dutch non-governmental organisation called Hivos, in partnership with KPN, a Dutch telecom Company. Game4Life: Mobile games in AIDS education allows young people to learn and understand dangers of HIV and AIDS by playing games on their mobile phones. Currently Hivos is offering three cell phone games: a quiz game that provides general information on HIV and AIDS in a question and answer format and Java-based football and helicopter games.<sup>lxxxviii</sup>

#### **The Philippine - Text2Teach**

Text2Teach is a project that focuses on the 11- to 13-year-old age group because children at this age are just beginning to absorb large amounts of information. The first phase means that Text2Teach enables teachers to simply use the mobile phone to order video clips, which are then delivered via satellite, stored in the media master, and viewed on TV. The second phase, launched this year, is even simpler: the teacher just plugs the mobile phone pre-loaded with educational videos to a TV set and plays the video lesson. New videos are accessed by downloading them through the mobile phone, using Globe's 3G technology. The Philippine Text2Teach alliance is composed of Ayala Foundation, Nokia, Globe Telecom, SEAMEO-Innotech, Chikka Asia and PMSI-Dream Broadcasting Systems.

lxxxix

#### **UK - University recruits via mobile phone**

The University of Teesside claims to be the first in Britain to broadcast its prospectus to mobile phones over the internet. Course details, contact numbers for admission officers and even students' lecture timetables will be beamed to the latest generation of mobile phones, under plans being developed by the university. Academics want to recruit students who find it difficult to reach a computer. Under the system, anyone with a phone using the latest

wireless application protocol (WAP) system will be able to surf through the university's list of courses, arrange for full details to be e-mailed to them, or get a direct number so they can call an admissions tutor. Future developments will allow students to use their phones to find out where they have to be for lectures or tutorials.<sup>xc</sup>

## **4. SMS for Emergency**

### **Peru, Indonesia - Telecoms Without Borders**

A nongovernmental organization, Telecoms Without Borders, headquartered in France, uses mobile telecommunications to help re-establish these vital communications networks in the response to and management of humanitarian crises. Within hours of the earthquake in Peru, five staff and volunteers boarded a commercial aircraft from TSF's Latin America regional office in Managua, Nicaragua to Peru's capital city of Lima. With them, they carried everything they would need to set up emergency telecommunication operations—satellite phones, mobile phones, routers, laptops, fax machines, printers, and scanners. Within 24 hours of their arrival, the team had established temporary telecommunications centers in three of Peru's hardest-hit areas: Pisco, Inca, and Chicha. Over the next ten days, a broad range of disaster relief agencies used TSF's service to coordinate relief efforts and help save lives. These included the Peruvian Ministries of Health and Education, the National Program for Food Assistance, the United Nations (UN), and local and international NGOs. Satellite phones were also made available so that local residents could contact family and friends. In all, more than 17 agencies and 1,400 families accessed TSF's services over the course of its deployment.<sup>xcii</sup>

### **Kenya - Violence-Prevention Tool**

Text messaging was used as a Violence-Prevention Tool during presidential election to help stem the violence, human rights advocates in the country quickly mobilized by creating a text messaging 'nerve center.' That center served as a vital tool for conflict management and prevention by providing a hub for real-time information about actual and planned attacks between rival ethnic and political groups. The text messages, sent in by human rights advocates, religious leaders, and others, were then relayed to local Peace Committees for response.<sup>xciii</sup>

### **Bangladesh - SMS cyclone alert system**

SMS cyclone alert system is a text message service to warn people of natural disasters, including floods and cyclones.<sup>xciii</sup>

### **China –SMS emergency service**

Chinese authorities use SMS services to alert citizens on emergency occasion. Millions of villagers and fishermen have been alerted during unusually typhoon season via SMS. The government has used SMS to reassure the public about bird flu outbreaks and warn against supporting for the banned Falun Gong spiritual movement or taking part in unauthorized protests. In part, the government was been playing catch-up to political activists when it used SMS to try to quell protests. The demonstrations had been organized and coordinated by activists using phone.<sup>xciv</sup>

### **USA - DC Text Alert**

DC Text Alert is used to transmit information to the public during a major emergency such <sup>xcv</sup>as a terrorist attack or severe weather incident.

### **Denmark - Cell Broadcast**

The system, called Cell Broadcast, uses GSM technology to identify cell phone users in a particular area. If a disaster occurs, a message is sent to all phones in the area, warning of the danger. The Cell Broadcast system will be used in addition to the other warning systems which are currently used if disaster strikes, such as sirens and special emergency broadcasts on radio and television.<sup>xcvi</sup>

### **UK - C.A.T.S. (City Alert Texting System)**

C.A.T.S. emergency text messaging system is a service that sends out warnings covering a range of emergencies. The authority wants the majority of people (especially those living in areas at risk of floods), to sign up for this service.<sup>xcvii</sup>

### **USA - 911 SMS Service**

An emergency call center in Waterloo, Iowa, has become the first in USA to accept "911" emergency text messages and even reply back. 911 texting is aimed at helping the deaf, who have had to rely on more cumbersome methods for aid. The service is also useful in emergencies involving instances where the victim is hiding and doesn't want to be heard.  
<sup>xcviii</sup>

### **USA - Emergencye.com**

Emergencye.com is a free public service, notifying citizens of an emergency by e-mail, text messaging or pager, from local, regional and national government sources.<sup>xcix</sup>

### **Korea -Multi-Q**

In high-tech South Korea, mobile phones are now keeping their owners informed of national disasters via short messaging services. Under the service Multi-Q, the carrier will send an emergency text message to subscribers who carry service-specific handsets for no extra charge. <sup>c</sup>

### **UK - SMS against terrorism**

Police in Manchester uses text messages to warn city businesses and residents of any terrorist incidents in future. Messages are sent to subscribers of the new alert scheme via mobile phones, computers and pagers, telling them the type of incident, location and any safety instructions - within 30 seconds of the incident occurring. <sup>ci</sup>

### **Northern Ireland - SMS for disabled**

The Police Service of Northern Ireland operates an emergency SMS text message registration scheme to assist those with certain disabilities to be able to contact them in an emergency. This service also enables police to pass on requests for assistance to the Fire and Ambulance service as well. <sup>cii</sup>

### **Great Britain - SMS for deaf**

In case the deaf or citizens with hearing difficulties in West Midland have a problem, they send a message to central police mobile number. This service is meant for registered citizens whose information has been given to police. The first service of such type in Great Britain, received the award of prestigious global GSM Association in 2003 – “Best Use of Wireless for Accessibility” <sup>ciii</sup>

### **Holland – SMS for deaf**

In case of hazardous/toxic fire or other threat, the deaf citizens of Amsterdam receive SMS message – accompanying to siren (e.g. Go home, close windows and doors.)

### **Bangladesh – SMS against natural disasters.**

The government of Bangladesh sends text messages to warn people of natural disasters, including floods and cyclones. They'll be told whether to go to shelters and what to do. <sup>civ</sup>

### **Philippines -SMS against natural disasters**

The province of Albay in Philippines is using short messaging system (SMS) to monitor natural disasters and provide early warning issuances to constituents. The provincial

government has partnered with service provider Smart, providing SIM (subscriber identification module) cards to some 15,000 local government officials.<sup>cv</sup>

### **Italy - SMS against high tide**

Cell phones will tell Italians when the tide is high in Venice. The city government has launched a free text message alert system for the floods which frequently put La Serenissima under several feet of water.<sup>cvi</sup>

### **Australia - Firewatch**

Firewatch is an email and SMS based fire warning system. Citizens can subscribe with their email address or mobile number and one or more Victorian suburbs to watch out for, and the system will email/SMS back whenever there's an incident within 15 kilometres.<sup>cvii</sup>

## **5. SMS for Humanitarian Relief**

### **USA - Mobile Fundraising**

In the aftermath of Hurricane Katrina in the United States, the Wireless Foundation partnered with the American Red Cross to develop a mechanism through which citizens could make fast, easy donations. In just two months, more than US \$100,000 was raised for the American Red Cross to assist hurricane victims. Realizing this arrangement could help victims of future natural disasters, the partnering organizations established a permanent text messaging response system.<sup>cviii</sup>

### **Damascus - WorldFoodProgram**

The project idea was to distribute food to refugees in Damascus: In August 2007, WorldFoodProgram's program in Damascus sent a text message to people on their list to go to the distribution site and receive the food.<sup>cix</sup>

### **China - SMS for weather forecast**

Short message service has played an important role in helping disastrous weather forecast in China, the China Meteorological Administration (CMA). The Sichuan branch of China Mobile, the country's largest mobile communication operator, has invested 150 million yuan (almost 20 million U.S. dollars) to install information terminals, devices that can receive short messages, among the 50,000 villages across the southwest province.<sup>cx</sup>

