M-Government

MOBILE TECHNOLOGIES FOR RESPONSIVE GOVERNMENTS AND CONNECTED SOCIETIES

OECD

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Foreword

Mobile phones are becoming the most rapidly adopted technology in history and the most popular and widespread personal technology in the world. Additionally, they play an increasingly important role in providing access to the Internet. Access to mobile networks is available to 90% of the world population, and to 80% of the population living in rural areas, according to the ITU World Telecommunication/ICT Indicators database; and among OECD countries mobile broadband subscriptions grew at a compounded annual growth rate of 20% between 2007 and 2009, according to the OECD Communications Outlook 2011.

Given this unparalleled advancement of mobile communication technologies, governments are turning to m-government to realise the value of mobile technologies for responsive governance and measurable improvements to social and economic development, public service delivery, operational efficiencies and active citizen engagement. The interoperability of mobile applications, which support quick access to integrated data and location-based services, paves the way for innovative public sector governance models – also called mobile governance or m-governance – based on the use of mobile technology in support of public services and information delivery.

This report highlights the critical potential of mobile technologies for improved public governance, as well as for economic and social progress in achieving the internationally agreed development goals including the Millennium Development Goals (MDGs). The report also provides an in-depth analysis of the prerequisites for m-government, its main benefits and challenges, the value-chain and key stakeholders, and the checklist of concrete actions to sustain policy makers in monitoring and updating their knowledge on m-government.

Whether it is an electronic wallet card linked to a mobile phone in Bahrain, the United Arab Emirates, or the Philippines; voting, registration or election monitoring in Morocco, Kenya, Estonia and Ukraine; support for farmers with weather forecast information and market price alerts in Malaysia, Uganda, India and China; or co-ordination of real-time location data for emergency response in Turkey, the United States and France, mobile

technologies are enhancing dynamic interactions between citizens and government, creating further opportunities for open and transparent government.

M-Government: Mobile Technologies for Responsive Governments and Connected Societies is a unique report. It is the result of the joint work of the International Telecommunication Union (ITU) and the Organisation for Economic Co-operation and Development (OECD), in collaboration with the United Nations Department of Economic and Social Affairs (DESA). Recognising the ubiquity of public good governance principles, and the existence of opportunities and challenges commonly shared by governments worldwide, these three organisations aim to offer a call for action to all member countries to be strategic in moving ahead in implementing m-visions that drive public sector change and strengthen its good governance.

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Denominations and classifications employed in this publication do not imply any opinion on the part of the ITU, the OECD and the UN Secretariats, and their member countries concerning the legal or other status of any country, territory, town or geographical zone, or any endorsement or acceptance or recognition of any boundary, or other territorial limit. Where the designation "country" appears in this publication, it covers countries and territories. The opinions expressed in this report are those of the authors and do not necessarily represent those of the ITU, OECD or UN Secretariats or their member countries.

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Executive summary

Introduction

In the past decade, the mobile communication technologies revolution and the growth of high-speed broadband and wireless access have begun to make a considerable impact on economic and social development worldwide, reinforced by the expansion of the public sector's capacity to leverage the use of ICTs to improve its internal functioning, as well as its interactions with citizens and businesses. However, the level of access to fixed broadband, particularly in developing countries, is lower than the access to mobile technology. This is due, in great part, to the high cost of the broadband technology and required infrastructure, in comparison to the cost-effectiveness and impact of mobile technology on citizens' lives and on their interaction with governments.

By creating new and expanded communication channels, mobile technologies provide access in areas where the infrastructure required for Internet or wired phone service is not a viable option. The development of mobile communication technologies has not only created a new venue for governments to reach out to a much greater number of people than ever, but it has also brought citizens previously unimaginable opportunities to communicate with each other conveniently, and to access both public and private information and services, with diminishing time and space boundaries and limits. Cheap and ready-for-use mobile devices are removing existing barriers and are empowering citizens to connect to governments to access a wide range of information and services in a number of policy areas, *e.g.* legal information, health, education, finance, employment, transportation and public safety. Furthermore, new generation mobile phones, or "smart phones", and the realisation of 3G and 4G networks with new built-in functions and a plethora of mobile applications, are providing unprecedented possibilities in terms of communication, networking and interactive experiences to actors across the globe.

M-Government – the adoption of mobile technologies to support and enhance government performance and foster a more connected society – can help improve government performance and strengthen public good governance provided that the emphasis is not placed on the "m". Focus should be indeed on the needs of the public sector and of the end-users, be these citizens or businesses, to ensure that technology is exploited to reorganise the way civil servants work and to meet the needs of citizens through improved service delivery".

Innovating service delivery

M-Government is not intended to eliminate existing on-line and off-line modalities of service delivery, but it affords powerful and transformational capacity to the public sector not only by increasing access to existing services, but also by enabling the design and delivery of new services (*e.g.* through new levels of civic engagement in policy development and democratic decision-making). Hence, it supports those governments that recognise that they have reached 'the limits' with their current approaches to service delivery. Examples include considerable advancements in education and innovative health services.

Empowering digitally deprived citizens

By empowering citizens, m-government is improving the quality of life of many individuals who were previously digitally excluded. Specifically, mobile technologies enable convenient access to public information and services. Citizens in remote areas can, for example, receive improved m-health assistance, notifications and emergency medical alerts. Mobile technologies also facilitate financial transactions (*e.g.* process cash transfers, deposits and withdrawals, payroll credits, international remittances and similar banking activities) and allow the delivery of educational content to students who would normally have limited access to public education. However, as there are still limits in the capacity of m-government to reach out to certain segments of the population, and in order to not widen the digital gap, governments should avoid enforcing the use of mobile channels, and provide access to new technologies only to those who are willing to use them.

Intensifying partnerships and exchange between the public and private sectors

Mobile technologies are also bringing new momentum to the business world. Key advances in wireless technology, faster and wider networks, larger device displays and better technical platforms for applications are creating opportunities for citizens, while allowing companies to reduce costs of both subscriptions and physical infrastructure. The private sector's growing knowledge and expertise may have a major impact on public sector activities. For example, more sophisticated mobile technologies are being used to support more efficient business processes in the public sector, through real-time communication and quick data access, and more agile and mobile public work forces. This is a key driver for exploring intensified and new public-private partnership models that allow governments to understand what is possible and adequate, and the private sector to better comprehend the public sector's needs and offer relevant solutions.

Enhancing public sector performance and good governance

Mobile communication technologies can be expected to provide governments with significant opportunities to achieve greater cost optimisation, improved communication, and data exchange, expanded service delivery and stronger digital equality. With mobile technologies, information and actions can be co-ordinated in any location and among agencies, improving collaboration and co-ordination between public authorities across levels of government; this is particularly critical in emergency response and crisis management. Furthermore, mobile phone penetration extends outreach and access to groups which are often difficult to reach, *e.g.* citizens in rural areas, and expands governments' accountability and transparency to a higher number of citizens.

In conclusion, the rapid uptake of mobile technologies – even in remote locations of low-income countries – together with the emergence of many innovative mobile applications and services, has radically increased the potential for ICT to play a constructive role in supporting ubiquitous good governance, and in fighting poverty. In the years to come, governments worldwide will be challenged by the need to look into developing m-government by adopting strategies that will enable them to harness the opportunities offered by mobile technologies and maximise their benefits in order to achieve the policy goals highlighted in this report.

Mobile government builds upon two decades of governments developing their e-government capacity. This experience shows that adopting any new technology implies adjustments which in most cases are not quick and bear costs in terms of infrastructural, organisational and cultural changes.

Adoption rate, demographics, and economy will influence the transition time, and governments will need some time to design, develop and implement national m-visions. This will not be an easy task and the extent to which the potential of m-government will be exploited will depend on governments' capacity to capture new opportunities brought about by mobile technologies in a meaningful manner, given the national needs; on their ability to build on progresses already made in e-government development; and on their readiness to address the challenges and barriers to m-government also highlighted in this report.

Chapter 1

Towards the next generation of public services

Data show an impressive increase in the use of and access to mobile technology, in both developed and developing countries. Mobile cellular is the most rapidly adopted technology in history and the most popular and widespread personal technology worldwide. Growing research demonstrates the potential of mobile communications to radically transform governments and to provide access to public information and services in areas where infrastructure required for Internet or wired phone service is not an option. M-Government is therefore emerging as the next big wave for information and communication technology (ICT) use in the public sector. For many public agencies, however, m-government is still in the early stages of development, and, in many instances, it is still part of an overall strategy of public sector modernisation and enhanced public service delivery. Understanding the underlying concepts and motivational factors which explain the emergence of m-government is crucial for governments to set priorities and formulate adequate policies.

From e-government to m-government

The strategic importance of mobile technologies is becoming more evident, as the wireless and mobile technology explosion increasingly affects how public institutions function and deliver services in both developing and developed countries. "Enabled mobility" offers new opportunities to provide more responsive public services through mobile applications and solutions. Just as the decision to embark on electronic government (e-government) was an important step taken decades ago by many governments worldwide, the adoption of mobile government (m-government) to support and enhance government performance and a more connected society is now inevitable. M-Government is emerging as the next big wave for information and communication technology (ICT) use in the public sector.[1]

Growing research demonstrates the potential of mobile communications to radically transform government, providing access in areas where infrastructure required for Internet or wired phone service is not an option. Mobile devices' lower costs and ease of use are removing barriers and empowering citizens to quickly and efficiently connect to government for health, education, employment, public safety, financial, transportation, legal and other services. As such, mobile government can help improve social and economic conditions worldwide and it can play an important role in supporting the achievement of the Millennium Development Goals (MDGs).

Recognising these trends – and the need to establish a sound foundation for the deployment of successful m-government initiatives – the ITU, the DESA and the OECD have prepared this report to: highlight the relevance and value of mobile technologies for economic and social impact; examine key principles for fostering agile and ubiquitous m-government; emphasise the importance of policy and governance models; and assist governments in the process of developing sustainable m-government implementation, optimising the range of possibilities for extending the outreach, efficiency and effectiveness of public services.

The report is organised into the following sections:

- Towards the next generation of public services
- Benefits and outcomes of m-government for citizens, government and business
- Understanding m-government adoption
- Prerequisites for agility and ubiquity
- Technology options for mobile solutions
- M-vision and a call for action

- References
- Annex A: Compendium of m-government projects

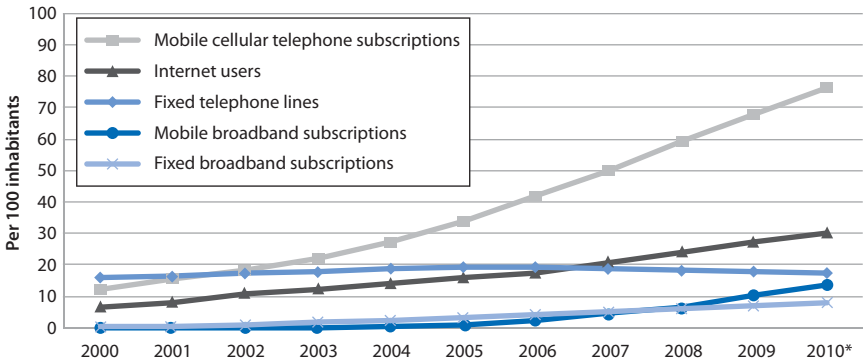
Growth of mobile technologies

Research demonstrates a dramatic increase in the use of and access to mobile technology, in both developed and developing countries. By the end of 2010, there were an estimated 5.3 billion mobile cellular phone subscribers, including 940 million subscriptions to 3G services. Ninety percent of the world population, and 80% of the population living in rural areas, has access to mobile networks.[2] In many developing countries, fixed telephone lines are largely limited to urban areas, but more than half of rural households have a mobile telephone. Globally, mobile cellular is the most rapidly adopted technology in history and the most popular and widespread personal technology worldwide. Figure 1.1 shows ICT growth over the past decade.

In 1998, global mobile penetration was about 5%. In 2008, it was more than 50%. By 2018, the number of mobile subscriptions is expected to be almost the same as the number of global citizens. Figure 1.2 illustrates a compelling perspective on the progression of mobile penetration, networks, speed and other indicators.

Mobile technology is becoming an affordable tool to fill in the digital gap between developed and developing countries, especially with the rapidly declining price of mobile products. Emerging and less developed countries have already demonstrated that they are capable of narrowing the digital gap by investing in websites and web portals – and by establishing telecenters,

Figure 1.1. **Global ICT developments, 2000-2010***



*Estimates

Source: ITU World Telecommunication/ICT Indicators database.

kiosks, community centers and other similar outlets to increase access to the Internet. Similarly, they are adopting the use of mobile technology at a fast rate. The significant worldwide increase in governments' use of mobile technology to communicate with citizens – by simple SMS, alert notification or full-fledged mobile service – will trigger the need to develop more mobile government services and will provide the private sector with an opportunity to work with governments to create and distribute mobile services.

For many public agencies, m-government is in the early stage of development, and, in many instances, it is still part of an overall strategy of public sector modernisation and enhanced public service delivery.[3] In this context, providing assistance to governments worldwide in the development of a coherent m-government framework for the public sector is fundamental.

Figure 1.2. **Key performance metrics**

Key Performance Metrics	1998	2008	2018 (Estimated)
Mobile Penetration – Global	5%	55%	96%
High GDP per capita Nations/Total Mobile Subscriber Base	75%	24%	15%
Mobile Data Services Revenues as %	4%	19%	40%
Networks	Primary 1G & 2G	Mostly 2.5G & 3G	Mostly 5G & 6G
3G+ Penetration	0%	18%	90%
Network Speeds	< 50kbps	Up to 2Mbps	Up to 1Gbps
Devices ASP	USD 200	USD 130	< USD 20
Smartphone Penetration	< 1%	10%	40%
Average Battery Life	2 hours	2.5 hours	24 hours

Source: Sharma, C. (2008), *Mobile Services Evolution 2008-2018*, Bellagio, Italy, 13 July-1 August.

Underlying concepts and motivational factors

The following brief overview is useful for classifying the evolution of government concepts (See Figure 1.3):

- **Government**: The means by which national policies are enforced, as well as the mechanism for determining national policies.
- **E-Government**: The use of information and communication technologies, particularly the Internet, as a tool to achieve better government.[4]
- **M-Government**: An extension or evolution of e-government through utilisation of mobile technologies for public service delivery.

Figure 1.3. **Overview of conventional, electronic, and mobile government concepts**

Item	C-Government	E-Government	M-Government
Principles	• Bureaucratic Process (phone, fax)	• Process reengineering using IT (PC, Internet)	• Seamless integration and linkage wireless devices
Service time	• 8 hours a day, 5 days a week	• 24 hours a day, 7 days a week	• 24 hours a day, 365 days non-stop
Service space	• In-person visit, fax, phone	• Customer's home and office using the Internet	• Customer's location and physical place
Service form	• Several visits to offices	• Multi-clicks to web portals	• One time access to needed service

Source: Oui-Suk, Uhm (2010), *Introduction of m.Government & IT Convergence Technology*, KAIST Institute for IT Convergence.