## **6. SMS for Tax service**

### **Norway - SMS for tax return**

The Norwegian Inland Revenue is giving Norwegians the chance to complete their tax returns by text message. It applies to taxpayers who have no changes to make to the form they receive in the post. In 2002 1.5 million Norwegian taxpayers returned the form unchanged. In 2003, they could simply send a text message with a code word, their identity number and a pin code instead. <sup>cx1</sup>

### **Sweden - SMS for tax return**

The national tax authority sends a pre-completed form to taxpayers, calculating how much they owe. This is possible because the tax authority sends a pre-completed form to every taxpayer, calculating how much they owe. All they need to do is agree to the assessment - by post, phone, Internet or text message. And in 2004 over 90,000 of Sweden's 7m taxpayers chose the mobile phone to do it. The citizens have an incentive to use electronic channels because it would cost them 6 krona (about 50p) by post. It was calculated that it saves 13 kronor (about £1) for every approval filed electronically. <sup>cxii</sup>

### **Sweden - Gateway Sweden**

The "Gateway Sweden" scheme allows lorry drivers to get customs clearance for their goods by mobile phone. So, mobile technology is also cutting costs at the Swedish customs agency and for its customers. With the system called Gateway Sweden, lorry drivers save hours, especially when bound for Russia. The drivers receive a message on the move telling them their cargo has been cleared, with a reference number if they're stopped for checking. <sup>cxiii</sup>

### **Philippines - PAYBIR**

The Bureau of Internal Revenue in the Philippines offers a service called "PAYBIR," where a taxpayer can file his or her income tax returns by SMS. Through the PAYBIR service, taxpayers can now pay their tax of R10,000 (\$281.-) and below through a text message. The BIR has forged a partnership with Land Bank of the Philippines as the accredited agent bank and Globe Telecom as the taxpayer agent. Globe Telecom uses its G-Cash facility to make tax payments on behalf of its subscribers. <sup>cxiv</sup>

## 7. M-Banking

The experience in the Philippines demonstrates that m-Banking brings advantages to all stakeholders:

**For users:** an opportunity to become engaged in the formal banking sector, facilitate and reduce the costs of remittances, and enable financial transactions without the costs and risks associated with the use of cash, including theft and travel to pay in person;

**For operators:** an increase in SMS revenues and a drop in customer churn;

**For consumers:** m-commerce is more secure and flexible than cash, allowing consumers to make payments remotely;

**For banks:** an increase in customer reach and added cash float;

**For retailers:** added business opportunities through the sale of prepaid account credits;

**For micro-finance institutions:** the ability to advance funds into remote areas and have regular repayments that do not inconvenience the user;

**For service industries and utilities:** the ability to get payments electronically from a significant portion of the population (InfoDev, 2006a).<sup>cxv</sup>

### Kenya, Tanzania, Afganistan - Project M-PESA



In January 2007, Vodafone started an M-commerce system in Kenya with its local partner Safari.com called M-PESA. Project M-PESA is the product name of a mobile-phone based money transfer service. Initially, the concept of M-PESA had been to provide a service that would allow borrowers to conveniently receive and re-pay loans using the network of Safaricom airtime resellers. But when the service was trialled, customers adopted the service for a variety of alternative uses and complications arose with Faulu, the partnering microfinance institution (MFI). M-PESA was re-focused and launched with a different value proposition: sending remittances home across the country and making payments.

M-PESA customers can deposit and withdraw money from a network of agents that includes airtime resellers and retail outlets acting as banking agents. M-Pesa is operated by Safaricom a Mobile Network Operators (MNO) which is not classed as a deposit-taking institution (such as banks), so M-PESA may not be advertised as a banking service. The service enables its users to:

- Deposit and withdraw money,
- Transfer money to other users and non-users,
- Pay bills,
- Purchase airtime.

The user interface technology of M-Pesa differs between Safaricom of Kenya and Vodacom of Tanzania, although the underlying platform is the same. While Safaricom uses SIM toolkit to provide handset menus for accessing the service, Vodacom relies on USSD to provide users with menus. The project initially targeted 200,000 customers by the end of 2007 but reached that figure by the end of April. By the end of the year, in fact, they had registered over two million users, out of Safari.coms 6.5 million subscribers.<sup>cxvi</sup>

### **Uganda - Mobile Money 2.0**

Mobile Money 2.0 solution enables subscribers to store and transfer funds through their mobile handset, providing an ideal service for developing countries that may have poor or limited banking resources in their rural communities. Some of the rural regions of Uganda lack an easily accessible banking infrastructure, which has been a key barrier to providing financial services. Through increased mobile penetration in Uganda and the expected launch of Mobile Money, Uganda Telecom will be providing Ugandans with unparalleled access to a new generation of financial services.<sup>cxvii</sup>

### **South-Africa - Mxit**

Mxit (South African chat client) uses Standard Bank's MiMoney as an electronic payment voucher that can be purchased through self-banking channels and various retailers.<sup>cxviii</sup>

### **Bangladesh - Grameen Foundation's Village Phone program**

Grameen Foundation's Village Phone program has long been touted as the poster child for using mobiles in the economic empowerment of poor women. The program gives villagers in Bangladesh - and now in several other countries - access to microcredit to buy a mobile phone that can then be rented to other villagers who do not have a mobile of their own.<sup>cxix</sup>

### **India - MHITS**

MHITS is an SMS-based micro-payment system (for payments less than \$100) that basically allows a mobile phone user to send small amounts of money to another phone user, akin to an electronic wallet.<sup>cxx</sup>

The State Bank of India has introduced a new facility is Mobile Banking Service, which employees can receive the details of their transactions in their account through Mobile Phones. To avail this facility, employees should apply for the same mentioning their Mobile Number and Account Number. Employees will be informed through SMS about the transactions of Salaries, GPF, LTC and other advances as soon as it is credited in their respective accounts.<sup>cxxi</sup>

### **Malta - Notification for Direct Credit Payments from the Department of Social Security**

This service offers the citizen to receive a notification whenever there is a direct credit payment to the bank account from the Department of Social Security.<sup>cxxii</sup>

## **8. Other SMS services**

### **Ireland- Dial-a-Buoy**

Marine Institute SMS project is called Dial-a-Buoy. This SMS text service gives weather forecasts, shipping bulletins, gale and swell warnings, as well as public information and research news, by SMS text message directly to a mobile phone. This service does so by connecting to the Marine Institute's network of five floating weather stations around the Irish Coast. The benefits of this service have been felt by members of the public wishing to sail or surf right through to commercial fishermen. Subscription to the service is also relatively cheap meaning that it is an attractive service for those involved in water borne activities.<sup>cxxiii</sup>

### **UK - aitTEXT**

A number of environmental groups are embracing text messaging as a means of engaging key stakeholders, whether in their capacity as community members or consumers. airTEXT is a free air quality information service for people in London. Users who sign up for airTEXT receive voice or text message alerts when air pollution is forecast to be higher than normal. The service is aimed at people who suffer from heart and breathing problems, whose health

or quality of life may be affected by air pollution. Similar services exist for specific locations in the United States.<sup>cxxiv</sup>

### **USA – Climate Counts**

Climate Counts enables consumers to check companies' environmental sustainability ratings, and compare them with their competitors. The information, in the form of a scorecard that is delivered via text message back to the user, reflects the self-reported efforts of companies to address climate change. Climate Counts has compiled an index based on whether companies have measured their climate 'footprint,' reduced their impact on global warming, supported (or suggested intent to block) progressive climate legislation, and publicly disclosed their climate actions.<sup>cxxv</sup>

### **EU - mobGAS**

A mobile application called mobGAS can be used to track individual emissions of greenhouse gases. The application, developed by scientists at the European Commission's Joint Research Centre, tracks the emissions of carbon dioxide, nitrous oxide, and methane based on information on daily activities entered by the user. Users can enter the information on a website or their mobile phone and then compare their emissions with national and international averages. The application is particularly useful on mobile phones because users can enter data about activities that cause emissions—like watching television, driving, or cooking—at any time. By helping users make connections between their daily activities and greenhouse gas emissions, mobGAS hopes to encourage individuals to make lifestyle changes. The application also offers tips on how to modify activities to decrease emissions. According to Tiago de Sousa Pedrosa, a project coordinator, mobGAS was downloaded more than 3,000 times between December 2007 and February 2008. By raising awareness of individual emissions, mobGAS hopes that the application can spark higher-level change. It will be developed for the 27 EU countries, and available in 21 languages.<sup>cxxvi</sup>

### **Argentina- The Forest Law**

To confront rapid deforestation, Greenpeace Argentina used the web, mobile phones, and publicity on television and in newspapers to gather 1.5 million signatures for a petition supporting *La Ley de Bosques*, or the Forest Law.<sup>cxxvii</sup>