There are some fundamental differences between e- and m-government service delivery. E-government involves the electronic provision of information to geographically diverse but technologically homogenous ICTs (such as personal computers or information kiosks). In contrast, m-government involves interaction in which the use contexts are unknown, where accessing government services might be one of several activities being undertaken, and where the physical constraints of interacting with mobile devices limit the amount and type of information that might be located and accessed.[5] These differences pose challenges for both implementation and acceptance of m-government.

One of the most important questions with respect to developing technology for m-government is: will e-government as we know it now be replaced by m-government as the dominant mode, or will m-government be just another access channel to public administration? In view of developments around the interaction between mobile state administrations, mobile citizens, and mobile public officials, there is no doubt that the transition from e-government to m-government is not only a matter of a shift in the ICT technologies that are applied, but a more fundamental change.[6] Such a fundamental change may lead to a different relationship between the mobile state and the mobile citizen, and between the mobile state and the mobile public official, as well as the growth of a different relationship between the citizen and the public official.

While there are a number of reasons for the emergence of m-government solutions, the main factors are:

- wider acceptance of these technologies by the public sector;
- penetration of mobile devices;

- ease of use for citizens;
- easier interoperability;
- the fact it can bring government closer to citizens, and
- the fact that m-government services are cheaper than computer-based services.

Motivational factors are:

Better service accessibility – M-government provides an additional communication channel for users to access government services. This can attract more users to access government services using alternative channels that are more convenient, especially for people who are located in geographically remote areas or who are physically disadvantaged.

Better service availability – Like many m-business service models, certain m-government services can be automated to provide 24/7 availability, *e.g.* general information retrieval or certain transaction processing.

Better service responsiveness – Because certain m-government services can be automated, users can access these services with virtually no waiting time, whereas completing the same transaction using conventional approaches (such as telephone calls or in-person visits) can take longer.

Better service quality and efficiency – Success in building interest, enthusiasm and capacity of socially marginalised communities to interact and communicate via online technologies contributes to m-government's success in achieving efficiency gains and improving services.

Service scalability – The advantage of scalability is that the provision of m-government services has a far lower cost in comparison to traditional service delivery (*e.g.* printing materials, especially in regions that have higher population density). Efficiency and effectiveness are improved. Flexibility and scalability can be maintained because functional components can use a set of common interfaces to communicate with each other.

Better stakeholder participation – M-Government services, optimised by smartphones, allow citizens and businesses to take advantage of the Internet to access government services, resulting in better perception and higher participation.

Integration, communication and interaction – Using information technology allows better integration of functional departments in government processes, and increases customer satisfaction with service delivery across both traditional and electronic channels. The additional electronic communication channel gives governments the opportunity to interact with specific groups of users who otherwise may not be reached through conventional communication

approaches. However, as m-government services are typically designed in a way that requires a considerable amount of human-computer interaction (as citizens operate the services), it may be more difficult for staff to perform maintenance and administration tasks.

Reduced costs (fixed and operational) – One of the major benefits to government agencies is the flexibility m-government allows to enable information storage and presentation. This may lead to far lower operating and maintenance costs, compared to printing all materials. Altering, correcting or updating content can be completed online without incurring costs for re-printing, waste disposal and re-delivery.

Better image and perception – Research suggests[7] that using online or mobile channels to interact with citizens and engage them in decision making has a positive impact on trust, as well as public perceptions of government responsiveness. In addition, the use of mobile channels can lead to increased citizen participation, which can in turn make it easier to design and implement policies that lead to better outcomes. Therefore, m-government services may result in an improved image of government operations, so political decisions may push forward the adoption of m-government services to showcase these factors and to create a more positive international image.

Policy formulation and priority setting

Policy formulation should take into consideration the following key features of the next generation of public services:[8]

Citizen centric: Most governments' work is still not geared to look at policy making from the citizen perspective. Changing governments' perspective will require real changes in thinking, as well as structure of governance.

Restructured government: Governments should move towards more co-operative models of service and policy design and delivery (*i.e.* adopting a whole-of-government approach, and engaging appropriate players, stakeholders and public agencies).

Participatory, measurable and transparent: Citizens are increasingly becoming more aware of the work of government and, in some developed countries, have also started participating in policy making. Transparency and citizens' ability to measure the outcomes and impact of government programmes, and to participate in their development, will be key features of next generation public services.

In the aftermath of the economic and financial crisis, governments need to provide better public services with fewer resources.[9] Each of these priorities works towards that goal: providing new and better ways to engage with

citizens. The availability of innovative mobile technologies – together with more open specifications which allow for greater sharing, re-use and interoperability, and the possibility of counting on the future market trends – reinforce the strong role for mobile services in the government's pursuit of the next generation of public services.

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Chapter 2

Benefits and outcomes of m-government

Mobile technology is significantly expanding governments' capacity to produce benefits and deliver outcomes for governments, citizens, businesses, and to impact positively national overall economic growth. The most notable progress will be in developing countries which have been historically limited by poor or non-existent communications infrastructure that, in turn, have constrained economic development and social improvements. However, m-government development will also provide countries with more developed e-government and the opportunity to tackle a number of issues - such as those related to the digital-divide - which remain a critical factor in the levels of e-government services take-up which are lower-than-expected in many countries. By enabling the development of a whole new set of G2C, G2G, G2B and G2E applications and services, m-government affords, for instance, a powerful and transformational capacity to extend access to existing services, to expand the delivery of new services, to increase active citizen participation in government operations and to change the way of working within the public sector.

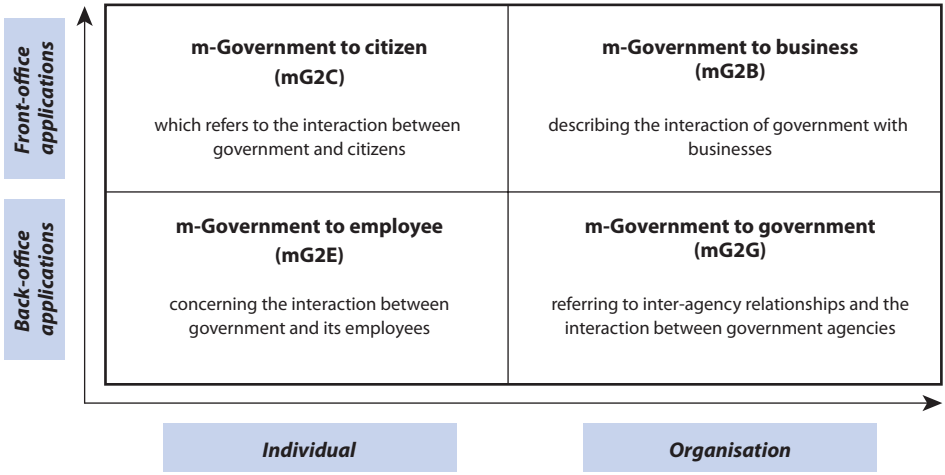
Expanding governments' capacity

Mobile technology is significantly expanding the capacity of government to deliver citizen- and business-centric services. The most notable progress will be in developing countries, which historically have been limited by poor or non-existent communications infrastructure that, in turn, constrains economic development and social improvements.

However, these developments will also provide countries with more developed e-government and the opportunity to tackle digital-divide-related issues, which remain a critical factor in lower-than-expected levels of m-government services take-up.[1]

M-Government affords a powerful and transformational capacity to both extend access to existing services, and expand the delivery of new services – and to increase active citizen participation in government operations, moving beyond the initial concentration of e-government on commerce and e-taxation, and improving internal operations. This will foster civic engagement and transparent democracy, as well as educational advancement and innovative health services. The amalgamation of mobile devices and new media applications – which support quick access to integrated data, location-based services, and empowered citizens from any place at any time – is the cornerstone of the emerging impact of mobile governance. Mobile technologies are enhancing the value of government services: from an electronic wallet

Figure 2.1. **Primary delivery models of m-government**



Source: Oui-Suk, Uhm (2010), *Introduction of m.Government & IT Convergence Technology*, KAIST Institute for IT Convergence.

card linked to a mobile phone in Bahrain, the United Arab Emirates or the Philippines; to voting, registration or election monitoring in Morocco, Kenya, Estonia and Ukraine; to support of farmers with weather and market price alerts in Malaysia, Uganda, India and China; to co-ordination of real-time location data for emergency response in Turkey, the United States and France.

In general, there are four primary delivery models of m-government:

- government-to-citizens (G2C)
- government-to-government (G2G)
- government-to-business (G2B)
- government-to-employees (G2E)

Mobile applications and services are to a large extent Government-to-Citizens (G2C) services. However, G2G, G2B and G2E m-government services also exist.

Transformational stages of e-government

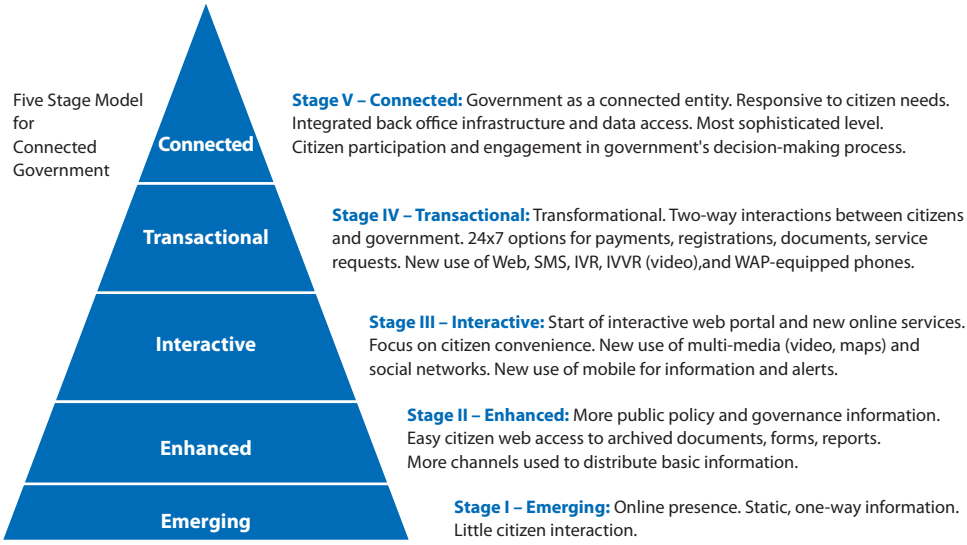
By conducting periodic global e-government surveys and examining the Knowledge Base of E-Government Practices, the United Nations Department of Economic and Social Affairs (DESA) studies the idea of connected governance as the means to achieve maximum cost savings and improve service delivery. The concept of connected government looks towards technology as a strategic tool and an enabler for public service transformation, innovation and productivity growth.

DESA identifies five stages for connected government: *(1)* emerging, *(2)* enhanced, *(3)* interactive, *(4)* transactional, and *(5)* connected.[2] According to DESA definitions, the "emerging" stage includes a basic web presence. The ability to present documents or forms would be more advanced and, therefore, be part of the "enhanced" stage. During this second stage, users are not yet able to interact electronically with the administration. The establishment of interactive portals, websites or mobile applications would be representative of the third, "interactive" stage, while "transactional" relations would be part of DESA's fourth stage. The final stage of e-government combines vertical and horizontal integration with other capabilities, such as interoperability and the establishment of connections among several stakeholders (government, businesses, academic institutions, NGOs and civil society). E-participation – that is, the involvement of different individuals and groups in forming opinions and the decision-making processes through electronic means – is representative of the final "connected" stage.

As organisations move towards the stage of connected government, they pass through many thresholds in terms of infrastructure development, content delivery, business re-engineering, data management, security and customer management. Each stage, as indicated in Figure 2.2, presents a number of similar challenges; how a government meets those challenges will determine the pace at which it migrates upwards on the pyramid.

The following m-government applications and services show to what extent mobile technologies are a catalyst in assisting governments to transform themselves and move across the transformational stages towards the ultimate goal of connected governance.

Figure 2.2. **Stages of connected government**



Source: DESA (2010), *E.Government Survey 2010*, United Nations, New York.

G2C applications and services

Government-to-Citizens services enable citizens to interact with government in a way that is responsive to citizen needs and communication preferences. G2C services allow citizens to stay current on government information, ask questions, request services, complete transactions, submit comments, report problems, request emergency assistance and access data.

Once an agency has "emerged" and is at the "enhanced" level of governance, more channels – such as SMS (Short Message Service), IVR (interactive voice response), IVVR (Interactive Voice and Video Response), and WAP-equipped phones – are used to send to and receive from citizens information about topics important to them, ranging from overdue library books and exam results to job vacancies and emergency updates. Included in these new tools for G2C communications is the active use of popular social media, such as Facebook, Twitter, and YouTube.

M-Government G2C services fall into four categories:

- informational and educational services
- interactive services
- transactional services
- governance and citizen engagement

Informational and educational services (Push services)

This type of G2C service involves distributing information to citizens (*e.g.* related to services, schedules, education, emergencies, regulations and other flat content). The government service is mainly comprised of pushing information through SMS, for example, or making it available on a Web or WAP site. Much of the information is static and there is little interaction with citizens. Most inquiries to government from citizens are for basic service information, and providing push services both enables real-time communications to citizens, and creates cost savings for government.

Services can be related to:

- *general information for citizens (*e.g. *weather, tourism, recreation, health, public safety, contact information, services, regulations);*
- *specific information (*e.g. *exchange rates, market rates, exam results, events and programmes, news, road closures, holiday schedules, public hearing/meeting schedules, service or fee changes);*
- *emergency alerts (*e.g. *severe weather, terrorism, fires, accidents, health risks);*
- *health and safety education (prevention and preparedness);*
- *educational programmes;*
- *notifications (*e.g. *library book deadlines, security notifications, social media posts, RSS feeds for news and updates).*

Examples:

- An SMS broadcasting system used in Mexico City, Mexico, sends alert messages to citizens in the district regarding meteorological and high-rain risks, low temperatures, potential disasters, and emergency locations, as well as contact numbers.
- Singapore's citizen alert system sends notification for library book deadlines and passport renewals, as well as flight information.
- Australia's broad range of SMS-based services includes alerts of delays in public transport, notification of examination results, availability of parking spaces and alerts on the location of drug-sniffing dogs.
- The bulk of SMS news in Galewela, Sri Lanka, to rural farmers and youth sends timely information about market prices and new seeds and fertilizers, as well as information on vocational education courses, health education and nutrition.
- Denmark's Mobile Alert System provides instructions to citizens via their mobile devices in case of natural disasters, accidents and other emergencies.
- G2C emergency notifications via SMS are utilised in Malaysia for limited drinking water supplies; in England and the United States for flood dangers; in China for typhoon dangers; in the United States for energy black-outs; and in England for terrorist threats.
- The "M4Girls" innovative project – a partnership of the South African Government's Department of Education, Nokia and the non-profit Mindset Network – provides mobile phones loaded with educational material to help students from historically disadvantaged backgrounds improve their proficiency in key subjects like mathematics. The project recognises the active use of mobile phones by young people to access the Internet and network with peers, and is using their preferred channel to expand education.[3]
- Bridgeit is a pioneering educational programme in Tanzania implemented by the International Youth Foundation and a number of partner agencies, with a USD 2-million grant from the United States Agency for International Development in 2008. The programme is significantly increasing educational quality and student achievement in math, science and life skills through the innovative use of cell phones and digital technology.[4] Mobile technologies are enabling in-context learning, such as geographically- mapped Wikipedia entries and mobile astronomy to point and identify stars, creating breakthrough learning in a digital age.[5]

- The Republic of Korea provides a disaster information messaging service, via a cell broadcast system (CBS), to mobile phone subscribers located within base stations who receive disaster information messages on impending natural disasters such as typhoons, heavy rain or snow.
- The Republic of Korea provides a national mobile portal service (*m.korea.go.kr*) through which citizens can use the m-government services of each government organisation and receive customised national policy information at once.
- The National Library of the Republic of Korea offers SMS services to users regarding confirmation of overnight book reservations, return requests, confirmation of new book requests, answers to service requests, confirmation of copy and mail requests, confirmation of library field trip applications.