### **USA - Florida Keys Mosquito Control District**

M-government also provides opportunities to improve the internal operation of public agencies. Again, there are few instances of such applications yet in developing/transitional economies. The Florida Keys Mosquito Control District's challenge is to effectively and

efficiently use their 61 vehicles engaged in insecticide control to prevent the spread of West Nile Virus and other mosquito-borne diseases in over a million acres of coastal marshland. They are now using a wireless fleet management solution that monitors the locations, heading, speed and insecticide applications of all their vehicles in real time. The information wirelessly provided by their vehicles is displayed on a digital map screen at district headquarters in Key West. The digital map monitors what each vehicle is doing, where it is spraying (or dropping) chemicals, and the vehicle rates of speed. This allows supervisory staff at headquarters to monitor vehicle progress and instruct personnel as necessary. The system also allows them to generate reports both in real time and on a historical basis (for example to demonstrate spraying activity over a period of time or to calculate cost analysis information).<sup>cxxviii</sup>

#### **USA - The Denton Public Library SMS service**

The Denton Public Library makes information more accessible to its customers by a text-messaging system. Text message notification is used to inform customers of items ready to be picked up, due dates, items that are overdue and other notices through their cell phones.<sup>cxxix</sup>

## **9. Special notifications by SMS**

#### **Dubai -eGovernment's SMS service**

Dubai Public Prosecution has adopted Dubai eGovernment's SMS service. This SMS integrated service allows clients, including the transacting public, lawyers and prosecutors, to inquire about cases, times of sessions, resolutions, and the status of proposals and requests drafted by the Public Prosecution.<sup>cxxx</sup>

#### **Malta- Notification of acknowledgements and status change of customer complaints**

This service enables the citizen to receive an acknowledgement via SMS after the person has contacted the Customer Care web site, [www.servizz.gov.mt](http://www.servizz.gov.mt). The [servizz.gov](http://servizz.gov) web site enables to submit a question, a suggestion or a complaint to any Public entity, Government Department or Local Council in regard to the services they offer. This service also enables the citizen to receive SMS' on the progress made and whatever has been done regarding your problem.<sup>cxxxi</sup>

### **Malta - Notifications via SMS for license-renewal to the holders of licenses**

This service enables the citizen to receive notifications via SMS for licence renewals to the holders of Trade licences, Malta Tourism Authority licences and Malta Maritime Authority licences.<sup>cxxxii</sup>

### **Germany - Search for missing children/citizens and criminals**

When police are searching for missing people or criminals, SMS will be sent to registered bus and taxi drivers.

### **Philippines - Garbage collection via SMS**

The service allows citizens to communicate with dustmen service, so the environment can be improved.<sup>cxxxiii</sup>

## **10. SMS for Transport**

### **Spain - The mobile bus ticket EMT**

Malaga's municipal transportation company - EMT (Empresa Malagueña de Transportes) introduced a mobile bus ticket system in Spain and used Gavitec hardware solutions - EXIO™ - to validate the mobile tickets in buses. Malaga is the first Spanish city to offer people the chance to pay their bus fare with their mobile phone. Passengers will be able to pay for a single ticket or even top up their season tickets simply by using their mobile phone. Using the Mobipay payment system, travellers can buy bus tickets and receive them as unique 2D codes (Data Matrix) via one text message (SMS) on their mobile phone. The ticket price is charged to the phone bill or deducted from the pre-paid phone card.<sup>cxxxiv</sup>

### **South-Africa - City of Johannesburg traffic fine system**

Motorists around the City of Johannesburg can find out if they have outstanding traffic fines, summonses or warrants of arrests through SMS. All they need to do is to send their ID numbers via the SMS to 36997 from any network. Motorists will then receive a notification with their contact details recorded on a data system.<sup>cxxxv</sup>

### **UK - Bus Text Message Service**

Aberystwyth University together with Traveline Cymru offers Bus Text Message Service that tells the student when the next bus is going to arrive at the bus stop. It works by simply texting the 7 character Bus Stop Code of the bus stop where the person wants to travel

from.<sup>cxxxvi</sup>

## ***IV. CASE STUDY - ESTONIA LEADING IN M-GOVERNMENT***

### **1. The success of Estonia**

Estonia's mobile market is one of the most penetrated in Eastern Europe, with SIM card penetration exceeding 100%. Services are offered by mobile network operators EMT, Elisa and Tele2 as well as MVNOs. WCDMA-based (3G) and HSDPA networks have been launched and the higher speeds available from 3G has been used to offer mobile broadband access services as well as mobile content and applications, which are expected to underpin future revenue growth.<sup>cxxxvii</sup>

Estonia has also adopted SMS tool as a powerful and convenient way to provide a communication channel from government offices to citizens.

Estonia is in the forefront of the world with its e-government and m-government initiatives. This achievement of Estonia is attributed to the willingness of the Estonian government to quickly adopt new technologies (Rannu 2003).

Hannes Astok, the Member of Parliament in Estonia, has said that the success of Estonian m-government is the result of the Estonian government, municipalities and private sector companies who are working very closely.<sup>cxxxviii</sup>

### **2. KPMG report shows Estonia as CEE leader in mobile payments**

A KPMG (a global network of professional firms providing Audit, Tax and Advisory services) survey (5 March 2009) singles out Estonia as the most advanced mobile payments market in Central and East Europe. The survey considers Estonia to be advanced beyond the initial m-payments phase while most other Central and East European countries still have much room for improvement.

"Estonia stands out among CEE countries by its mobile ID solutions, among other things," said Veiko Kullaste, adviser with KPMG Baltics. According to the survey, there are numerous m-payment applications in Estonia but apart from m-parking they have not really caught

on. Since 2000 some 55-60% of parking sales is generated by mobile phone in Estonia and the method has spread to the other Baltic states.

What also strikes the eye in Estonia is the close cooperation between mobile network operators and banks. Mobile payment transactions are executed through the Bank Card Center set up by major banks originally for processing and supporting card transactions (it has by now been sold to a foreign investor) and a certification center too has been established here.

M-banking applications are in active use in Estonia. When it comes to m-banking, the Baltic states are the clear leader and the only countries with services that go beyond simple transactions, the report says.

The existing environment is favourable for the development of m-payment systems and for Estonia - cash transactions are on the decline and mobile penetration exceeds 100 percent.

cxxxix

### **3. Estonian best practices**

In this part of the report, an overview of Estonian successful mobile services will be introduced. In Estonia many of the government services are available through mobile phone. Today, governments around the world, also in Estonia are investing to optimize their processes and to improve their services using technologies, where mobile devices are part of these strategies.

#### **Tartu mCity**



Tartu mCity is a project by Tartu City Government that aims at making the life in Tartu better by introducing, piloting and implementing new mobile solutions in various areas of city life: from public transport and neighbourhood watch to education and healthcare.

The services are developed in co-operation of Tartu municipality, local and international companies, public institutions, universities and other m-cities across Europe.<sup>cxl</sup>

### **Mobile-ID service**

A service, Mobile-ID (Mobiil-ID in Estonian) was launched in Estonia by mobile operator EMT in cooperation with CA AS Sertifitseerimiskeskus.

The infosecurity 2009 initiative was launched on 23 May 2006 by the Look@World Foundation – gathering ten Estonian leading companies and established in 2001- and the Ministry of Economic Affairs and Communications of Estonia. The initiative aims to considerably increase the number of Internet users and the users of eID card and Mobiil-ID in Estonia.

To use a Mobile-ID, the customer has to subscribe to the Mobile-ID service agreement with participating telecommunication services providers and change the phone's SIM-card. The new SIM-card with added functionalities bears regular PIN-codes and PUK-codes as well as codes needed for identification over the Internet and for using digital signature. In the world Estonia is in the frontline with this service and different countries have shown a great interest towards this service. This service has shown real value in furthering secure usage of e-services. Both, ID-card and mobile phone, are handy devices that most of the people have with them at all time, so with these devices the risks of using e-services can be minimized to a great extent.

Furthermore, while Latvia and Lithuania do not widely use the ID-card, Mobile-ID has a potential of becoming a unified personal identification and digital signature service for all three Baltic countries.<sup>cxli</sup>

### **ID-ticket/Mobile transport ticketing**

In 2003, Tallinn and Tartu started to develop the electronic payment system in the sector of public transportation. A pilot project, based on a so called IDEE card was used in Tartu already earlier.<sup>cxlii</sup>

All three Estonian mobile operators, namely EMT, Tele2 and Radiolinja (now Elisa) participated in the ID-card based electronic ticket system for public transport, that was launched in Tallinn on March 1, 2004. Reportedly, Estonia is the first country where electronic tickets can also be purchased by fixed phone.

To promote and make m-payment services more customer-friendly, three mobile operators introduced a shared mobile payment sign with their logos together with number 1312.

The agreement between operators reflects new thinking in business, as for the first time the technical cooperation reached the customer level.