Interactive services

Through interactive G2C services, citizens can engage in dialogue with governments and send inquiries, problems, comments, or service requests to specific agencies. Citizens also can access forms, applications, and databases. In this stage, the interaction becomes more personalised, detailed and targeted to specific citizen interests and service needs, and specific agency divisions and service areas. The communication becomes one-to-one, rather than one-to-many. The focus is on citizen convenience and increased participation, with citizens choosing to receive specific notifications, such as neighbourhood crime reports, exam results or the availability of a special library book. Mapping, location-based services and photo/video capabilities enhance the functionality of SMS and mobile applications. Social media tools build communication networks for breaking news, events and emergencies, with real-time citizen feedback and information sharing.

Services can be related to:

- *health services (*e.g. *screening and tests, monitoring, health forms);*
- *education services (*e.g. *grades, admissions, exam results);*
- *security services (*e.g. *crime reporting, service requests, law enforcement, emergency assistance requests);*
- *filing claims and reporting problems (*e.g. *service interruptions, suspicious activity, voting issues, complaints about government officials);*
- *information inquiry services (*e.g. *account information, traffic and transportation availability, service request status); and*
- *schedules (airline flights, field crew locations, etc.).*

Examples:

- Rwanda's eNota Project, a mobile-based system that allows students to access their national examination results via their mobile phones.
- Uganda's PurcAI Mobile enables teachers to enter student grades into a system that can be accessed by students, teachers and parents using SMS.
- Ireland's Multimedia (MMS) enables citizens to send photos of criminal suspects to law enforcement agencies and fight against terrorism (criminals have been caught using both of these services).
- India's SMS services to empower citizens to help enforce anti-pollution laws by reporting smoke-belching public buses and other vehicles, and to get citizens involved in the fight against crime and illegal drugs.
- Bahrain's mobile portal, a mobile version of the national portal via WAP-equipped phones, enables anyone with a mobile phone to communicate with all government entities and access their services, in addition to other services, via text message. The initial phase of the mobile portal started with 11 basic government services, expanding with 39 more. The key services include inquiries regarding electricity bills and traffic contraventions, daily price indices, flight information, school examination results and registration of complaints to government bodies.
- In Singapore, more than 150 government services are now accessible via mobile phones using a common SMS number, SGOVT (74688).[6] Also, the Integrated Clinic Management System enables seamless update and retrieval of patients' records, providing real-time access to accurate patient information, using Radio Frequency IDentification (RFID) technology to match appropriate drugs to patients, and providing an alert system that enables doctors to get critical lab results via SMS.[7]
- India's DakNet, a store and forward wireless broadband network, uses a Mobile Access Point (MAP) mounted on a regular passenger bus to transmit information between village and district headquarters. Villagers can request information about their land records or other services through a PC in a WiFi-enabled village kiosk. The request will be stored in the computer until a bus with a MAP passes and collects the information wirelessly. The information then will be transferred to the district headquarters when the bus is within range of the WiFi-enabled systems based at headquarters. The villager gets the response when the bus "delivers" the information back to the PC in the village kiosk.
- The Republic of Korea provides public transportation maps (subway and buses) with real-time operation information and traffic information of main roads via mobile devices. Train passes can be also

purchased and reservation information or ticket confirmation can be checked on a mobile device. Specifically, with relevant public information such as public transportation and road traffic information provided to the public sector, many applications are being developed.

- The Republic of Korea allows search on missing children's information via website, mobile web and twitter. This service also allows reporting of missing or found children. An amber alert is issued through mobile phone SMS to induce active participation of citizens in finding missing children.

Transactional services

With G2C Transactional Services, governments begin to transform themselves by expanding two-way interactions between citizens and government to new levels. In this stage, citizens can complete their transactions with government electronically and at their convenience. This includes self-service options for paying taxes, making payments, lodging tax returns, applying for services and grants, as well as other similar G2C interactions, allowing the citizen to access these services 24/7.

Services can be related to:

- employment (*e.g.* job postings, applications, matching services, interviews);
- government transfer programmes (*e.g.* food coupons, relief compensation, basic income grants, social benefits);
- paying taxes (*e.g.* income, real estate, etc.);
- booking appointments (*e.g.* officials, inspections);
- transportation services (*e.g.* buying train tickets, parking, bus tickets, airline flights);
- signing a transaction with mobile signature.

Examples:

- Citizen bus/train ticket system in Amsterdam, the Netherlands, enables passengers to use an IVR or the Internet to request a specific route at a specific time and receive a ticket via SMS sent to their mobile phones; they can then show the SMS (M-Ticket) to the conductor.
- In Turkey mobile signature is valid for signing commercial and public services and banking transactions. Two of three mobile phone operators offer m-signature services, namely Turkcell and Avea.

- Uganda's SMS service for employers allows companies to access the labour force and recruit instantly through a SMS service.
- The Philippines' Job Hunt notification system sends a message to a job seeker whenever a matching job is available.
- Kenya's job information service allows employers to post job listings and job seekers to get personalised text messages based on the kind of work they are seeking.
- Brazil's SMS registration service for job seekers and employers provides notification of a job match and 24-hour notice to show up for an interview.
- Istanbul's SMS tax service enables citizens to query and pay their taxes via SMS, along with a reminder module for their tax payment deadlines and tax amounts upon registration.
- mPARK mobile parking fee payment services in Edinburgh, Scotland (UK); Cologne, Germany; Oklahoma City, United States; and Tartu, Estonia; and SMS toll payment service in London, UK, provide transportation-related payments.
- Malta's lifelong learning "cradle to grave" certificate service provides the public with the ability to order official documents from a central registry and pay for copies by cell phone and have them delivered to their homes.
- Norway's SMS tax returns enable taxpayers who have no changes to make to the form they receive in the post to simply send a text message with a code word, their identity number and a pin code, instead of returning the form by mail, benefiting an estimated 1.5 million Norwegian taxpayers.
- The Republic of Korea provides frequently used civil application services through smart phones and citizens can now view the process of their application regardless of time, and place and in a more convenient way via smart phones rather than visiting public offices in person or accessing the Internet. Particularly, mobile security features encrypting communication sections and personal information as well as prohibiting storage of process information leads to stability of mobile services.
- Through the Home Tax Service, tax payers in the Republic of Korea can check through mobile phones to see what has been filed electronically by their agents on a real-time basis. Home Tax Service users subscribing to an electronic billing service can retrieve billing information such as tax items and the amount from the day of billing to the due date of payment. The amount of tax return, left uncollected by tax payers

for the last five years, can be retrieved and by entering the business registration number on mobile phones, citizens can retrieve the business type and operation status.

Box 2.1. **Mobile payment**

Mobile payment is a growing alternative payment method, especially in Asia and Europe. The four primary models for mobile payments are Premium SMS-based Transactional Payments, Direct Mobile Billing, Mobile Web Payments (WAP) and Contactless NFC (Near Field Communication). The combined market for all types of mobile payments is expected to reach more than USD 600 billion globally by 2013.

Source: http://en.wikipedia.org/wiki/Mobile_payment.

Governance and citizen engagement

A key result area for connected governance is citizen engagement. Mobile technologies facilitate achievement of that goal by increasing ease of access and participation. One mobile tool, SMS, or "texting," has become a powerful and prevalent communication channel for government and citizens, and a fundamental foundation of effective m-government strategies, positively impacting the democratic process.

Services can be related to:

- citizen engagement (to strengthen a citizen-centred approach to government and to involve citizens in policy development and decision making)
- elections and voting

Examples:

- Citizens in China and the Philippines can actively text message members of their legislatures.
- Increased voter registration and turn-out in the United States as a result of the 2004 Rock the Vote campaign,[8] the 2005 San Francisco initiative and the 2008 presidential election.
- Increased participation of women voting in Macedonia in the 2006 national elections, with a 29% increase of women in Parliament.

- Casting of ballots via mobile phone by over 70% of 300 000 voters in the Republic of Korea in the October 2007 poll for the presidential candidate for the United New Democratic Party.
- Use of SMS by nearly 8 million voters in Venezuela during the 2006 Presidential Election to find their polling station.
- Direct political action by the Nairobi People's Settlement Network using mobile phones and the Internet to organise and rally against evictions; by Pakistani NGOs and activists using an SMS-based system to co-ordinate peace rallies and candlelight vigils against martial law;[9] and by the Women of Uganda Network's use of social networking tools such as websites, email, SMS and mobile phones to reduce violence against women.[10]
- By allowing real-time reception of civil complaints and policy suggestions on mobile websites and smartphone applications, the Republic of Korea is facilitating citizen participation in policy-making.

G2G applications and services

With G2G services, governments transform themselves into a connected entity that more effectively and efficiently responds to the needs of its citizens by developing an integrated back-office infrastructure. Connections can be:

- horizontal connections (among government agencies)
- vertical connections (between central and local government agencies)

Services can be related to:

- *co-ordination of government activities for inspections, controls and supervisions*
- *security services (law enforcement, citizens' security)*
- *emergency management*
- *access to knowledge bases and records (public safety, health, education, etc.).*

Examples:

Public safety and emergency management personnel have been making transformational progress in their notification, response and disaster management capabilities through the use of mobile technologies. Real-time data is being accessed and co-ordinated among agencies through state-of-the-art mapping and planning technology and traffic information systems.

- G2G services in the United States use mobile technology to link field reporting, ambulance tracking, and other communication systems among emergency professionals, police officers, firefighters, and public works departments; mobile technologies play a critical role in administering and co-ordinating complex emergency management and law enforcement efforts, in which mobile actors must rely on fast, precise, and safe communication channels.
- Use of mobile phones for shared and co-ordinated communications among emergency personnel and agency officials in California's National Park Service, the US Forest Service, the Bureau of Land Management, and the California Department of Forestry in their battle against a 10 000-acre blaze in the Cleveland National Forest.
- Texas's emergency system in the United States estimates flooding by using light detection and ranging, or LIDAR, which is similar to the radar used in airplanes and can transmit data over mobile telecommunications devices to emergency personnel in the event of flooding.
- Turkey's Trafik Bilgi Sistemi or Traffic Information System equips mobile traffic units with tablet PCs to quickly conduct queries on the licenses and vehicle information of offending drivers. This increases the efficiency of the mobile traffic units. In addition, each mobile traffic unit can be located and dispatched to a particular location, such as a traffic incident. Vehicle information is cross-checked with several government agencies for road tax expiration, criminal suspicion and owner's validation.
- In the Republic of Korea, the National Computing and Information Agency carries out integrated operation and management of information systems of each government organisation. It provides information on failure alerts, maintenance status and results to each officer through SMS. In addition, the Republic of Korea provides government organizations with SMS/MMS, mobile civil complaint service, and an environment for MSG and WAP services to achieve m-government.

G2B applications and services

Government to Business (G2B) services include providing information regarding policies, regulations, forms, and applications related to procurement, licensing, permitting and payment of taxes, as well as support of small and medium enterprises and business development. With considerable value for rural businesses, government agencies are providing support including accessible kiosks and low-cost handsets, digital signature services, SMS weather and market updates, mobile wallets and maps for transport and tourist sites.

Examples:

- India's unique mobile weather forecast service helps farmers and fishermen decide when to plant, water and harvest their crops, and when to fish, boosting the profits of many fishermen in south India.
- Farmer's Friend, an agricultural information service based on text messages, is used in Uganda and other countries. The system accepts queries such as "rice aphids", "tomato blight" or "how to plant bananas" and retrieves advice from a database. More complicated questions are forwarded to human experts. The query "pineapple disease" elicits the answer "Copper deficiency in pineapples leads to fruit rot. Cut affected fruit as soon as noticed and dispose of where they will not contaminate other fruits or burn".
- Oman Mobile's new bi-lingual iBulk SMS service utilises an innovative web-based engine that allows businesses to communicate easily with their targeted opt-in customers via the mobile medium and gives businesses the ability to send short messages to their targeted clientele effortlessly, with the click of a button.
- US mobile data entry and inspection reporting provides building contractors, restaurant owners, and other business managers with onsite, real time inspection and permitting results, improving timeliness and accuracy.
- TradeNet in Ghana utilises web pages and text messages to allow rural farmers to advertise their merchandise to an international market and find the fairest price for their crops.
- Bangladesh's SMS classified-ads service provides a marketplace to buy and sell goods and services.
- The Republic of Korea has introduced various information services required for business activities such as industry information, business news and government aid programmes on a single mobile website (*m.g4b.go.kr*). Moreover, it provides information on the progress of test inspection and certification applications registered online by businesses and offers services issuing and retrieving performance reports and certificates.

G2E applications and services

With Government to Employees (G2E) services, governments provide tools, training, and data access to their employees that not only assist those employees in their daily operations, but also improve organisational efficiencies and accountability, maximise limited resources and enhance the quality of service to citizens. Mobile technologies have substantial impact on improving

G2E services, especially for field crews and staff who work in secondary or remote locations, enabling real-time access to enter, retrieve and share data.

Examples:

- The North London Strategic Alliance Street Wardens Pilot Project is a mobile government application aimed at streamlining the operations of street wardens, who fill in information regarding incidents "at the scene" using a mobile device like a smartphone or Pocket PC, which have GPRS and Bluetooth connectivity as well as mapping capabilities.
- In Hong Kong, China's Mobile Field Inspection System enables inspectors to use touch-screen PDAs to enter inspection information at the scene, as well as review the results of past inspections. Inspectors can send their reports through their mobile phones without going to the office. The PDAs were designed for easy use, so the training time was short. Some of the savings include an approximate 10% increase in productivity, a 1.5-hour time savings per inspection team on a daily basis, and elimination of duplicate work.
- Florida Keys Mosquito Control District Digital Mapping in the United States helps to maximise the use of the 61 vehicles engaged in insecticide control to prevent the spread of West Nile Virus and other mosquito-borne diseases in over 1 million acres of coastal marshland. A wireless fleet management solution is used to monitor the locations, heading, speed and insecticide applications of all vehicles in real time. The information provided wirelessly by the 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's rate 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.
- The City of Corpus Christi, US, has a comprehensive mobile application for its work and asset management system. Officials use a standardised enterprise system with embedded GIS (Geographic Information System) for operating departments, and developed a customised CRM (Customer Resource Management) in the same system for their centralised Customer Service Center, through which agents issue work orders to mobile crews. As part of an Intel Digital Cities Initiative, pilot projects were deployed and field workers were provided with different mobile devices, along with training, to determine what worked best. As a result, mobile workers are using laptops and smartphones to access information, displayed for smaller screens, and

enter data. The City's WiFi network was extended to enable consistent onsite access. CCMobile, promoted through Facebook and Twitter, is a complementary, interfaced application that enables citizens to download a free application on smartphones, take photos of problems and send service requests, with global positioning systems (GPS) location, date and time stamp. Mobile workers participate in regular user group meetings to identify improvement opportunities. Work crews respond in the field to service requests, enabling real-time status, joint data access, information consistency, instant emergency communications and reduced calls. To exemplify the benefit, in one service department, the mobile system has enabled mobile crews to increase unit availability and achieve personnel savings of approximately USD 50 000 per year, as well as a reduction in fuel costs.[11]

- Ministries in the Republic of Korea provide various mobile intra-governmental administrative services, including emails, notices, personal appointments, press releases, and contact information.

M-Government – Benefits for governments

Mobile technologies provide government with significant opportunities for achieving greater cost optimisation, improved communications and data co-ordination, expanded service delivery and much progress towards digital equality.

Wider reach – Mobile phone penetration extends outreach and access to often difficult-to-reach groups, such as seniors, people with disabilities and citizens living in rural areas. Government has tremendous opportunities for community messaging and to capitalise on networks through which people forward information to friends, families and co-workers. Communication impact can be appreciably compounded. Mobile phone communications offer flexible communication options, such as voice communications or IVR for visually impaired people and SMS for those who are hearing impaired.[12] In Amsterdam and London, it was possible to provide emergency alerts to hearing-impaired people through Vibro-SMS Emergency Alerts.

Mobility and ubiquity – Citizens have access to government information and services anytime and anywhere using wireless networks through their mobile and wireless devices. Government employees can work using the exact same type of devices regardless of distance, time, place and diverse natural conditions, especially relevant for public safety and emergency management.

More personalisation of services – Provision of location-based government services: As mobile phones are typically personal, the possibility of locating an individual's exact physical location ensures that governments can directly

Box 2.2. **Turkey – SMS judicial information system**

Overview – The SMS judicial information system, officially called National Judiciary Informatics System, enables citizens and lawyers to receive SMS messages containing legal information, such as ongoing cases, dates of court hearings, the latest actions on cases, and suits or claims against them. Although sending an SMS does not replace official notification, it provides information to the parties so that they can take necessary measures in time, without delay, in order to prevent deprivation of legal rights. The IT Department of the Ministry of Justice of Turkey was responsible for implementation; it signed a co-operation agreement with the Turkish GSM operators in order to establish the SMS system. The UYAP system was awarded a 2009 e-government award by the European Commission in the framework of the 5th Ministerial e-government Conference in Malmö, Sweden.

Pressures and drivers – The Turkish Constitution states that judicial tasks should be maintained in a swift and economic manner. Additionally, access to justice is included as a fundamental priority in the Accession Partnership of the EU. Before implementing the SMS system, there was a huge workload for staff in answering inquiries of citizens in courts. Previously, notifications were sent via post, and lawyers and citizens often went directly to the court to obtain information. Turkey's unique citizen ID numbers, used for every process, greatly facilitate implementation of this system.

Impact – This system increases the quality of legal services by reducing costs, preventing red tape and ensuring utmost availability of information. For citizens and lawyers, it is not necessary to go to courthouses to get information about cases or find hearing dates or pay travel costs to go to remote courts. The system will be integrated with other state department e-government programmes so that citizens can be informed instantly about all other public services. For example, plans are in place to integrate it with the security forces' electronic system. When a wanted person makes any transaction with the systems in hospitals, pharmacies, airports and railway ports, the nearest police station will be notified by SMS which will show the location of the person.

Response – This m-government application has transformed the vision of judicial organs from a conservative state demanding information from individuals to a modern state swiftly providing information to them, so as to prevent unjust treatments and irregularities. Use of this system makes the justice system more efficient and transparent, engendering greater public trust and confidence in the judiciary and respect for the rule of law. SMS information system applications have become a key method for reaching citizens living in remote areas and promoting exchange of communications. An important feature of the system for Turkey is the ability to reach people living in rural areas.

Source: UYAP *www.e-justice.gov.tr/.*

provide services to each person. This could accelerate reforming government organisational structures to become more horizontal and more simplified.

Cost-effectiveness **–** Cost-saving results include m-government streamlined processes, shared and co-ordinated data access, embedded mapping, and electronic processes, communications and transactions. Empowerment of field workers and cross-agency interactions can reduce requirements and costs for time, travel and staffing, as well as eliminate redundant data entry. Mobile crews with mobile devices can increase unit availability.

Faster information flow **–** Real-time and location-based processes result in quick and easily accessible data and communications, information consistency, responsive case management and seamless information exchanges. Information and actions can be co-ordinated in any location and with other agencies, improving collaboration among government authorities. Mobile technologies can be valuable assets in emergency response through instant information access and release, and shared access to mapping data.

Better management **–** Mobile technology has the potential to help government officials to better manage allocated financial and human resources. Satellite or rural offices and operations can communicate needs and situations as they occur. Current and accurate data improves knowledge-based decision making and responsiveness.

Increased democracy **–** Public officials can stay current on public opinion and priorities from a larger group of citizens. Extended outreach also expands government accountability and transparency to more citizens and empowers greater citizen participation in policy development and democratic decision making. For example, a free mobile application, Visible Vote,[13] enables citizens in the United States to connect with elected officials on legislation, express opinions on issues, and track voting records.

Enabled green government – This is the result of the environmental-friendliness and paper-use reduction achieved thanks to the increased use of the mobile services. Mobile phones batteries are not very green – so the proliferation of cell phones and their batteries will have an environmental cost. It would therefore be good to start working a greener solution to this, at least to ensure proper disposal.

M-Government – Benefits for citizens

Mobile technologies are empowering citizens in all aspects of their daily lives, improving the quality of life for many. More people can afford a mobile phone than a personal computer and are comfortable learning to use mobile devices in their daily lives. The popularity of social media and use of Web 2.0 tools is also transferring easily to mobile applications. M-Government

can affect the activities of any public sector agency, ranging from tax and customs administration to health, social security and personal identification. The prevailing use of mobile phones by citizens across the world provides a communication channel that vastly improves the timeliness and ease with which citizens can access and interact with government.

More importantly, mobile technologies present government with opportunities to increase citizens' take-up and adoption of connected government processes. At the same time, governments should address the challenges of ensuring privacy and extending digital inclusion. Further personalisation and location-based services are additional strategies that can enhance benefits for citizens, resulting in greater citizen engagement and satisfaction. Evaluating the ongoing effectiveness of public officials or public bodies through m-government applications ensures that the officials and institutions are performing to their full potential, providing value for money in the provision of public services, instilling confidence in the government and being responsive to the community they are meant to be serving.

Convenience and access – Mobile technologies enable convenient access to government information, forms and business processes. Mobile devices are a common part of most citizens' daily life. Since 2005, mobile phone penetration in some developed countries has exceeded 100%. Although global positioning systems (GPS) and smartphones are less widespread, they are becoming increasingly popular worldwide.

In a number of US cities, citizens can request services and report problems (with photos, automatic locations and date stamps) through free downloadable smartphone applications.[14] In cities across the world, citizens can make payments, sign up for specific notifications, and interact with service providers and government leaders. They can hold elected officials accountable through access to performance and financial data. Citizens can reserve and pay for parking spots or travel tickets. These actions can be completed where and when they choose. Mobile communications can be a substitute for transportation. Inexpensive handsets, micro prepayments, and top-up cards have increased affordability and are just some of the reasons that mobile telephony has become the most easily accessible and ubiquitous communications device in rural areas.[15]

Health and public safety – Citizens in previously unreachable areas can receive m-health assistance, monitoring, notifications and emergency medical alerts.[16] For example, handheld devices were distributed to public health and other health workers in developing countries, providing real-time information on infectious diseases.[17] Through mobile technologies, citizens can also report suspicious or criminal activity, as well as improper actions of officials; therefore, contributing to increased transparency and accountability. Citizens can request emergency assistance, with the mobile application providing GPS data. Residents can participate in emergency management, identifying specific locations and conditions with mapping, photos and video.

Financial management **–** M-Government mobile payment applications are widespread in both developed and developing countries. Multiple applications are available for banking and financial services, money transfers, remittances, emergency aid, grants, loans and social cash transfers.

In addition to those with easy access to smartphones, mobile technologies are empowering citizens who previously had difficulty to securely process cash transfers, deposits and withdrawals, payroll credits, international remittances and other banking activities.

While person-to-person remittances and e-bill payment through mobile phones have been widely adopted and have had great impact, especially among rural and underserved populations as in Kenya (M-PESA[18]) and Bangladesh (Grameen phone's BillPay service), it is important to move to other value-added services such as receipt and payments of loans, interest bearing accounts, payroll and any other Government-to-Person (G2P) payments. Governments can reach the critical mass, providing them with value-added services, such as paying out salaries and other government disbursements and social benefit payments via secured mobile payments platforms.

Education **–** Teachers are now delivering content to students in primary schools and entering student grades through mobile technologies. Students are able to access exam scores and scholarship decisions, and parents can receive notifications if a child is absent from school.[19] Mobile projects, like India's e-learning initiatives for seamless transfer of educational content,[20] are being implemented in multiple countries to expand educational access and promote academic achievement.

Box 2.3. **mGive platform**

Responding to the earthquake in Haiti is an excellent example of partnerships and the power of mobile payments. As of June 2010, over USD 41 million was raised in text message donations by the Red Cross to help victims of the earthquake. Mobile Accord's mGive platform enabled the public to send one-time gifts of USD 10, which was charged to the sender's mobile account. 95% of the donations received were from first-time donors.

Source: www.nten.org/blog/2010/09/13/7-ways-nonprofits-use-mobile-phones-rake-cash-monies.

Box 2.4. **Estonia – Mobile ID**

Overview – The Mobile-ID service is a collection of organisational and technical measures to create a strong, seamless digital identity for Internet users. To use Mobile-ID, users must acquire a special SIM card (available from mobile operators) and, for extra security, activate the service on a website with an Estonian ID card. After that, the Mobile-ID is ready to be used on any compatible website for authentication and digital signature. The Mobile-ID certificates are valid for five years, after which the SIM should be replaced. The service is implemented according to Public Key Infrastructure (PKI) and launched by mobile operator EMT in co-operation with CA AS Sertifitseerimiskeskus. The initiative is being led by the Ministry of Economic Affairs and Communications.

Pressures and drivers – Estonia‘s mobile market is one of the most penetrated, exceeding 100%. Mobile broadband access services, as well as mobile content and applications, are readily available, underpinning future revenue growth. Implementing the Mobile-ID ensures compliance with Directive 1999/93/EC and subsequent Estonian Digital Signature Law. The biggest concern is ensuring that the user registration process is secure enough to be used by service providers and government. There were no standards and no best practices available in this area.

Impact (change) – The main impact is for users, who benefit from a more convenient login (authentication) process, which is compatible among websites. This service has shown real value in furthering secure usage of m- and e-services. Most people have both ID-cards and mobile phones with them at all times, so these devices greatly minimise the risks of using e-services. There is no more queuing, no bribes, no forms in triplicate, and no need to plead a case to several administrators. The benefit for service providers is that the authentication process is highly secure and low cost.

Impact (innovation) – The e-Governance Academy (eGA) was founded to create and transfer knowledge concerning e-governance, e-democracy and the development of civil society. eGA implements its mission through research, training, consultancy and networking. Estonia is exporting its digital-democracy technology through its e-Governance Academy, which has trained bureaucrats from 36 countries.

Response – Because Mobile-ID is based on the same technologies as the Estonian ID card, it can be applied for m-voting. 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 and when votes are confirmed with digital signatures. The m-voting solution might increase voter turnout, thus ensuring more effective actualisation of the will of the people. A security study has been initiated, and the law would have to be amended to make it possible to use Mobile-ID for voting.

Source: www.id.ee/10995.

M-Government – Benefits for businesses and economic growth

Several factors are contributing to the expansion of business use of mobile technologies. Business managers are focused on reducing costs and physical infrastructure, and recognise the capabilities created by key advances in wireless technology: faster and wider wireless networks; larger device displays; and better technical platforms for applications (capacity and operating systems).

Box 2.5. **The Republic of Korea – Mobile Public Procurement Service**

Overview – The mobile public procurement system increases efficiency of public procurement by handling all procurement procedures through an online single window. In particular, it has provided 'smart electronic procurement service' through mobile phones, allowing users to search for bidding information and participate in bidding since 2005 (PDA), 2008 (3G phones), 2010 (smart phones). The mobile procurement service features upgraded security functions by supporting dual authentication procedures that consist of PIN authentication of smart security token and fingerprint identification for mobile bidding participation. The mobile procurement service (wireless) is based on the Republic of Korea's fixed electronic procurement service which won the UN Public Service Award in 2003 and the AFACT e-Asia Award in 2007.

Pressures and drivers – All registered companies are enabled to participate in biddings of all public organisations, including national organisations, local government bodies, and public corporations by a single registration in the system. The mobile procurement system improves efficiency and transparency and helps corporations which need bid-information and fast decision-making.

Impact – The wired and wireless procurement volume through G2B reaches approximately 555 000 contracts, USD 75 billion per year and the rate of the electronic contracts is 97% in 2010. Many stages of procurement ranging from notices, bidding information, opening of the bids, participation to the result of the bids are handled and procurement progress can be monitored on a real-time basis using mobile phones.

Response – Government will rebuild the public procurement system through 2012 in order to enhance user oriented online bidding service. In particular, the mobile service area will be expanded by using smart phones.

Source: Government of the Republic of Korea.

Box 2.6. **Mobile Technology**

According to a 2009 World Bank study, every 10 percentage-point increase in mobile-phone penetration in a developing country yields an extra 0.81 percentage points of annual economic growth. Mobile Internet can have an even greater impact.

Source: www.economist.com/node/16944020?story_id=16944020.