### **Exam results by SMS**

The first mobile SMS-based service that succeeded very well in Estonia was about notifying students about their high school final test results. To see their results in their mobile phone order students have to log in to state portal, activate the corresponding service and enter a mobile phone number where the result can be sent. Authentication is done via ID card, Mobile-ID or via Internet banking passwords. The service has been popular since it was introduced in 2004. In 2007 there were altogether 24 586 examinees taking 56 118 exams. 15 538 of them ordered SMS notification service and in sum 37 910 SMS notifications were sent out. In conclusion, 63% of the examinees used this service. SMS-notification is provided by the National Examinations and Qualifications Centre in cooperation with EMT and Mobi Solutions. <sup>cxliii</sup>

### **Mobile parking**

Mobile parking is a fast and easy way to pay for parking in the districts of paid parking in five bigger Estonian cities (Tallinn, Tartu, Pärnu, Viljandi and Kuressaare). Payments are included in the mobile phone bill and there is no need to fill in special parking forms. Mobile parking also enables to pay only for the actual parking time. The popularity of mobile parking is supported by the fact that nearly half of parking charges in Tallinn in 2003 were paid by mobile phone.

Mobile parking service is about sending an SMS for the parking time. At present, the service is automatically activated for all contractual clients of the Estonian mobile operators.

EMT has been providing M-parking service in Estonia already since 1 July 2000 and the service has achieved great success. M-parking service of EMT was one of the four nominees for the most innovative GSM Wireless Service at the GSM Association conference in 2001. It was also titled for "Deed of the Year" from the Association of Estonian Information Technology and Telecommunications Companies (ITL). <sup>cxliv</sup>

### **Data Exchange Layer X-Road**

The X-Road was launched in 2001. At the beginning, X-Road was developed as an environment that would facilitate making queries to different databases. By now, a number

of standard tools have been developed for the creation of eServices capable of simultaneously using the data of different databases. These services enable to read and write data, develop business logic based on data etc. The X-Road enables to make any common data processing operation. Proceeding from this principle, several extensions have been developed for the X-Road: writing operations to databases, transmission of huge data sets between information systems, successive search operations of data in different data sheets, possibility to provide services via web portals, etc.

The average number of monthly X-Road enquiries already amounts to 2.5 million with 3,068 million enquiries having been made by June 2006. 163,736 people, i.e. more than 12% of Estonia's population, used X-Road services via different portals in 2006. The number of companies and public bodies among the X-Road users currently amounts to 28,300 and 65 databases have joined with the X-Road to offer their services via this environment. <sup>cxlv</sup>

### **M-neighbourhood watch**

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 SMSnotifications 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 who are included in this project. The service has been actively used especially in finding missing persons and the relevant cases have been covered also in media. <sup>cxlvi</sup>

### **M-library**

The pilot of m-library was launched in February 2005. Tartu City library sends out notifications to the readers who are in the waiting list. If a person wants to borrow a book, movie or audiotape which is currently not available, he or she can register and receive an SMS when it becomes available. The m-library is a good example of how even small mobile solutions can save time and resources for everyone involved. Before the service of m-library, people went to the library, not knowing if book was in the library at the moment. They had to repeat the visit or call the librarian randomly to know the status of the book. Also, librarians spent time answering requests and calls. With m-library all these time-wasting transaction costs have reduced significantly. <sup>cxlvii</sup>

### **M-Teacher**

In Estonia schools and parents have an opportunity to improve communicate via SMS. Mobi Solutions is providing schools with a web-based interface for sending out SMS-messages. Every teacher has the necessary contacts (mostly parents, but also pupils) in their address

book and can send out messages whenever necessary. Messages can be sent either to a predefined group or to a single contact. Content of the message is not restricted, so teachers have the opportunity to send messages on different occasions. Few examples: teacher is sick, class can be re-scheduled, reminders - A pupil is missing school without notice, information on child's progress, etc. To implement the service, Mobi Solutions installs and configures the service as requested by the school.

All public schools in the city of Tartu have joined the M-Teacher project. Feedback regarding the teacher's survey made in September 2009 demonstrates that M-Teacher has made teachers' jobs easier, improving the consistency and rate of communication between the teacher and students' homes. Parents said that since joining M-Teacher they feel more involved in the lives of their children and have better understanding of how their children are doing at school on a short-term basis.<sup>cxlviii</sup> In 2007 M-Teacher was one of the 44 projects to take part in the international competition Baltic Challenge Award and was one to reach to the final competition.<sup>cxlix</sup>

### **M-Police**

With M-Police, Mobi Solutions is providing an opportunity to activate and engage the street-level community by providing easy avenues of communication between civil servants, city residents and the police department. Mobi Solutions provides the Police operations center with a powerful application for sending out SMS messages and equips them with an easy access address book. User groups within the phone books are logically organized by field and geographic area. M-Police enables police to quickly communicate with other street-level groups in real-time about crimes or events. M-Police is an extremely effective tool. Thus far it has been actively used in the following cases: finding lost people (elderly and children mostly), finding witnesses for accidents, deploying information about fugitives, in instances of city-wide disasters or disruptions. In fact, M-Police technology has contributed to the capture and detainment of a runaway murderer!<sup>cl</sup>

### **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](http://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 objects. <sup>cli</sup>

### **The logo of Tallinn contest**

In 2005 the city of Tallinn organized a contest to find the best logo for the city. Invitation was sent to selected design bureaus to design their vision of the logo of Tallinn. 11 logo projects were then presented to citizens and tourists in the city and on a special website that was also advertised in the biggest news portals of Estonia. Every visitor had a chance to cast his/her vote by using mobile phone and sending simple SMS containing the number of logo. Afterwards, the votes were taken into account besides expert jury and city officials opinions. SMS was selected to gather citizens' votes because it's simple to use, but at the same time it provides higher reliability than web. Every vote caster is identified through the phone number and therefore every phone could only vote once. The results were available real time and the costs of the service were low. <sup>clii</sup>

### **Mobile-ID and voting**

Voting on the Internet is as a manifestation of democracy. E-voting was first used in Estonia in local government elections in 2005, and then again in the parliamentary election in 2007. Estonia broke new ground in this area, showing that E-voting is possible and thoroughly secure when citizens are identified by personal keys that are stored on their ID cards and the relevant certificates and when votes are confirmed with digital signature. Because Mobile-ID is based on the same technologies as the Estonian ID card, and because the issuance of Mobile-ID SIM cards is fully in line with the Estonian Digital Signatures Act and the EU Directive 1999/93/EC on the Community framework for E-signatures, one may well ask whether the next time that Estonians go to the polls, they will be able to do so by means of Mobile-ID.

The first deputy speaker of Parliament, Kristiina Ojuland, says that that solution might increase voter turnout, thus ensuring the more effective actualization of the will of the people. A security study has been initiated to compare the technical and organisational security measures of Mobile-ID and the ID card. The Election Act states that E-voting is carried out by means of the ID card, and the law would have to be amended to make it possible also to use Mobile-ID. <sup>cliii</sup>

### **Eesti Post Mobile payment**

Card payment solution via GSM phone which was developed by Estonian Post was nominated as the World Mail Awards Innovation of the postal world 2006.

Customers expect to be able to pay by using a bank card in post offices as well as at any location. To meet these expectations and to retain competitiveness, Estonian Post, in cooperation with leading Estonian mobile operator EMT, and one of the leading banks, SEB Eesti Ühispank, has developed a mobile bank card payment solution for couriers and postmen which allows customers to pay for services with a debit or credit card wherever they wish.

The solution enables the wider provision of Cash on Delivery services. The solution gives distance sellers the opportunity to improve services, since their customers have more convenient ways to pay for their goods. Business and private customers of a courier service do not need to worry about a lack of cash, and there are no extra visits to the post office to pay for the service if they lack cash during a courier's visit. The World Mail Award for Innovation is a continuation of the overall strategy and achievement of the Estonian state in being foremost in the world in mobile and e-solutions.<sup>cliv</sup>

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## **PART 3 - USER FEEDBACK**

### ***V. USER SATISFACTION***

User's satisfaction and usage have been handled by many researchers in the IT, IS and Networking fields and may be defined as the extent to which they believe that the available service meets their needs.

In mobile government research, Carroll (2005) reports that at present users are constructing 'portfolios' of electronic and non-electronic resources to meet their real-time, situated needs as they move from place to place. Carroll (2005) states that mobile users select from the vast array of devices, media, applications and non-electronic resources according to their personal preferences, those of their peer group, their perceived needs and purposes for diverse activities in likely situations of use.

This portfolio can then provide tailored technological support to the user, be adapted as needs change and aspects of the portfolio can be updated as enhanced technologies become available.<sup>clv</sup>

Success of m-government requires active engagement by both government and its citizens and so providing services is only one aspect of the m-government equation.