Economic opportunity and improvement – Mobile applications are being used to assist job seekers and support more efficient business processes through real-time communications, quick data access, notifications, and product orders from the field. People can connect rather than travel. Farmers and fishermen have increased productivity and profits through on-the-spot weather and market price alerts.[21] By calling first, buyers can locate best price options, which supports price stabilisation and reduces product waste. Through SMS services, farmers can text their questions and instantly get advice from a database or agricultural experts. The database is expanded as new inquiries are received. With a focus on small and medium-sized businesses (SMEs), governments and service providers are joining forces to expand mobile access through low-cost handsets, recycled mobile phones and even travelling "telephone teams" which function as a mobile phone booth. Mobile phones are streamlining business activities, enabling remote, real-time business management and matching buyers and sellers from across the world.

Productivity – The productivity benefits of mobile phones include business expansion through more accurate product or service demand projections and customer outreach; streamlined and more accessible employment searches; lower start-up and operating costs for entrepreneurs; accessible and cost-efficient mobile banking; and real-time, flexible communications and transactions between buyers and sellers.[22]

Mobile workers – The research firm IDC reports that the number of mobile workers accessing enterprise systems worldwide will reach 1 billion in 2010 and 1.2 billion by 2013, or more than one-third of the world's workforce.[23] Empowered mobile workers increase efficiencies, co-ordination, real-time communications and performance management.

Customer service – Mobile computing enables access to customer relationship management systems from multiple locations to maintain current and accurate customer information. Customers can use self-service options to establish new accounts, obtain account information, or make payments, improving both customer satisfaction levels and cost efficiency for companies. Customers can also access inventory availability and pricing, and place orders, thus streamlining business processes, responsiveness and resource requirements.[24]

Green economy – ICT has an active role in efforts towards a "Green Economy." Current network optimisation packages for mobile infrastructure can reduce energy consumption by 44%, while solar-based base stations have the potential to reduce carbon emission by 80%. Mobile devices can reduce energy consumption through energy saving configuration and empowered field staff, sales teams and telepresence conferencing.[25] The theme of a green economy in the context of sustainable development, and the impact of mobile technologies, will be a focus at the 2012 Rio+20, the United Nations Conference on Sustainable Development.[26]

Box 2.7. **Singapore – Mobile Government Programme**

Overview – The Mobile Government Programme makes government e-services more accessible to a wider customer base and more convenient for those who need to transact on the move. In 2009, more than 3.3 million government mobile transactions were conducted. Today, more than 300 mobile government information and services are available. "M-Gov" also established a whole-of-government (WOG) central short-messaging-service (SMS) platform, known as OneSMS, to facilitate the development of m-services by government agencies through demand aggregation. The programme was co-developed by the Ministry of Finance (MOF) and the Infocomm Development Authority of Singapore (IDA) as part of the Integrated Government 2010 ("iGov2010") e-government master plan for the years 2005-10. The achievements are specially mentioned in the 2010 UN E-government Survey.

Pressures and drivers – Mobile channels are of special interest due to the high mobility of mobile phone devices, with a higher penetration rate in Singapore (140.7%) compared to the household Internet penetration rate (81% in 2009). This presents the opportunity for higher adoption of e-services delivered through the mobile channel. In addition, mobile technologies open up a vista of possibilities for new services that are not possible or relevant through the Internet or counters (*e.g.* location-aware capability), offering a unique opportunity to deliver new and personalised services to customers.

Impact – The following objectives have largely been met: (1) deliver innovative services via the mobile channel that were not feasible with the Internet or counters; and (2) make government e-services more accessible to a wider customer base and increase convenience for those who need to transact on the move. Demand aggregation enabled government agencies to enjoy bulk discounts on SMS delivery rates, which resulted in significant cost savings of about SGD 1 million per year. Citizens also benefited from the integrated WOG approach, as any m-service subscription could be easily accessed on the one-stop portal "My citizen" (www.myecitizen.sg). They also enjoyed the convenience of only remembering one short code and a more consistent user experience on the mobile channel. The Singapore Police Force and five voluntary welfare organisations collaborated to develop SMS70999. This gave registered members of the deaf, hard of hearing and speech impaired community in Singapore an emergency SMS helpline to contact the police and emergency services via SMS. Prior to this, the community with special needs was unable to access the emergency voice helpline.

Response – In line with technology trends, the M-Gov programme is also shifting gears to facilitate the delivery of government m-services over more varied mobile devices and platforms. To further tap into the emerging mobile technologies, such as location-based capabilities and augmented reality, the M-Gov programme is supporting agencies in their pilot development of m-services.

Source: www.sgdi.gov.sg/mobile.

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Chapter 3

Understanding m-government adoption

M-Government is not just a series of single initiatives; rather, it is becoming a strategic and inherent way of doing government business. Government adoption of mobile technologies is propelled by a number of factors, such as policies, standards, cultural trends, availability and costs. When analysing the potential of m-government within an agency, and the modality for its adoption, it is important for the governments to examine a number of elements. These include the value chain, which is created by the various entities that provide the products and services required in the process of constructing a mobile solution, the key players and stakeholders across the value chain, as well as the stakeholders' partnerships and collaborations.

The inherent value of m-government

M-Government is not just a series of single initiatives; rather, it is becoming a strategic and inherent way of doing government business. Real leadership will be demonstrated by those public organisations that adopt and leverage mobile business models.[1]

The dictates for government entities are clear: cutting costs through greater efficiencies, without reducing services; understanding and maximising the power of new technologies; providing new choices for communication and access channels to citizens, including new social media applications and options; and addressing citizens' social and economic needs.

To meet the challenges and maximise the opportunities, governments must:

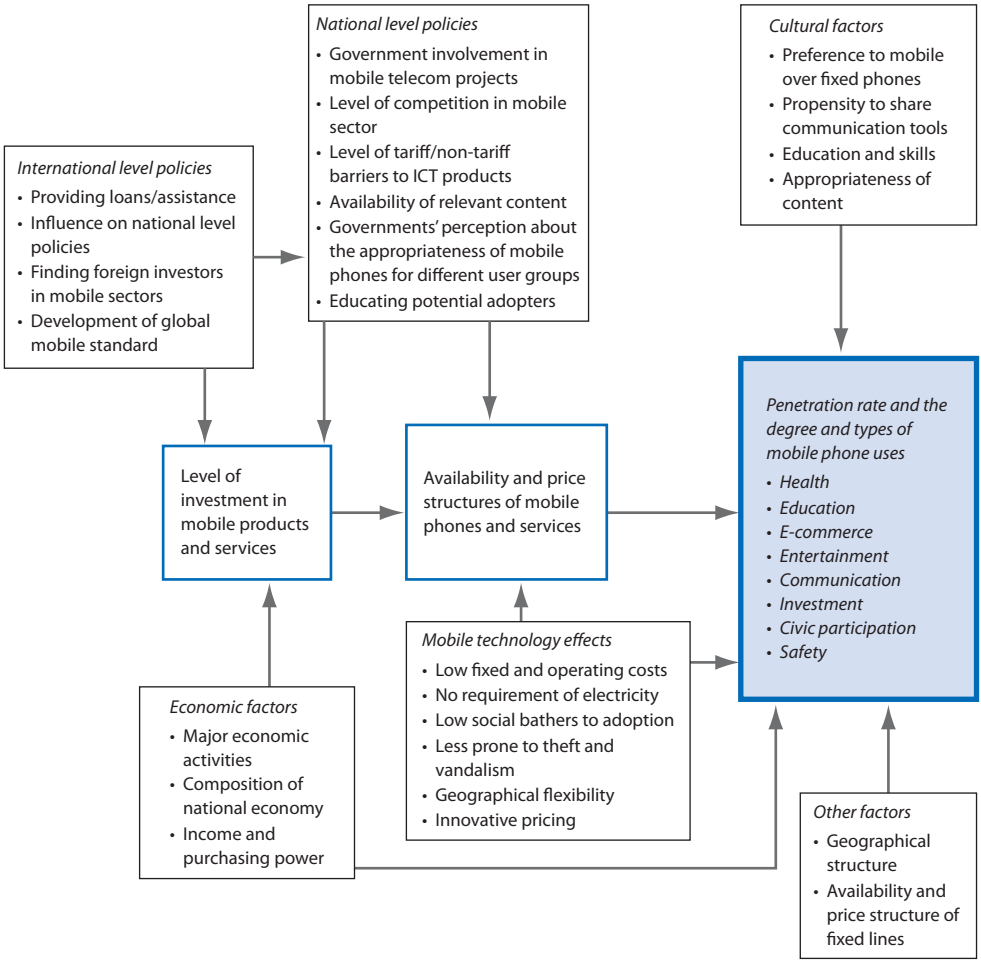
- know how to deploy new technologies quickly with minimal risks;
- know how to ensure sustainability for those technologies and the processes and services they support;
- foster innovative ideas in terms of service delivery, targeting both individuals and communities;
- enlist and benefit from the competencies of integrators, software providers, and wireless carriers with regards to specific tools and overall knowledge;
- recognise the value of system flexibility to meet future transformations in technology;
- expand knowledge of effective mobile application models.

Adoption factors

Government adoption of mobile technologies is propelled by a number of factors, such as policies, standards, cultural trends, availability, costs, and economics. The Mobile e-Development Model (see Figure 3.1) is a useful framework to identify relevant factors that are driving adoption of mobile technologies.

Governments can take a strategic approach to increase the take-up of m-government. A first step is to examine how national and international policies are influencing mobile penetration. When governments open the mobile market for competition and invest in mobile projects, availability of mobile devices and accessible pricing structures increase. Agreements to eliminate customs duties on mobile products can also accelerate mobile acceptance by driving down user costs. Adoption is strengthened when governments facilitate the development of relevant Web portals and content. Economies

Figure 3.1. **Mobile e-Development Model**



Source: Dholakia, N. and N. Kshetri (2001), *The Global Digital Divide and Mobile Business Models: Identifying Viable Patterns of e-Development*, University of Rhode Island, USA.

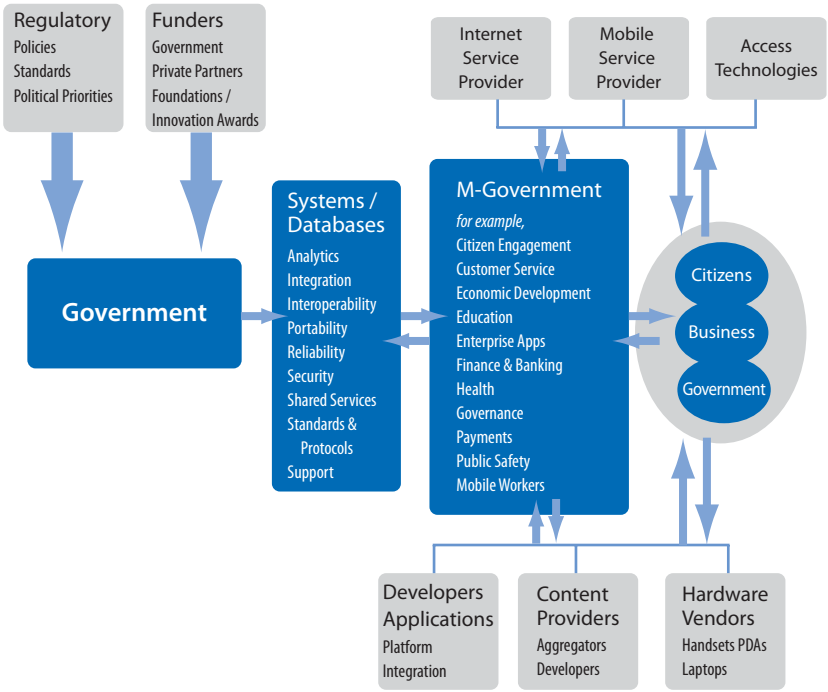
of scale are achievable through global standards for mobile communications. Economic factors can determine mobile adoption rates in a number of ways, ranging from the purchasing power of users to the potential impact of measurable GDP growth. Government consideration of these and other specific economic conditions can direct the focus of mobile applications as viable solutions for economic development and poverty reduction. The lack of availability

and costs of fixed lines and computers can underscore the prospective value of m-government in many locations. Lower costs, geographic flexibility, scalability, and ease of acceptance are some of the advantages of mobile technology that foster adoption. Cultural factors for different geographic areas and user groups also need to be considered, as they influence communication preferences, comfort levels with sharing mobile phones and perceived usefulness of applications. Countries with aging, or less tech savvy populations, will have a much lower adoption rate than countries with younger populations. Economic factors will play a role too, so classical services will unlikely disappear. Building capacity in and alignment of these elements can help an organisation attain m-government goals.

Mobile value chain

When analysing the potential for m-government within an agency and how it can be adopted, it is important to examine the value chain which is created by the various entities that provide the products and services required

Figure 3.2. **M-Government value chain model**



Source: Susan Cable, Public Technology Institute, 2010

in the process of constructing a mobile solution and to identify strengths and address gaps. Besides government agencies, the key entities are: the wireless operators and service providers; independent hardware vendors; communication infrastructure providers; independent software vendors; system integrators and device manufacturers. All components of an enterprise mobile solution are related, and strategic partnerships are advantageous and critical to reach an integrated end-to-end solution.[2] Figure 3.2 provides an example of a value chain model for m-government.

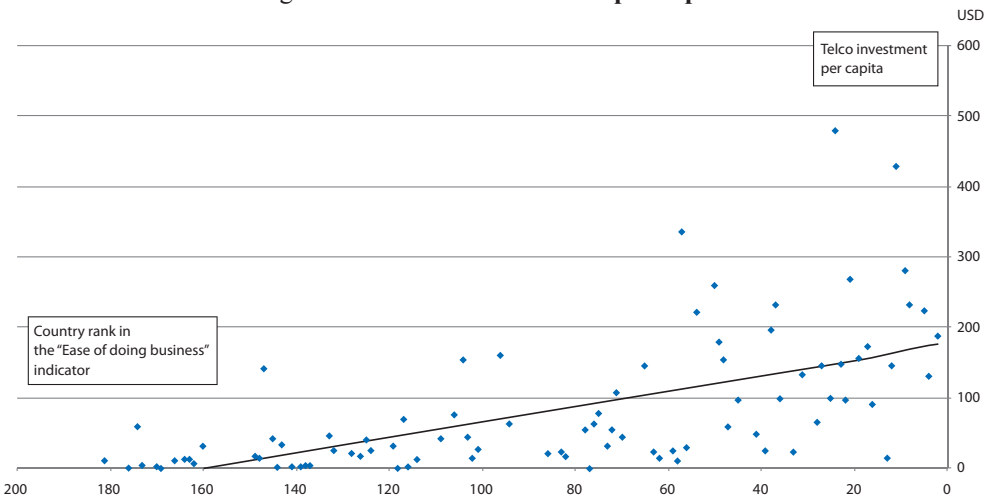
Following an effective application of the model, mobile initiatives would be jumpstarted by positive regulatory policies and standards, and through resourceful funding strategies. The foundation for these initiatives is built on quality systems and databases, which are then utilised in a mobile application that has relevance to users. Missing pieces can derail the process, but innovative technologies, new application options and an updated paradigm of integration are generating effective alternatives, often eliminating the complex task of building new systems. Access technologies and mobile devices that support users are rapidly improving. Mobile service providers are responding at a rapid pace to a competitive environment. New and interesting partnerships of mobile and Internet service providers, along with application developers, are emerging – including more open source solutions. Usage of data and projections for mobile adoption are driving a supportive environment for the expansion of government mobile services that promote citizen engagement and enhanced customer services; provide mobile applications related to key government service areas, such as economic development, health, education, finance, and public safety; and enable more specific functionality, such as payments and mobile workers. Partnerships with global suppliers are key to the success of m-government for functionality and cost reduction/funding. Wireless infrastructure roll-out will depend on the service providers and their business plans, *e.g.* when to move to 3G, 4G. There will be a cost to upgrading, and there are competing technologies as well which will need to be considered.