A more challenging aspect, is achieving acceptance and widespread persistent use of m-government by citizens. This depends on the design and implementation of m-government offerings that citizens value and appropriate so that they become part of their everyday interactions with government.<sup>clvi</sup>

## **VI. END-USER STUDY**

### **1. The mapping and analysis of the preferences and expectations of the mobile and positioning services**

The priority of the study is the mapping and analysis of the preferences and expectations of the users of mobile and positioning services. The data was collected by Norstat Eesti AS and the analysis was made by HeiVäl Consulting.

The inquiry was held in September 2009 and the survey was completed in October 2009. It consisted of telephone interviews and web-based questionnaires. The questionnaire part was divided into three: satisfaction of the services, advertising/notification services and positioning services.

The selection of the respondents consisted of the contacts of three Estonian enterprises:

1. The users of EMT m-services
2. Nonstationary selection of the users and non-users of m-services by Norstat Eesti AS
3. Nonstationary selection of the users of m-services by HeiVäl OÜ

In total, 403 respondents participated in the study. 150 (37.2%) of them were the users of m-services and 253 (62.8%) did not use m-services.

Higher proportion of the respondents are people with higher education (35.5%, 143 respondents out of 403) or secondary education (35.2%, 142 respondents out of 403), who are followed by people with vocational education (16.9%, 68 respondents out of 403) and primary education (12.4%, 50 respondents out of 403).

Most of the respondents (23.3%, 94 respondents out of 403) are among 26-35 years old and people with the age of 56 and older (23.1%, 93 respondents out of 403). They are followed by respondents between 19-25 years old (17.6%, 71 respondents out of 403), between 36-45 (15.9%, 64 respondents out of 403) and between 46-55 years old (13.6%, 55 respondents out of 403). Out of all respondents, 6.4% (26 respondents out of 403) are people of the age 18 and younger.

## **2. The analysis of the users and non-users of m-services**

The percentage of the non-users is larger on the occasion when the bill is paid by themselves or by a family member. Contrary is the situation when the phone bill is paid by the employer. On such occasions the users of m-services threefold the number of non-users.

### **The analysis of respondents according to income**

In comparison with non-users, the users of m-services increase if the income of the respondent is more than 10 000 kroons. The general trend is that the higher the income, the higher the ratio of m-services in this income group.

### **The analysis of respondents according to age**

The number of non-users in comparison with the users of m-services is lower among the group of respondents who are younger and older. At the age of 19, the number of users of m-services starts to rise. More users are among 26-35 years of age. After that age group the number of users starts to fall and the number of non-users increases.

### **The analysis of respondents according to education**

Most of the users (56% of the users of m-services) belong to the group of higher-education. Most of the non-users are among the middle-education respondents.

### **The analysis of respondents according to gender**

The study reveals that among the male respondents in comparison with the female respondents, the proportion of users compared to the non-users is larger.

### **The analysis of respondents according to location**

Most users of m-services are from bigger cities, in Estonia from Tallinn or Tartu.

## **3. The results from the non-users of m-services**

### **Why are you not using m-services?**

Respondents were asked to name the reasons why they are not using m-services. Most common reason for not naming any service is unfamiliarity with the services available.. In

non-users' opinion mobile phone is uncomfortable for such services, so they prefer to use computer instead. Non-users foremost prefer to use mobile phone for making calls or otherwise their phones are unable to implement m-services as the needed functions are missing. Also, the cost of m-services is named to be too expensive and for people who live out of the city in a country place the location is seen as an obstacle.

#### **What can be changed for you to use m-services?**

Respondents bring out that they need more information about m-services. They are not familiar with the purport of m-services. People emphasize that they would use m-services if the cost would be lower and if they move to the city. People would use m-services more if they replace computers to mobile devices.

#### **4. The results from the users of m-services**

##### **What kind of m-services do you have a need for?**

The respondents were asked to name services that are not yet implemented, but what would be useful for them. Respondents would like to use m-services that have a value for everyday use: m-doctor (the time of the GP, the length of the doctor's queue), parking zones in the mall, info about football scores, m-tanking (Neste), m-wash (Jazz), mobile info search (alike Google), client card in the mobile (to make a free call on some number in order to identify the client), and a card program based on vector graph with an open platform and positioning info.

##### **The analysis of the users of m-services (income vs the monthly telephone bill)**

If the user of the service doesn't have an income and the phone bill is covered by someone other than himself, the number of m-users is higher.

If the user has an income, then the correlation between the service, the amount of the telephone bill and income is positive - the higher the income, the higher the telephone bill and the more use of m-services.

#### **5. Summary**

The number of the users of m-services depends mostly on the age, the income and the location. Most users are among the age group 19-35. The correlation between the income

and the users is positive - the higher the income, the more users of m-services. People living in big cities, have more opportunity to use the service. Therefore, most of the users in Estonia are in Tallinn and Tartu. At the moment the users of m-services are satisfied with the service. They complain most about the cost, as this is too high. The availability of information was rated as good. At the same time, non-users of m-services said that the purpose they do not use m-services is the lack of information. They are not familiar with the utility of the services and benefit they would get out of them. Also, the cost of the services was rated as too high. In this part, their opinion resembled with the users of m-services.

## **6. Recommendations**

In order to make m-services more available, increase the number of users and the efficiency, some client-oriented changes have to be made. M-services have to be introduced to the wider public. Users should know the advantages and benefits of m-services. Mobile service companies have to co-operate with mobile operators, so that the customer service would introduce m-services to all the people buying a new phone. Also the opportunity to use m-services have to be made available to everyone: those living in metropolitans, as well as at the countryside.

## ***VII. TARGET-GROUP STUDY***

### **1. The Research of M-Teacher**

M-Teacher has been successfully used in Tartu's schools for 5 years now. Thousands of messages have been sent out by teachers and lots of information has been received by parents. In August-September 2009 the first survey after M-Teacher's implementation was conducted.

The intention of the survey is to describe the real value and perspective of the service for parents and teachers. For data processing this research uses reports from telephone interviews with 36 parents from 12 Tartu schools and internet-based questionnaires from 118 teachers from 18 Tartu schools.

Because of the different amount of messages received (during one school year, in all 1498 text messages were sent to 36 parents. On the average one parent received 42 text messages per school year. Here is an important divergence between schools and classes: when a parent from Tartu *Forselius* Gymnasium received 163 messages a year, another parent from Raatuse Gymnasium got only 7 messages per year.), the sampling of parents consisted of an equal number of participants: 12 who had received many messages, 12 who got less messages compared to others and 12 who received an average amount of messages.

## **2. Feedback from parents**

### **How useful is M-Teacher for you?**

The survey reveals that the service has benefits for all the parents. Information by text messages was rated as "very useful" by 61% of the parents and "useful" by 31%. Together, over 90% of the parents greatly valued the service as the intermediary between home and school communication. The rest, 8% of the parents (3 parents) found the service to be "likely to be useful". In all, on the five-point scale M-teacher was rated with the mark 4.53.

### **What kind of messages teachers send?**

The survey reveals that all the parents have received information about school events by SMS. Some respondents add that information about school related activities (such as parent-teacher meetings, sporting days, class excursions) is warmly welcomed, so that the parent has an opportunity to plan time and prepare for the event. Most of the parents (89%) have received emergency or extraordinary messages on their phone. More than half (53%) have also got greetings by text message, messages about child's progress or notifications about absence and other problems. Reason why other half of the parents have not received messages about child's progress, absence or problems, is the consequence that child brings home good marks and behaves well in class, whereas teachers evidently send less complimentary messages. Some parents from the elementary school noted that their child is not yet familiar with the term "skipping school" - therefore, there is no need for the teacher to send such messages. Parents also emphasize that they prefer to get personal information about their child.

### **Has M-Teacher changed communication more efficient?**

The survey revealed that M-Teacher has changed the relationship between school and home more active. For 83% of the parents, the service is an efficient way for communicating with teachers. Respondents were satisfied that they receive valuable feedback from teachers and are familiar with necessary issues already before the parent-teacher meeting. 17% of the respondents rated the service as inefficient. For one parent the service was inefficient because he belongs to the school's parent association, where he is already closely related to school activities, so he has no need for SMS as an extra communication channel.. Some parents answered that they go to school daily or log on to e-school, so they are well-informed about their child's well-being in school.

### **Was the information useful and requested?**

In parents' opinion teachers send valuable information by SMS. 61% of the respondents rated the content of the text messages as "very useful", 25% as "useful" and 8% as "rather useful". Therefore, 94% of the parents said that messages are needed and relevant for them. For one respondent (3%) messages are seen as "rather not useful" and for one parent (3%) they are not useful at all. (For some respondents information from the teacher was unnecessary. Also, the respondent preferred not to receive messages about child's problems and progress, as e-school gives the opportunity to check marks and the parent prefers to choose her own time when to monitor child's progress in school.) In conclusion, on the five-point scale the service of M-teacher was rated with 4.53.