Key players and stakeholders across the value chain

Telecom operators – Private sector investment continues to be a primary driver in the expansive growth of mobile technologies, especially within positive legal and regulatory environments. Private mobile operators provide services that are responsive to the demand of consumers and generate profits for both manufacturers and operators.

As illustrated in Figure 3.3, the ITU reports that a relatively better performance in the "Ease of doing business" country rankings is associated with higher levels of telecom investment per capita.[3]

Figure 3.3. **Telecom investment per capita**



Source: ITU World Telecommunication/ICT Indicator Database and World Bank Doing Business.

In OECD member countries mobile revenues have grown 7.5% each year since 2005, reaching USD 526.7 billion in 2007. Even though mobile revenues in telecommunication sectors differs across countries, they have accounted for 45.4% of all telecommunication revenues in the OECD in 2009, up from 24.4% just ten years earlier. started to fall from high levels in the 1990s with the introduction of competition in the sector. This pushed prices down more than 50% from 1996 to 2002. Operators countered the fall in voice revenues by emphasising new and existing data services such as WAP, GPRS, 3G and SMS. The effort was successful and mobile revenues per subscriber have been slowly increasing since. Operators are looking to data on 3G networks as a new revenue source, but these investments are only now beginning to draw in a substantial number of users. Data services on 3G networks remain a promising source of new revenue.[4]

Government – The role of government is to develop policies and standards, and to co-ordinate partnerships with technology providers. Governments not only play a role in shaping policy and regulations, they can also stimulate demand and create the local market. Governments are the advocates for citizens in identifying the best applications of mobile technologies to advance responsive public service delivery, expand citizen engagement, improve service delivery, increase operational efficiency and amplify accountability.

End users – Citizens, businesses and government workers who use government's mobile phone applications impact adoption of mobile services, provide input for applications and improvements and influence each other. They are the

customers of m-government, but even more importantly can be encouraged to become co-designers of solutions.

Device manufacturers – Manufacturers are responsible for building mobile devices that can conduct voice or data transactions between proprietary networks and ensure updated operating systems. They have an important role in adding value for users by meeting their changing needs for size, quality, appearance, functionality, and synchronicity. Device manufacturers can drive network operators to increase the functionality of the network and reduce infrastructure costs with smart devices.

Infrastructure providers – Mobile communication infrastructure involves the design, manufacturing and assembling of switches, gateways, and interfaces to conduct mobile communications among subscribers and the public switched telephone network (PSTN). Infrastructure providers' products include base stations, base station controllers, mobile switching centres, packet control unit, GPRS Support Node, Mobile Operator's Packet Switched Data network, Gateways, WAP Servers, PSTN interface and other circuit switch and packet components. They provide the network necessary for mobile users to perform voice and data services, and enhance the process by increasing the functionality of the network, while lowering costs and increasing performance. They can also provide knowledge of interfacing with legacy networks.

Application developers – Applications provide the interface between the device and the network hardware. Developers' role in creating and releasing wireless applications to support services like WAP and c-HTML – and in writing efficient programmes that help mobile users to conduct transactions from anywhere and at any time – are key to the effectiveness of mobile Internet and connected government. Another important role of application developers is to support personalisation and synchronicity.

Content developers and enablers – Content developers compile content into mobile-ready formats so applications can immediately extract desired information and package it according to users' requests. They play a key role in enabling mobile users to have personalised information anytime and anywhere to conduct transactions.

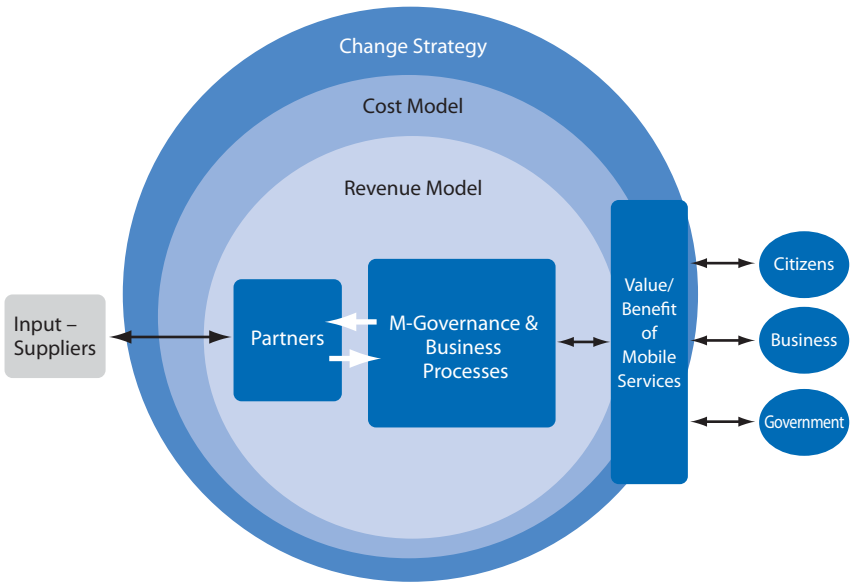
Stakeholders' partnerships and collaboration

According to Chetan Sharma, regardless of the applications, the evolution of the mobile services platform will be significantly impacted by "private-public partnerships and collaboration between profit-driven companies, research institutes, government agencies, non-profit agencies, charitable concerns with specific goals, and consumers." Understanding this is vital. Funding is foundational for m-government, and both financial and technical resources need to be co-ordinated; additionally, the strongest teams with the greatest capacity

for working together are required to meet challenges, minimise duplicative efforts, maintain alignment and achieve common goals. Technical collaboration is required for critical functions, such as emergency planning and rapid response, in order to find the best solutions which use the most innovative technology and enable improved responsiveness. "Government and regulatory agencies must create an environment that balances the fostering of mobile government growth and user-protection through current and relevant policies. Mobile technologies should advance with market competition, consumer privacy, secured sensitive information and clearly defined liabilities." [5]

Public-private partnerships (PPP) can align resources and expertise to effectively accomplish shared goals for mobile services (see Figure 3.4). Although partnerships may vary with regard to structure, responsibilities, management and governance, a basic business model includes identifying and agreeing upon: (1) a user-group for the mobile service; and (2) the specific benefit and value of mobile services to that group; (3) the revenue or benefit to the providers/partners; (4) the business processes and activities that will produce the mobile services; (5) the requirements for and allocation of partner resources and competencies; (6) the costs to acquire, produce and distribute the mobile services; and (7) suppliers of required resources, including physical, human and financial capital, as well as policy makers. Supporting this model is a commitment to ongoing management, adaptation

Figure 3.4. **M-Government business model**



Source: Susan Cable, Public Technology Institute, 2011.

and improvement to successfully address change factors, such as new users, emerging technologies and economic climates.

An excellent example of collaboration in the pursuit of a common objective is Text4baby,[6] a mobile health programme which promotes maternal and child health among underserved women. Launched in February 2010 to address the rising infant mortality rate in the United States, Text4baby provides timely and expert health information through SMS text messages to pregnant women and new mothers through their babies' first year. This broad, public-private partnership includes government agencies, corporations, academic institutions, professional associations, tribal agencies and non-profit organisations. Outreach partners spread the word about Text4baby in many different ways and encourage the women they reach to sign up for the service. Founding partners include HMHB, Voxiva, CTIA – The Wireless Foundation and Grey Healthcare Group (a WPP company). Johnson & Johnson is the founding sponsor, and premier sponsors include WellPoint, Pfizer and CareFirst BlueCross BlueShield. US government partners include the White House Office of Science and Technology Policy, the Department of Health and Human Services and the Department of Defense Military Health System. The mobile health platform is provided by Voxiva and free messaging services are provided by participating wireless service providers. The success of the programme has been facilitated by extensive collaboration from the national to local levels of partnerships and participation.

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Chapter 4

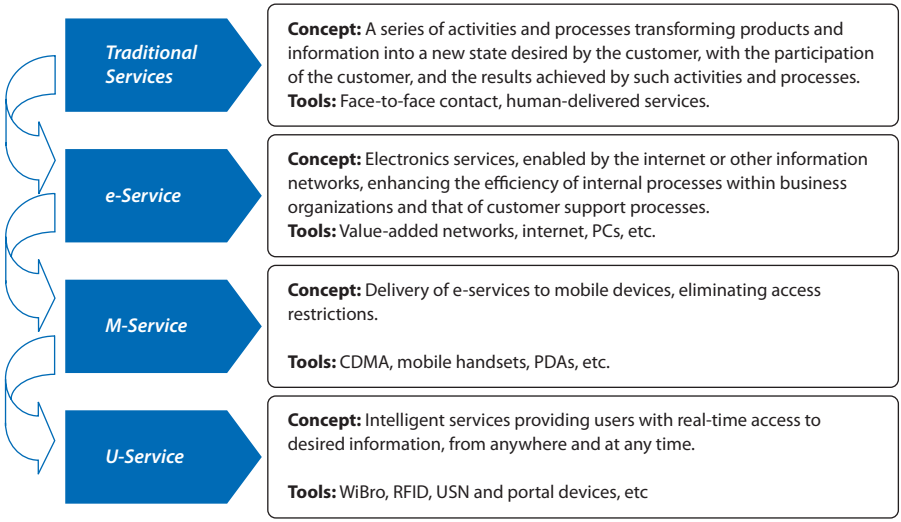
Prerequisites for agility and ubiquity

E-Government services are increasingly required to be platform-independent and constantly available. Therefore, concepts such as mobile government and one-stop shops have gained priority. As governments are trying to foster their capacity to be agile and ubiquitous, they are slowly evolving service delivery towards mobile wireless. This reality requires careful analysis, prototyping and evaluation of services to investigate whether any change leading to new forms of information or service delivery, and/or access, will be accepted by citizens; if changes in user acceptance and cultural adaption are needed; and whether the needed critical mass of "digital natives" exists to fully reap the benefits of the new investments. The analysis may identify a number of different challenges which will have to be surmounted, i.e. *technical, governance, policy, financial, economic, organisational and institutional, legal and regulatory.*

Evolving public service delivery

Governments are slowly evolving service delivery towards mobile wireless. Currently, e-government services are increasingly required to be platform-independent and constantly available. Therefore, concepts such as mobile government and one-stop shops have gained priority. Figure 4.1 summarises this evolution, linking the different levels of service concepts:

Figure 4.1. **Development of service concepts**



Source: Oui-Suk, Uhm (2010), *Introduction of m.Government & IT Convergence Technology*, KAIST Institute for IT Convergence.

The wider meaning of ubiquitous government – "u-government" – services can be interpreted as advanced social infrastructure for future society. Technology is often a few steps ahead of the socio-economic and usability enablers necessary to make the transition. The stakeholders are working in various collaborative contexts to implement the paradigm of "anywhere, anytime, anyhow access to any service by anybody", which is based on the World Wide Web Consortium (W3C) device independence principles.[1]

Reviewing the various approaches to u-government shows that a unified definition or understanding of u-government is still lacking.[2] For the purposes of this report, u-government can be viewed as a superset of e-government, which reflects new forms of interaction and transaction that are possible anywhere and at any time on various devices, due to the pervasive availability of

networks, applications and services. On the other hand, it should be taken into account that the provision of public services is citizen-centric, and governments must meet the digital divide challenge. For services to be available and delivered ubiquitously, *i.e.* beyond any temporal or geographic constraints, they may not necessarily use online channels exclusively. While the use of online channels to deliver government services may be more cost effective and efficient in many circumstances, it is not necessarily always the case. Pragmatically, policymakers have to exercise due diligence to assure the availability of government services online and to improve their accessibility and mobility. An imperative question is how to use limited resources to maximise the availability and accessibility of government services through an appropriate combination of online and offline channels in a ubiquitous manner.

Looking at the potential of mobile devices for positive social and economic change in rural communities, Pete Cranston relates that Information and Communications Technologies for Development (ICT4D) policy targets eight critical success factors:[3]

- build on existing systems
- ensure services are demand-driven
- determine who should pay
- ensure equitable access
- promote local content
- build capacity
- use realistic technologies
- build knowledge partnerships

Successful *Mobile for Development* projects are more evolutionary than revolutionary, more aligned with existing practices, and more focused on intended outcomes. Approaches to success include:

- embedding the mobile element into an ongoing development effort, rather than creating the mobile service as the development effort itself;
- using mobile technology to reduce transaction costs and increase productivity of existing practices, rather than introducing entirely new behaviours;
- requiring only basic literacy or skills from users, rather than requiring additional technical knowledge or support.

Deployment and feasibility

Careful analysis, prototyping and evaluation of services are required to investigate whether any change leading to new forms of information or service delivery and/or access will be accepted by citizens. Given the evolving and diverse nature of mobile technology use, designing m-government services merely to support current practices is likely to lead to obsolescence and to result in an inefficient use of resources. However, the more general lessons that arise from studying current usage provide a foundation for designing and deploying m-government services and applications that are likely to be accepted and used by citizens in the long term. It appears that an evolutionary approach, where a small set of high-value services that are accessible from a range of technologies is developed over time, will be more successful.

Furthermore, flexibility in the form and nature of applications is needed to meet the changing needs of a variety of citizens. As citizens' technology choices change, these applications can be evolved to meet new needs. Therefore, the findings indicate that a "mix-and-match" rather than a "one-size-fits-all" approach to the development of m-government services is more likely to succeed.

In determining whether to deploy mobile and/or wireless technology and, on such basis, to offer new forms of service delivery, the following factors are also relevant:[4]

Possibility of substituting wired networks – These are cases in which the areas of operation are remote and the wired infrastructure is very expensive. In many developing countries, the wired networks are unreliable and expensive. In some developing countries, technology has skipped a generation and thus, while the wired telecommunication infrastructure is spotty and sporadic, one may find extensive wireless coverage. In such cases, wireless technology is an obvious choice for m-government applications.

Multi-channel strategies – The application of m-government services should be part of a multi-channel strategy to provide options for the delivery of services to citizens and businesses. Hence, the impact and role of wireless technology on e-government should be examined within the context of a multi-channel strategy.