## **3. Feedback from teachers**

### **What kind of information have you sent via SMS?**

Teachers have no limitations about the context of the SMS. They compose messages according to circumstances and forward these to parents. The survey revealed that most of the teachers (88%) inform parents mostly about school related activities by SMS. 82% of the respondents send emergency or extraordinary messages (cancellation of lessons). Many teachers (74%) inform parents about absence and other problems by SMS. More than half (67%) of the teachers use M-teacher to send greetings and compliments about child's progress. Most uncommon, for 36% of the respondents, is to inform parents about child's progress in school.

### **What is the main advantage of sending an SMS compared to other communication channels (via child, telephone calls or e-mails)?**

Teachers (83% of the respondents) say that when communicating with parents the most valuable quality of M-teacher is time-efficiency. For 75% of the teachers it is also more convenient to send information by SMS and 61% value the low cost of the service. For 69% the advantages of M-teacher are also the high level of assurance that the message is always picked up and the direct contact with the parent.

### **Has M-Teacher changed the communication with parents?**

All the teachers emphasize that M-teacher has changed the relationship with school more active. For 85% of the teachers now the communication between school and home is more efficient and for 37% it is also more dense than before. 6% of the respondents haven't noticed any changes after the implementation of M-teacher.

### **How do you rate the process of sending SMS?**

Teachers are satisfied that M-teacher is an user-oriented service. 97% of the respondents see the process of sending messages easy and convenient. Only for 3% of the teachers it is not convenient.

### **How do you rate the usefulness of M-teacher when communicating with parents?**

In teachers opinion M-teacher gives great value to the everyday communication with parents. Therefore, 75% of the respondents consider it to be "very useful". 22% of the teachers named the opportunity to communicate with parents by SMS "useful" and only for 3% it is "rather useful".

## ***VIII. PUBLIC SECTOR STUDY***

### **1. Mobile services for the public sector**

The priority of the study is to map the public sectors' expectations and needs of the ICT and mobile services. The outcome of the study has a practical value for the government: the results give an overview of the officials' needs and interests of m-services and help to identify those institutions whose need and interest for the m-services is the greatest.

The study was carried out by Mobi Solutions Ltd and the Estonian Informatics Centre. The enquiry was held in December 2009. The online questionnaire was sent to the communication and IT managers of the Estonian government institutions. The questionnaire has 19 questions from which 17 about mobile services and 2 about respondents' profile. The questionnaire is divided into five sections: development of new services, usage of mobile services, notification methods, development of mobile services and respondent's (official's) profile. For data processing the study uses 26 answers that were returned from the public servants.

## **2. Feedback from the officials**

### **I Questions about the development of new services:**

#### **Is your institution active on developing and using ICT services?**

Government institutions see themselves as active participants in the field of ICT. 88% of the public servants consider their institution as technology savvy, from which 46% of the respondents evaluate their institution as "active" and 42% as "rather active" users of m-services. For one respondent the institution was "rather not-active" and for two "not active" in using m-services.

#### **What is the main reason for creating ICT solutions?**

Respondents had a chance to name several options. For most of the officials the most important factor for thinking about new ICT solutions is more effective and faster processes. For 85%, the second most important factor is the better availability of the services. Over half named the better quality of the service and the lower costs to be a stimulus for creating new ICT solutions.

#### **What is the most urgent target group (based on your institutions' needs) for whom to develop new services?**

For 69% of the public servants the most important services to be developed are for the end-user and for the citizen. Quarter of the respondents see the most urgent need to develop intra-organizational or official targeted services and another quarter the need to increase co-operation within other institutions and organizations.

### **What is the main barrier for the institution in activation new services?**

Respondents could name more than one preference. The main reason for 65% of the public servants in activating new services is the lack of funds. Approximately half of the respondents see also the lack of time and technological complexity to be a barrier. Least hindering circumstances for developing new services are insufficient legislation for 31% and lack of ideas for 15% of the respondents.

### **II Questions about the usage of mobile services:**

#### **What kind of mobile services (besides voice) are you using or have used before?**

Respondents could name more than one preference. Most of the respondents have used SMS/MMS services. 77% of them are familiar with m-parking, 65% have used mobile internet, half have used m-ticket and mobile-ID, 31% positioning services, 19% have used m-bank, and 8% have used some other services.

#### **How often do you use mobile services?**

Public servants are rather active in using mobile technology in their everyday life. 88% of the respondents use mobile services at least once a week. Only 8% use them several times a month and one respondent less than once a month.

### **III Questions based on the mobile notification services:**

#### **If at all and how does your institution send time-critical information to the citizen (if the notice has to reach the person instantly)?**

Respondents had a chance to choose several answers. Most of the respondents send time-critical information via e-mail. 69% use voice services and 27% use SMS. Posted letter and other methods to notify the citizen, are used less during time-critical occasions.

#### **If at all and how does your institution send information that is not time-critical, but important to the citizen?**

Respondents had a chance to select several answer opportunities. Most often, public servants prefer to inform citizens via e-mail. Over half use a posted letter and 32% use voice services. Only quarter of the respondents see a need to send an SMS for information that is not time-critical. Two respondents do not send such messages at all.

### **What types of services are the most useful for sending time-critical information?**

Respondents had a chance to name several options. They could also name services that they have not used before. The most efficient method to share time-critical information is via SMS - 88% say that they would use SMS for time-critical occasions. Another important channel to forward urgent information is by e-mail or by voice.

### **What types of services are the most useful for sending information that is not time-critical?**

Respondents had a chance to select several answer opportunities. They could also name options that they have not used before. Respondents' answers illustrate that even for information that is not time-critical, a trend is to use more electronic channels than regular post services. 65% use e-mail for information that is not time-critical and a quarter uses SMS or some other method to share information. Only 5% prefer to send a posted letter.

## **IV Questions about the development of mobile services:**

### **What type of technologies could the public sector's mobile services implement more?**

Over half of the public servants prefer services that work in all types of mobile phones and that are easily handled for the citizens (voice, SMS). For 36%, public sector services should be created for both, for mobile phones with maximum level of opportunities, as well as for older telephones that do not include high-tech opportunities. None of the public servants think that public sector services should be available only in mobile phones that support maximum level of opportunities (3G, mobile internet, video etc).

### **What should the mobile internet site look like?**

Most of the respondents prefer the kind of site that can be adjusted to the mobile phone's small screen and data content. Two respondents would like to see that the mobile internet page looks the same as the "real internet page" and two respondents do not own opinion about the topic.

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## **PART 4 - FUTURE SCENARIOS**

Nobody knows exactly how many mobile phones there are in the world but as of September 2008 industry estimates were between 3 billion and 3.8 billion handsets. Even accounting for some multiple phone ownership - Finland for example has 128.7% penetration of mobile phones, and the United Kingdom 121.9% (ITU World Telecommunication/ICT Indicators Database) - the device is on a path to global ubiquity. (Promise of Ubiquity research paper) The evolution of mobile services is impacted by several key forces of change, chief among them are – technology innovation and diffusion, consumer behavior, globalization and the elimination of economic borders, and easing of regulations to promote trade and commerce. (Mobile Service evolution 2008.) No doubt that future lifestyle as well as government will be driven by technology.

### ***IX. FUTURE GOVERNMENT***

Mobile devices are going to be equipped with additional features of larger computing power for the taking care of voice, text and multimedia content. This emergent behaviour enabled by the convergence of personal communications and publishing technology with massive private and government data sources could empower individuals in their relations with governments. This provides a potential opportunity for government agencies to explore the ways to enhance the outreach of e-Government services with the use of mobile and wireless technologies. <sup>clvii</sup> Thus, organisations and governments need to culturally attune to continuous change, supporting visionary champions who are empowered to effect meaningful change and embed innovation and change management at the core of their activities. <sup>clviii</sup> The change is going to bring forth a significant growth of e-government, where also m-government is inevitable and growing fast. Given today's multiple stops for information, frustrated citizen users and new Generation Y government employees, even entrenched bureaucrats can envision a much more efficiently operating government. As Kristina Höök, head of the Mobile Life Center in Stockholm, predicts a new wave of user-oriented mobile services will reshape society much like the Internet has over the past decade. "Mobile technology will have even more of a profound effect than the Internet and

wireless technology because it influences every aspect of our lives," she says. It is evident that mobiles will shape the future as we do not only put our mobiles on our desks, but carry them everywhere. In a way, mobiles have become an extension of ourselves. <sup>clix</sup>

### **1. Raising efficiency**

In the future government should do more for less. Efficient and effective government is a key component of innovative economies and inclusive societies. E-government with m-government can be the enabler for better government when it pursues cost-effectiveness, efficiency and ubiquity (The Institute for Prospective Technology Studies (IPTS) eGovernment vision for 2010). ICTs achieve "considerable gains in efficiency" and "significant reductions in administrative burdens" when they have a public value and are used by everyone.