Impact on digital divide – Given the penetration of wireless technology among citizens, its social acceptability, its user friendliness, and its cost, compared with the PC-based Internet wireless technology, it may be a significant way to reduce the impact of the digital divide and provide m-government services that more citizens can access.

Impact of competition – Governments often look at wireless technologies only from the point of view of return on investment (ROI) and cost containment, but there is more to consider. Governments at the local and national

levels compete in today's global economy for business investments, skilled workforce, good jobs, and so on. Governments need to view wireless/mobile technology as a means of gaining competitive and strategic advantage in a crowded field. Thus, some wireless applications may not make much sense from an ROI (Return on Investment) viewpoint, but may make good sense from a strategic, social viewpoint.

M-Government offers many opportunities to economise on the traditional costs of e-government. For example, in certain parts of a country where no fixed telecommunication facilities exist, the cost of developing and maintaining such facilities can be saved. Most authors[5] agree on the following financial and economic advantages of m-government:

- increasing efficiencies;
- decreasing costs by avoiding overlaps;
- increasing service level and ease of service;
- increasing adaptability to future requirements;
- improving auditing and control.

In the case of mobile health service (m-health), for example, enabled health care institutions aim to improve the effectiveness of care services while reducing costs. Handheld wireless applications can enable doctors, nurses and other health care professionals to gain access to the right information at the right time to prescribe the proper treatment. In addition to saving time for intervention and prevention, using mobile devices can offer benefits and efficiency with:

- access to patient records, lab test results, latest drug reference databases;
- requests for urgent blood donations;
- sending patients' data for a second opinion;
- electronic billing for in-home health care workers.

In terms of deployment, scaling-up of m-application initiatives – expanding coverage and organisational size, increasing activities, broadening indirect impact and enhancing organisational sustainability – should be considered. A universalist approach is possible: generalisations that can be replicated, directly expanded, or adopted elsewhere with a simple set of rules. Another possible approach is contextualised: focusing on tailored-made applications to address context-specific conditions. Given that m-governance applications must be inclusive and have a national spread, the key aspect is how to go from successful pilots to national-scale projects.[6]

Changes in user acceptance and cultural adaption

Widespread acceptance of mobile technologies for everyday activities does not guarantee the acceptance of these technologies for the provision of public services. It is important to temper some of the enthusiasm for m-government by drawing attention to some likely barriers to user acceptance of m-government services. There are risks in investing significant resources in providing technologies and services whose acceptance is uncertain. One needs to look beyond the groups that are driving m-government to those individuals who will use mobile technologies in providing or consuming m-government offerings. Failure by these stakeholders to accept m-government, or use the mobile government services as intended in the long term, will lead to failure of m-government programmes.[7] The risk for governments is low levels of take-up of mobile services, as experienced by many countries for some e-government services.

Adopting mobile technologies to deliver services traditionally delivered electronically necessitates a change. Habits, fear of the unknown, security-related concerns and economic factors are some reasons why people might resist accepting new approaches. When mobile technologies are implemented in the workplace, civil servants might view these applications as threatening, fearing that they may lead to their replacement, or make them feel that they are losing control to machines.[8]

Education, employee participation, and interpersonal communication should be at the centre of the adaption process; this will 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 throughout the process and ensured that these effects will bring with them better self-service within the organisation and better service delivery to citizens and businesses.

On the user side, mobile devices – particularly mobile phones – are seen by many as leisure tools *e.g.* for fun and entertainment, more 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.

To design and to deliver m-government services, authorities should consider the expectations and the perceptions of citizens toward using the services. A recent study indicates[9] that whether or not citizens adopt m-government services is influenced by the following beliefs:

- perceived ease of use; efficiency in time and distance; value for money; convenience; availability of device and infrastructure; usefulness;

responsiveness; relevance, quality and reliability of information; risk to user privacy; reliability of the mobile network and the SMS-based system; risk to money; compatibility;

- trust in the mobile service technology, in the government and perceived quality of public services;
- self-efficacy in using mobile technology.

Cultural resistance to m-government may come from a lack of confidence in the new technologies, and from traditional caution (as a bureaucratic virtue) which may turn to risk-avoidance and lack of innovation.

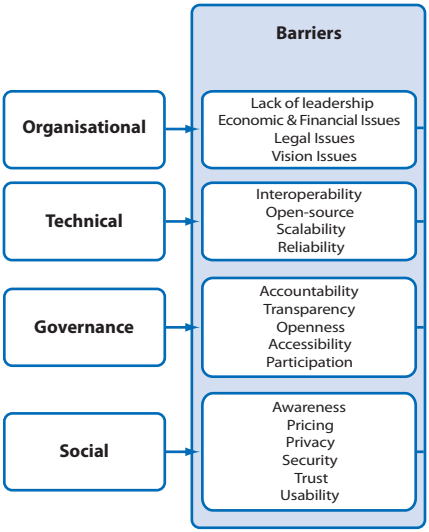
Finally, resistance and limited uptake may also be due to the inadequate level of digital literacy among the targeted users of m-government services, both within the society and the public sector. The common perception is often that the rate of digital natives is much higher than the actual one. There are still segments of the population that do not have the right level of digital literacy required to use mobile technologies to their full extent, which may cause their exclusion from the new opportunities to interact more easily and conveniently with the public sector brought about by m-government. This aspect should be taken into consideration by governments worldwide as they increasingly consider developing m-government to provide more inclusive and convenient public services. Ensuring a multi-channel service delivery strategy and envisaging policies specifically aiming to increase IT capacities and skills within the society will indeed be essential to avoid the creation of new forms of digital divide and to reap the benefits of investments in m-government. The topic of accessibility and digital literacy is also discussed in Chapter 5 of this report.

Key barriers and challenges

Considering rapidly changing citizens' needs, quick technological developments and the increasing number of policy initiatives aiming to foster innovation in public service delivery through the use of m-government solutions, further growth of m-government implementation is certain in the coming years. However, many challenges will have to be surmounted. To mention one technical example, not every government service can be adapted to mobile technologies (for example, services that require large amounts of data to be downloaded to mobile phones, which have limited storage capability and small screen real estate).

Hence, a thorough investigation of the government services that can be offered by mobile technologies and a careful analysis of the barriers to success of such services should be undertaken when embarking on a mobile service project. To define, analyse and tackle these barriers, they are classified and grouped together as challenges (See Figure 4.2).

Figure 4.2. **Mobile government service implementation challenges**



Source: El Kiki, Tarek (2009), *A Management Framework for Mobile Government Services*, University of Technology, Sydney.

Governance and policy challenges

It is evident that the digital divide still exists in most countries worldwide. M-Government policy actions should therefore try to avoid widening the digital gap. Governments should avoid enforcing the use of mobile channels, and provide access to new technologies only to those who are willing to use them. While m-government has great potential to vastly expand access to public services to the most vulnerable segments of the population, particularly those living in remote areas, or in areas where wired telecommunications and ICT services do not exist, there are still limits to its capabilities, *e.g.* older and poorer groups in society tend to be excluded from this technology. This poses a challenge to governments, which have to ensure that m-government does not become one more way in which the "haves" benefit at the expense of the "have-nots". The fact that some groups cannot access m-government services, however, does not imply that the unreached benefits from m-government will increase the schism between those who are able and those who are not.[10]

M-Government is currently over-shadowed by a lack of clarity on the value it can add to service delivery. M-Government should focus on exploiting the mobile aspect of the devices to position mobile devices as a complementary dissemination channel for e-government; both channels should be used to maximise service delivery to citizens. The existence of m-government

and its applications alone do not guarantee results. Despite the global character of mobile technologies, governments' and citizens' needs may differ significantly, which leads to the general recommendation that governments should proactively consult with the public and take stakeholders' opinions into account for implementation of m-government strategies. Therefore, three separate strategies need to be developed: an infrastructure strategy, a service delivery strategy (based on users' needs assessment) and an organisational change strategy. There is a need for pragmatic planning on the side of governments, which must understand that technology is not the focus of planning. The focus should rather be the end-user of the m-enabled solution, be it the civil servant, the citizen or the business. This will help governments reduce the risk of low levels of m-government service uptake, as was the case for e-government services. Additionally, as technology evolves quickly – screen sizes, device capabilities – there will be an on-going 'maintenance' cost to keep in step, as well as keep supporting older technologies, and a well thought-through strategy weill help governments to keep pace at an affordable cost.

Moreover, it must be noted that users keeping a constant communication channel with the government through their mobile devices may raise issues about transparency and accountability. Users (either businesses or citizens) expect a free flow of information about governments' decisions and actions, *i.e.* transparency.[11] Transparency is part of, and cannot be separated from, accountability; risks will arise when one of them is applied and the other is neglected.

Technical challenges

The technical challenges that governments deal with when developing e-government are comparable to the challenges they have to face when implementing m-services projects. Public sector agencies suffer from relatively high rates of failure among their largest IT efforts.[12] Experience with the introduction of sizable ICT innovations into public administration also shows that progress is difficult and risks are high.

To fully realise m-government's service co-operation potential, measures have to be implemented at three levels:[13]

- within and across levels of government with respect to sharing of information;
- within levels of government with respect to service delivery and user registration;
- across levels of government with respect to overall information architectures.

The first level is about electronic sharing of data related to service users and societal situations. During the design and reconciliation phases, the following aspects are to be taken into account:

- the definition of the shared data (which are often further defined in local regulations);
- the definition of messages required for the execution of tasks (operational work processes, about which administrative departments want to maintain a certain autonomy);
- the adoption of technical standards and protocols (to which administrations are accustomed and wish to adhere);
- the quality of data in terms of actuality (which may differ quite substantially among parties);
- the need to safeguard the security of shared data through technical and organisational measures and authorisations (the importance of security for the continuity of the business or for privacy may differ for the parties);
- the need to safeguard information privacy which refers to attributes that exceed anonymity, *i.e.* anonymity, unlinkability, linkability, undetectability, unobservability, pseudonymity, identifiability. The protection of these attributes introduces technical challenges since the privacy requirements should be taken into account while designing technical solutions;
- the establishment of a control authority on the observance of the set of agreements with respect to data and messages;
- the bearing of costs for common facilities (often the unbalanced benefits and costs for some parties leads to protracted discussions and considerable delays);
- object identification and numbering (of major importance for statistical research and prevention of fraud).

The second technical level is about the transformation of service delivery, the adoption of user orientation, the portal functions and the registration of citizens and businesses users. When the functional bureaucratic orientation is replaced by a "user" orientation, different agreements have to be reached concerning:

- public agencies, which move in the direction of becoming parts of one-stop shops, will have to agree on the portal functions they will develop in common and identify where the common boundaries of the network of connections with other organisations will be drawn;

- the management of the content of the website (this is normally organised according to information about rights and obligations, procedures and contacts with sister organisations and independent experts; "what-if" questions, etc.) and calculations of the entitlements with respect to provisions;
- content management systems have to be developed, *e.g.* with respect to standardisation and possible changes at one of the partners in the network;
- the required levels of identification and authentication for different online transactions have to be determined, as well as answers to questions about such things as electronic signatures, encryption, and public key infrastructure;[14]
- differences between the participants at a one-stop shop arrangement as to freedom of information and active disclosure of policy initiatives and existing databases have to be balanced.

The third technical level is about exchange of information between different sectors of the public administration. If different agencies "feed" databases which are managed and used by others, a need arises to develop an overarching information architecture for the whole public sector, as well as separate architectures for each sector. The overarching architecture must establish: where registrations will be kept, what kind of infrastructure will be built and maintained for routing data, and how this infrastructure will be positioned. Every time regulations applying to one of the relevant sectors change, the effect on the architecture will have to be checked. On the basis of the architecture, the most practical solutions for introduction, costs and administrative burdens can be chosen.

Financial and economic challenges

M-Government is no different from any other mechanism used by governments to deliver services: governments have a responsibility to the public to ensure that services are provided as efficiently and effectively as possible, and that any risks associated with the service delivery are identified and managed as early as possible.[15] Adopting mobile and wireless technologies to provide mobile delivery of services requires careful attention, throughout the stages of planning, development and implementation, to the following factors:

Cost **–** The need to investigate public funding of infrastructure and the options for joint ventures with private operators (*e.g.* PPPs); the high initial investment and cost recovery or return on investment (ROI); political factors and audit/regulatory considerations; the ability to maintain a single audit trail of transactions and procedural benchmarking; and the realisation of costs and

benefits from long term contracts with telecommunications companies and application vendors.

Business Process Re-engineering (BPR) – Business Process Re-engineering is an essential part of any given project, or initiative, and significantly affects the economic and financial factors (*i.e.* if a delivery process is not effective, first it needs to be re-organised, which might cost even more than later putting it on the mobile delivery channel); centralised authority and political support over potentially fragmented/rival channels; cohesive legal and regulatory environment to facilitate m-government operations; uniform interface for services and multi-jurisdictional service delivery; and technology portability from older systems to m-government interfaces.

Service security – Communication stability via stringent Service Level Agreements (SLA) from telecommunication and application providers; data integrity regardless of interface device, particularly in relation to loss and theft; transaction audit and transparency for financial interactions; seamless moves to future enhancements; and secure warehousing of data images through minimal duplication between agencies.

Long-term contracts – Generally, they increase savings for government service delivery. Because of the relatively high initial cost for infrastructure deployment, long-term perspective is required to realise major long-term cost benefits. Some governments have been able to adopt innovative costing strategies; for example, using fee-sharing arrangements that do not require the public sector to provide many up-front costs. At contract renewal, further discounts can be applied by the provider due to the increase in usage.

In addition to the above factors, a sound financial rationale is required for the introduction of new channels (or possibly the retention of old channels), in which costs and benefits must be balanced against each other. Evaluating m-government services with a cost-benefit analysis or with a similar financial assessment method, the rationale can be summarised along these lines:

- not all m-benefits are unambiguously net gains, and some efforts are driven by political or non-economic efficiency reasons;
- there is confidence *a priori* in potentials to be realised, although justifiable resource allocation requires rigorous evaluation methods;
- advanced services need vertical, horizontal, front/back-office integrations, often implying additional costs.

The assessment of costs and benefits will have to focus on both tangible and intangible factors. The question to be addressed is: how do the costs contribute to improved service delivery (user requirements), increased efficiency and effectiveness (provider requirements) and wider political objectives (greater participation, economic/social development)? There is no

single measurement method that applies equally to all administrations. The metrics to be used should be determined by a strategic management decision. However, whatever metrics are chosen, calculations should be based on realistic assumptions, past experiences and good practice cases.

By introducing and promoting new, less expensive channels of service delivery, in an effort to save costs on more expensive and traditional measures, the service becomes more visible and its take-up has good chances to grow. However, practice shows that the growth in service take-up is often distributed over all available channels; *i.e.* including the more expensive ones, thus raising total administration costs.

Organisational and institutional challenges

Governments around the world are now setting ambitious targets to move towards mobile government, while remaining engaged in the further development of e-government. This bureaucratic, or top-down, approach – which is primarily a result of external pressures from citizens and businesses – may fall short in identifying strategies for content (what) and process (how) in the shift to m-government. In other words, governments should have a roadmap which clearly identifies when it is necessary to make the change, what needs to be changed and how to make it happen.