### **2. No citizen left behind**

In the future no citizen should be left behind as public services concern everyone. E-government (and m-government) will only really make a difference if everyone can use it. The e-government action plan by the European Commission addressed some of the priority areas for 2010 and underlined the commitment of the European Commission to delivering tangible benefits to all Europeans, in cooperation with the Member States. The Commission<sup>clix</sup> works with Member States to make sure that by 2010 all citizens, regardless of gender, age, nationality, income, or disability will have access to a wide range of technologies such as Digital TV, PCs and mobile phones.<sup>clxi</sup> Governments worldwide should change their operational principles and become more customer-centered to better fulfil the needs and wants of their clients - citizens and business. Mobile and electronic government definitely have a role to play in this major change (mobilisedGov).

### **3. Customer expectations**

The needs and desires of the public are rapidly changing as technology advancement and increased knowledge create a citizenry with greater expectations for better, faster and greater services from the government. Thus, the role of the e-government is to create a public value which leads to "able society" who can benefit from the services. According to Jim Flyzik, former CIO and Deputy Assistant Secretary for Information Systems, Department of the Treasury, "It's all going to be based upon customer expectations, what citizens are expecting. With pervasive remote access, increasing adoption of smartphones and continued expansion of broadband, the idea of accessing information wherever you

are, do whatever you want, whenever you want, is going to drive the government to look at the ability to provide more services remotely. <sup>clxii</sup>

#### **4. Collaboration**

When the customers expect and demand more, more collaboration is essential. In a world where citizens have almost instant access to information and services, organisations must become transparent, accountable, collaborative and responsive or lose the trust and respect - and therefore the business - of their customers. <sup>clxiii</sup>

#### **5. Accessibility and broadband availability**

In line with the Lisbon strategy and the i2010 targets, many existing strategies identify accessibility and broadband availability as crucial factors within the public sector. We can no longer assume that data will be accessed in a set manner at predictable times. Governments need to ensure their data is portable enough to accommodate virtually any format, even those unanticipated today, and not confined within proprietary software or platforms. We can no longer assume that we will be using data as we have in the past. The era of one-way flow of information from a producer to a consumer is ending. Data will be shared, linked, transformed, and distributed in a dynamic, collaborative fashion. <sup>clxiv</sup> Making information more accessible via indexing and structuring data e.g. through semantic web or data mining have been identified as important topics to be investigated for the future.

#### **6. Multi-channel delivery**

Multi-channel accessibility is at the centre of many strategies, and in particular access through mobile devices is often mentioned in relation to multi-channel access in the future. It is widely acknowledged that e-government can only succeed if online public services are made accessible through a variety of channels relevant to their users' needs (Internet, telephone, info kiosks, etc.). IDA (Interchange of Data between Administrations) has launched a feasibility study that will identify common issues and challenges for this 'multi-channel delivery' of e-government services. The term 'multi-channel delivery' refers to the provision of services via different channels: electronic channels (Internet or e-mail access via PC or digital TV, mobile phones, personal digital assistants, info kiosks, voice or video conferencing) or traditional channels like face-to-face meetings or postal delivery. Such multi-channel provision is essential to ensure that everybody can benefit from the Information Society. This is more particularly the case for public services, for which universal access is a prerequisite. <sup>clxv</sup>

## **7. Strengthening participation and democratic decision-making**

<sup>clxvi</sup>The essence of this scenario is that technology has made geographic location irrelevant. Thus citizens have an opportunity to move across borders freely, where government does not restrict access and citizens can take part in all decisions that affect them. Here, the government takes on a moderator and gatekeeper role. <sup>clxvii</sup>

## **8. Digital economy and digital Europe <sup>clxviii</sup>**

The European Commission's Digital Competitiveness report shows that Europe's digital sector has made strong progress since 2005: 56% of Europeans now regularly use the internet, 80% of them via a high-speed connection (compared to only one third in 2004), making Europe the world leader in broadband internet. Europe is the world's first truly mobile continent with more mobile subscribers than citizens (a take up rate of 119%). Europe can advance even further as a generation of "digitally savvy" young Europeans becomes a strong market driver for growth and innovation. Building on the potential of the digital economy is essential for Europe's sustainable recovery from the economic crisis. By updating the GSM Directive, the EU has paved the way for a new generation of services and technologies where Europe can be a world leader," said EU Telecoms Commissioner Viviane Reding. "This reform will remove constraints on operators so that they can deploy new technologies in the GSM bands to develop high-speed mobile broadband services. This should give a welcome boost to Europe's wireless economy and help trigger the take-off of a Digital Europe."<sup>clxix</sup>

## **9. Development of mobile government in rural places**

The development of m-government is illustrated by the 8 million Sri Lankans who already own or use the devices necessary to interact with mobile government services and products. As Linneasia's research suggests, mobiles are already used and owned by those who will never buy a PC, even at the lowest economic groups in Sri Lanka. M-government can complement e-gov (largely designed and built for PC based access) by providing services through SMS and voice telephony such as free calls to services, such as the Government Information Centre, automated voice prompt services (also called IVR services) and on-demand SMS multilingual information services. Using augmented reality and location aware services and devices, citizens can be informed on the availability of and proximity to various government services and products as they travel. Kiosks can be set up in remote villages

with SMS devices that print government forms on demand upon a coded SMS instruction. The possibilities are as exciting as they are endless. <sup>clxx</sup>

## **10. Geocoding**

Trend that is on the rise is geocoding - the process of finding associated geographic coordinates (often expressed as latitude and longitude) from other geographic data, such as street addresses, or postal codes. With geographic coordinates the features can be mapped and entered into Geographic Information Systems, or the coordinates can be embedded into media such as digital photographs via geotagging. With many third-generation mobile phones being available with inbuilt global-positioning-systems, this has implications for agencies who may have branches customers need to visit, or for agencies such as the Department of Conservation who may have public spaces that could be found through mobile phones. <sup>clxxi</sup>

# ***X. CHALLENGES FOR A FUTURE OF M-GOVERNMENT:***

## **1. The physical limitation**

The physical limitations of mobile technology (small screen size, limited text input, etc) may restrict the amount of information that is easily sent or received.

## **2. Cost**

M-government tends to be yet one further channel for e-government, in which case it will create additional costs. This will continue until m-government can truly substitute for other delivery channels. Such substitution will be viable for applications within government. However, it would create serious problems for systems linking to citizens given the number of people who are likely to remain without mobile ICT devices for the foreseeable future. Hence, such systems are likely to be cost-addition rather than cost-substitution initiatives. At least some governments have been able to adopt innovative costing strategies, for example, using fee-sharing arrangements that avoid the public sector having to provide many up-front costs. In some areas, the mobile user is charged a fee for not just for sent SMS messages but also for received messages, placing financial limitations on the amount of information governments can cost-effectively provide to citizens. <sup>clxxii</sup>

### **3. mDigital divide**

Our society (governments included) should never forget those, unwilling or unable to go online and should not discriminate against them for such an opinion and approach. The digital divide really exists, and we should not try to close it by any enforcement within the frame of the entire society, but provide access to new technologies only to those who are willing to use them. (MobilisedGov) While m-government has great potential to vastly expand access to public services to the poorest segments of the population in areas where wired telecommunications and ICT services do not exist, there are still limits to its capabilities. In particular, older and poorer groups in society tend to be excluded from this technology. The fact that some groups cannot access m-government services, doesn't mean that the unreached benefits from m-government will increase the schism between those who are able. This poses a challenge to m-government to ensure that it is not just one more way in which the "haves" benefit at the expense of the "have nots".

### **4. Mobile mindsets**

Mobile devices - mobile phones particularly - are seen by many as tools more for fun and entertainment than for serious activities. Yet politics is a serious business involving difficult choices. Aligning these two mismatched worlds may be difficult. One sign already emerging of this underlying tension is the use of m-government systems for playing pranks, such as hoax messaging, encouraged by the anonymity that many mobile devices (which are often unregistered) offer.

### **5. Privacy and Security**

Citizens have a great concern about the privacy and security in m-government. The general issue is the conviction that their mobile phone numbers might be traced, when they send their opinions and inquiries to the government. The government must overcome the mistrust, and assure mobile users that people's privacy is protected and the information will not be sold to third parties. Wireless networks are still considered vulnerable because they use public airwaves to send signals. Because of interception in all traffic on the Internet, there is a big chance for outsiders to attack on wireless networks to steal important information and temper with documents and files (Antovski, 2003)<sup>clxxiii</sup> If m-government is to encompass m-payment systems or other transactional public services, then it must have good security and must be trusted. As yet, there is still a credibility gap to be crossed for many mobile device users.

A mobile phone can be used in voting procedures. These procedures could be anonymous online polls (e.g., as part of TV shows), inter-company elections or even legally binding electronic voting. In the latter cases (described below), the major challenges are assuring that eligible voters vote once and only once while the secrecy and anonymity of the vote are guaranteed. <sup>clxxiv</sup>

## **6. Responsibly managing exponential amounts of information and data overload**

Mobile devices increase the pressures of a world in which users are permanently connected: "always on". These permanent connections increase the number of messages circulating and can create a blizzard of communications - some valuable, some not - in which public service communications can come to be devalued or lost. <sup>clxxv</sup>

## **7. Resistance to organizational change**

Habits, fear of the unknown, security and economic factors are some reasons why people can resist accepting new approaches. As a consequence of the implementation of mobile technologies in the workplace, civil workers might view these applications as a threat that will cause them to be replaced or they may have a feeling that they are losing control to machines. Education, employee participation, and interpersonal communication should be at the center of this process in order to persuade the parties involved to be part of the change willingly rather than forcing them to agree to the established goals. Employees should be motivated, supported all throughout this process and ensured that these effects would bring with them better self-serving within the organization and better service to citizens and businesses. <sup>clxxvi</sup>

## **8. Lack of clarity around forward planning strategies clxxvii**

M-government is currently over-shadowed by an over-emphasis on e-government and lack of clarity on what value-added services it will bring. Of concern is the fact that m-government is now being implemented in some developed countries while developing countries are still pondering on what to do and how. Therefore, m-government should exploit the mobile aspect of the devices and must be positioned as a complementary dissemination channel for e-government - both should be used to maximize service delivery to citizens. <sup>clxxviii</sup> The existence of m-government and its applications does not on its own guarantee results. Despite the global character of mobile technologies, a nation's and its citizens needs and wants differ significantly, which leads to final recommendation of this

part: governments should proactively consult with the public and take their opinions into account over implementation of m-government strategies. Therefore, three separate strategies need to be developed: an infrastructure strategy, a user/customer strategy and organisational change strategy. There is a need for pragmatic planning on the side of government organisations and that technology is not the focus of planning, but the end user, be it worker or consumer.<sup>clxxix</sup>

### **9. Lack of mobile technology standards**

Another challenge is the lack of mobile technology standards which makes each government agency invest in different mobile systems according to their needs to achieve their own purpose (Kim et al. 2004) and that certainly leads to management and integration problems. Spending more money on fixing such problems contradicts the cost reducing advantage of m-government. Lack of security standards allows security breaches to occur even with the existence of many encryption technologies (Chang & Kannan 2002).

Survey question on "What are the most common Standards and Protocols used in M-Government projects?" illustrated that there is indeed confusion in this area. Some of the comments include:

There are no special standards in the m-government area. There should be standards if one wants broad acceptance of m-government applications and GovML Governmental Markup Language NISS"Network and Information Security Standardization. Other comments mentioned included: Data standards WAP 2.0 XML User-interface design guidelines.<sup>clxxx</sup>

### **10. Global Standards**

Globally accepted standards, not regional or local, should be used for telecommunications, data transfer, OTA (*Over-the-air*) downloading, security, and payments. Global standards are essential for business needs and can ensure a certain level of security. It is clear that data protection and privacy commissioners need to be involved in order to arrive at a global solution, and the commitment of governments in advocating such a solution and being early adopters is indispensable. With respect to eID cards, there are currently several European Specifications and interoperability is an issue here. The issue of eID interoperability is outside the scope of this paper but the specifications of the ID cards integrated into mobile devices should certainly follow a (standardized) specification for national eID cards<sup>clxxxi</sup>

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## CONCLUSION

Recent years have seen explosive new trends in communication, where technologies are changing the capacity and extent of contact between people. This paper has presented in theory and statistics the value and effect that mobile devices enable for government services.

**Mobile services are indeed useful to improve government, encourage citizen's empowerment and build democracy.**

Trends in the world and mobile penetration support the idea that mobile phones need to be used for a change. Global mobile penetration grew 10 fold in the last 10 years (1998-2008) and is likely to reach almost 100% by 2018. This is especially notable in China and India who will account for the most number of subscribers and will add a total of approximately 1.6 billion new subscribers in the next decade. This increase illustrates how mobiles have transformed from niche to the masses. Also Africa, where the level of progress compared to developed world can sometimes be many times lower, is approaching mobile technology more like a lifeline rather than a luxury.

**As it has been stated in the report, the functions of m-government allow to reduce previous barriers and therefore, to offer equal communication to every member of the community.**

Mobile phones are part of the solution to digital divide because they have several benefits over PCs, e.g., the lower cost, ability to be always on, Internet features etc. Also, as already noticed there will be a significant shift in mobile revenues from voice to data. It is already happening in Japan and similar trends are starting to emerge in Western Europe, Korea, and North America. As we detect from the previous data, mobiles are becoming an elementary part in people's as well as government's working.

**As the trend shows, the humankind is getting older, with a low birth rate, the productivity of health system is dependent on information and communication technology.**

Thus, mobile technology has become an inseparable tool in the health care system. Especially in Africa mobiles are part of the medical revolution - data gathered and information transmitted with the help of SMS, not only raises awareness, prevents diseases, but saves lives. Also developed countries such as US, UK, Canada and Netherlands have noticed the benefit that mobile technology enables in the public sector.

Time-efficiency is one characteristic of mobile phones that makes it a valuable tool in such occasions where information needs to be distributed to large amount of recipients and fast reaction is crucial. Thus, mobile phones have been used during security and emergency situations all over the world, e.g., to avoid chaos SMS or GPS systems are involved during catastrophes.

**As with the improvement of technology, the public area where mobiles are used is widening, this leads to a solo device where different communication devices are integrated into one.**

Designers and technology specialists won't think of these things as 'phones' either - these devices will be simply lenses on the online world. Future mobile phones will function more as computers than phones. As Steve Jones, co-founder of the Association of Internet Researchers and associate dean at the University of Illinois-Chicago, has said "*By 2020 I don't think it will be so easy to distinguish between a mobile phone and a laptop. These will blend into a general 'mobile computing' category of device (for which we probably don't yet have a name).*"

As the report emphasized mobile services must be created with the end user in mind. Mobile future is not about hype, it is based on the real need and purpose. The example of *M-Pesa* illustrated how the initial idea of the project (to provide a service that would allow borrowers to conveniently receive and re-pay loans using the network of Safaricom airtime resellers) was adopted by customers for a variety of alternative uses. (M-Pesa was re-focused and launched with a different value proposition: sending remittances home across the country and making payments.)<sup>clxxxii</sup>

**Mobile communication industry is still at the beginning, so the transformation is yet to come. Although a lot has been achieved, the abilities of mobile phone**

**remain vastly underused by the average owner and evidently by the government. Mobile applications have yet to really entrench in our lives.**

The report not only named reasons but explained in evidence why mobile government is essential for creating a strong public sector. We have seen before that the public appreciates new technological improvements for their everyday procedures - thus, the awareness of the benefits of mobile technology should be raised.

We could read from the report that the technology life-cycle model has divided the people and organizations into early adopters, pragmatics, conservatives and laggards. In case of both Internet and mobile technologies, governments should follow the trend of the youth and act more courageous in adopting new technologies. We can see that eventually mobile phones are less about technology and more about people, change and chance to improve personal well-being and public communication.

#### **Recommendations:**

**Public and private sector together should open and develop user-centric efficient services and background for service provision**

There is an increasing number of online services that are offered by public and private sector together. The public sector information and data protection, privacy and security issues have to be solved from a legal and technical perspective as well. User-focused services and service provision is needed whereas it is cost-effective together with administrative burden reduction. Whereas it is needed and possible, international standards have to be developed with a common effort of governments and private NGOs.

**The type of services offered through mobile phones should be identified on the basis of cost- efficiency and public good**

Some cases show that the unique advantage offered by mobile devices, mobile phones ( as a technology anytime easily accessible also without specific IT skills) could be used in urgent cases (e.g. emergency) or for the convenience of the people (e.g. education, weather forecast SMS).

There has to be a clear distinction what is appropriate to be offered by the public sector and to what extent, as tax-payers money is used. Nevertheless, it is equally important that the public sector actively uses mobile devices for public good, especially if this solution brings a change in a quality of service important for the humankind ( e.g. saving lives, health care).

Before introducing a new service, it is important to research, measure and evaluate the character of the service with the user-centric approach in mind.

The increase in mobile penetration can be seen as a solution for the digital divide in the rural areas and a tool for offering services for disadvantaged groups (SMS for deafs). Common actions, share of good practices and solutions could bring change.

For governments a cooperation is needed in order to identify relevant cross-border services, sharing good practices at national, regional and local level. Active communication and interaction with the citizens (with the end users) is essential in order to introduce and implement effective policies.

Using international experiences from m-services provided by private sector and finding collaboration opportunities for the public good is a key challenge where all stakeholders have a responsibility.

Practice and theory has to be brought together with further practical and academic work to learn more about opportunities hidden in m-government.

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