It can be assumed that it is unlikely that mobile government will require significant structural changes in public institutions in the near future. – This is in large part due to the fact that many m-government applications do not seem to have a large impact on the work of public organisations at large yet to necessitate a major structural change. Most mobile government initiatives are in fact occurring at the lower or local level with the involvement of very few agencies and civil servants. Moreover, m-government builds on structural changes already made to support e-government development. However, m-government will rather require re-engineering working processes,[16] that is in the way tasks are accomplished. In other words, some changes in the business processes and workflows of the departments are necessary. Moreover, as m-government will further develop, an increase in volume of requests to any existing services, as well as new services, is to be expected. It will create organisational needs in terms of required additional support staff to handle the increased volume of inquiries, requests, comments. This will be particularly true if a response in near real-time is expected by the user. Governments will therefore need to engineer the whole system and organisation to meet expected and forecast needs.

As an increasing number of public agencies embrace mobile government applications, a more unified mobile government strategy – as well as more integrated infrastructure and databases within the government – are likely to emerge. Once this level of adoption is achieved, some changes can be expected

in the structure of governmental organisations. Such changes are likely to be: virtual public agencies (*e.g.* mobile technologies enable civil servants to spend their time in the field); consolidation of some public agencies, and/or reductions in headcounts. For example, the void inspection surveyors in the London Borough of Barking and Dagenham[17] no longer require fixed office space.

The size and complexity of existing governmental structures usually limit their adaptability to new situations, such as emerging m-government opportunities. Co-operative behaviour is hindered by the separation of powers, the tier structure of public administration and the right of self-determination at different levels of government. The necessity to come to an agreement leads to compromises at the level of the lowest common denominator. The flexibility which is required by m-government is square to the immobility of existing public authorities. The legal necessity to maintain off-line facilities makes online m-government facilities extra expensive. Many organisational changes inspired by m-government relate to horizontal cross-boundary processes, while public administrations are generally mainly interested in vertical jointed jurisdictions. Finally, m-government measures are often too directed at saving costs in existing departments, rather than boosting interconnected chains of activities.

Commitment to the same objectives and a common sense of direction over the long term is often lacking in m-government initiatives. Different civil servants, each with their own specialty and "trained incapacity", are participating in larger m-government projects. Without strong management, too many partial decisions are taken, which are at cross purposes with the common goal. The staffing is often discontinuous, the dependency on outside specialists intensive, and the documentation of the projects insufficient.

Employees' acceptance of mobile and wireless technology and intention to use the new technology for work processes depends on three main factors:[18]

- the perceived usefulness of the technology
- the perceived ease of use
- the perceived availability of resources for the technology

Perceived usefulness is defined as the extent to which a public employee believes that using a particular technology will enhance her or his job performance. The higher the perceived usefulness, the higher the technology acceptance and adoption.

Perceived availability of resources includes resources such as time available for performing or learning to perform a task and level of support available from other staff, as well as technology attributes such as system availability, cost of access, documentation, and perceived level of control over the technology. The higher the perception of availability of these resources, the higher

the technology acceptance. This factor is particularly relevant if the wireless/mobile application is complex. Taking into account the civil servants' needs and views as users of the m-applications, and ensuring their buy-in will secure the success of m-government initiatives. Government agencies can take the following steps to increase employees' acceptance of wireless/mobile technology:[19]

- ***Train and educate employees*** – Training programmes, which include formal classroom education and hands-on job training, are essential for employees to understand the role wireless technology can play in their jobs. These training/education programmes must emphasise productivity benefits and process/usability issues. Testimonials from peer groups and superiors can play an important role in the acceptance of specific applications.
- ***Build peer support*** – An organisation can identify employees who are most receptive to wireless/mobile technology and use them as the "lead-user" group in providing support for their peers. Lead-users can be selected for training programmes first and then play a critical role in helping/supporting their peers through similar training programmes.
- ***Implement pilot initiatives and applications*** – In many situations, the usefulness of applications may not be explicitly evident before the applications are implemented. In such situations, pilot programmes are excellent ways to introduce the wireless technology and its benefits to employees. In addition to fostering employees' buy-in of such programmes they may help identify potential inhibitors to successful applications so that the negative impact can be minimised before a full-scale launch.
- ***Provide staff support*** – It is critical to engage staff early in the adoption process, especially when technology readiness is low. This helps employees overcome feelings of discomfort and insecurity.".
- ***Create a learning culture in the organisation*** – Employees should be encouraged to experiment with new wireless technology and new applications. Incentives should be provided helping to design applications and for suggesting improvements to the processes and applications. This enhances their involvement in the use of wireless technology, providing a sense of ownership and thereby improving the chances of successful adoption and potential productivity gains.

Increasing employees' comfort with the technology and increasing their perception of ease of use are the best ways to prepare them for technology acceptance. Government agencies should use incentives to encourage employees' use of PDAs, wireless devices, and handheld devices both for work and personal use.

Legal and regulatory challenges

Security and privacy concerns are perhaps the most important considerations for both the government and citizens in any m-government project. There needs to be data integrity, particularly in relation to loss and theft, as well as transaction audit and transparency. Storage of data is another relevant concern. If users' privacy is not protected when using a mobile service, they simply will not use it again, making it very difficult to achieve critical mass.[20] Users are becoming more aware of privacy issues and are comparing the privacy policies of government sites with those of the private sector. Security is not just about installing the latest security devices and deploying the most modern security technologies. Information security relies on a combination of business, management and technical measures applied on an ongoing basis, towards a "culture of security" as called for by the 2002 OECD Security Guidelines.[21] Privacy and security issues must be addressed in the planning phase, and may impact the timing or selection of a specific type of wireless service. Additionally, privacy challenges for m- services should not be limited only to data protection regulatory compliance. Information privacy refers to attributes that exceed anonymity, *i.e.* anonymity, unlinkability, linkability, undetectability, unobservability, pseudonymity, identifiability. The protection of these attributes introduces legal challenges.

Another major regulatory aspect is interoperability. National public services risk creating new electronic barriers if they opt for solutions that are not interoperable.[22] Such so-called e-barriers fragment the global market and hinder it from functioning properly. The disparate legal landscape across countries often prevents cross-border exchanges of information between state administrations. When such exchanges are allowed, the legal validity of information must be maintained across borders, and personal data protection legislation in both originating and receiving countries must be respected and aligned.[23] Thus, advancing interoperability is an essential requirement for the further development of m-government.

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Chapter 5

Technology options for mobile solutions

Mobile solutions can be constructed in a variety of ways, with diverse choices in terms of networks, channels (e.g. voice channels, signaling channels, data channels) back-end information systems and enterprise architecture, devices and applications. In order to effectively identify and deploy affordable, successful and sustainable mobile solutions, it is critical to have a clear focus on the targeted policy and service delivery goals, and a sound appraisal of available technology options. Technical issues, problems related to security, identity management, broadband connectivity and the integration and interoperability of systems and applications, are all matters that need to be discussed and addressed. Likewise, the development of location-based services, the impact of new trends on the mobile market and of social net-working on mobile service delivery, i.e. *"Mobile Web 2.0", will require adequate attention and will be at the core of policy makers' discussions in the upcoming years.*

Introduction

Mobile solutions can be constructed in a variety of ways, with diverse choices in networks, channels, back-end systems, devices and applications. With a focus on clearly defined service goals, understanding technology options is central to effectively identify and deploy affordable, successful and sustainable mobile solutions.

Voice channel

Although there is much focus on texting, mobile applications and the mobile web, voice remains an important function for mobile communications for many reasons: voice works on all telephony networks and all phones; it has greater capacity for information exchange; voice systems do not require literacy; voice is a familiar and trusted communication channel; and voice systems can be developed easily in multiple or local languages not supported on all handsets.

Voice XML (VXML) – Voice applications can be developed and deployed in the same way that HTML is for visual applications through VXML, the W3C's standard format for interactive voice dialogues between a human and a computer. VoiceXML documents are interpreted by a voice browser, which allow people to access the Web using speech synthesis, pre-recorded audio, and speech recognition and can be supplemented by keypads and small displays.[1]

Commercial VoiceXML applications process millions of telephone calls per day to check orders, get driving directions, use voice access for email, refill prescriptions and many other everyday activities. Infrastructure costs can be high for voice channels, and open source solutions for additional modules, such as text-to-speech and speech recognition, are limited.

Signalling channel

SMS – With its relative simplicity and ease of use, SMS continues to grow in popularity, especially with people aged 15 to 25 and for NGOs and grassroots organisations. Bypassing email and Instant Messaging, text messaging has become an integral part of daily lives across the world. Many communication applications have embedded direct-to-SMS functionality. Governments and NGOs actively use SMS for citizen notifications and engagement, news and weather updates, emergency alerts, healthcare and business support services, and to bridge back to websites.

Downsides to SMS are limitations for people with low literacy or language barriers, costs relative to data services such as GPRS, some security vulnerabilities and fake SMS that can be conducted via the Internet.[2]

For many governments, the use of SMS technology to enhance the access to, and delivery of, government services is popular as a complementary channel to existing Internet-based e-government. For example, in Australia, SMS is used for bushfire alerts in Victoria and notification for public transport timetables in Adelaide. In the Philippines in December 2008, 54 national government agencies were providing SMS services to augment traditional public services.[3] Citizens prefer a technology channel that is more familiar, simple and easy to use; supports their native language; uses a readily available device and infrastructure, and is low cost. SMS has crossed network and technology boundaries, and continues to find new applications, and provides inspiration for industry innovation as IP (Internet Protocol)-based messaging builds momentum. Mobile IM/Presence and mobile email are considered as emerging, but nevertheless "core", mobile messaging applications.

Other person-to-person (P2P) mobile messaging channels, such as voice SMS[4] and video, offer a way to create added value and an improved user experience. For instance, Voice SMS is suited for mission critical situations, where proof of delivery is needed, or for those who can't easily read an SMS, such as drivers, the elderly and the visually impaired. Likely applications for Voice SMS include messaging mobile public workers, particularly out of hours or in emergency situations. The same can be said for the network address book and PIM (personal information management).

USSD – Created specifically for standard GSM devices, Unstructured Supplementary Service Data (USSD) messages are transferred directly over network signalling channels. This is unlike MMS messaging, which is transferred via a wireless data connection. USSD is free, simple, logical, inexpensive and accessible, with great potential for mobile banking, accessing news services, submission services, feedback, voting, and directories. With interactive navigation, USSD is fast and allows for mass usage. However, messages cannot be saved or forwarded, the codes may be difficult to remember, and usage is not always reliable due to session-based timeouts.[5]

WAP – WAP (wireless application protocol) is an open, global specification that empowers mobile users with wireless devices to easily and instantly access information and services, and to interact with government. Small mobile devices commonly use a WAP browser, which accesses websites written in or converted to Wireless Markup Language (WML).

Devices that will use WAP include mobile phones, pagers, two-way radios, smartphones and communicators, from low-end to high-end. WAP provides service interoperability even between different device families. WAP is

published by the WAP Forum, founded in 1997 by Ericsson, Motorola, Nokia, and Unwired Planet. Forum members now represent over 90% of the global handset market, as well as leading infrastructure providers, software developers and other organisations.[6]

With minimal risk and investment, WAP enables operators to decrease churn (customer attrition or loss), cut costs, and increase revenues by improving existing, value-added services and offering new informational services. To fit into a small wireless terminal, WAP uses a Micro Browser, which is a small piece of software that makes minimal demands on hardware, memory and CPU. Some problems have occurred with WAP related to WML scripts and with gateway, protocol and mobile device security.[7]

The influence of IP and mobile Web technologies, including WAP, on the mobile messaging market is significant. Up to now, mostly tourist information or reminder services can be found on this level. The future success of emerging IP-based mobile messaging mediums will depend largely on how they are interwoven with existing services and standards, and interact with the new channels created by VoIP and social web-based communities; *i.e.* the "in-mail" and "public messaging" mediums of Web 2.0. Industry initiatives have addressed the issue of smooth transition from traditional messaging implementation to all IP messaging architecture. The focus is on improving end-user experiences with new mobile device capability and key network functions, such as location-based and presence information.

Data channel: Mobile messaging categories

There are three predominant categories of mobile messaging:

- A2P (application-to-person) – whereby content is pushed to the mobile phone (popular in both the SMS and MMS domain);
- P2A (person-to-application) – also known as "person-to-content", where the mobile phone user uploads content to the network/Web or sends a message to another application (*e.g.* applications such as voting, uploading photos to social network site, etc.);
- P2P (person-to-person) – the exchange of a message between two mobile phone subscribers.

An emerging mobile messaging category is machine-to-machine[8] (M2M), in applications such as telematics and software diagnostics. The main segments and area of usage are fleet and asset management, tracking and tracing, remote maintenance and control, smart metering, POS/payment, and healthcare security/surveillance.

From a technology perspective, there are three different types of mobile messaging user experiences:

- push – the message is sent out to the mobile device automatically (*i.e.* it is "pushed" from the server to the mobile device);
- pull – the mobile device pulls the remote server to retrieve the message (*i.e.* the mobile device "pulls" the message from the server);
- session – whereby a constant connection is established between the sender and the receiver for the near real-time exchange of messages (employed by IM for example).

There are both types of services: Push and Pull of information. Some Push services are aimed at all citizens, while others cater to individual needs.

MMS – Multimedia Messaging Service is mobile messaging similar to SMS for data transfer, but with additional functionality for rich text, video and audio attachments using Wireless Application Protocol (WAP) to access and display the content.

MMS allows for easy bulk-messaging and, combined with mobile Internet connectivity, can be used to drive an audience to social media or a website. However, MMS is not compatible with basic phones, costs more than SMS, and content is not always well adapted. This messaging platform has had issues with transferring malicious software and has lower read and response rates than SMS.

MMS continues to make headway in the consumer P2P market, but is finding more significant success as an enabler of mobile advertising and thus, ad-funded messaging tariffs.[9] From the perspective of public service delivery, MMS may open a whole range of possibilities, for instance in the medical field.

According to Juniper Research, most probably there will be no "big bang" or one "killer app" to catapult the mobile messaging industry to its next phase of development. Rather, the progression will be an evolution of mobile messaging services that play to the strengths and success of current offerings, combined with technology developments that enable mobile network operators (MNOs) to build on existing and stable delivery mechanisms, while gradually introducing IP-based network infrastructure to bridge the mobile/Web divide. The industry consensus is that the economic downturn has yet to negatively impact the mobile messaging market. Indeed, many commentators expect the longer-term impact to be minimal, with overall messaging traffic continuing to grow in many markets worldwide. Messaging, especially SMS, remains an economical method of P2P communication and, therefore, traffic growth is expected to remain strong. Meanwhile, smartphone users, in particular, will continue to drive high usage levels, as more advanced and

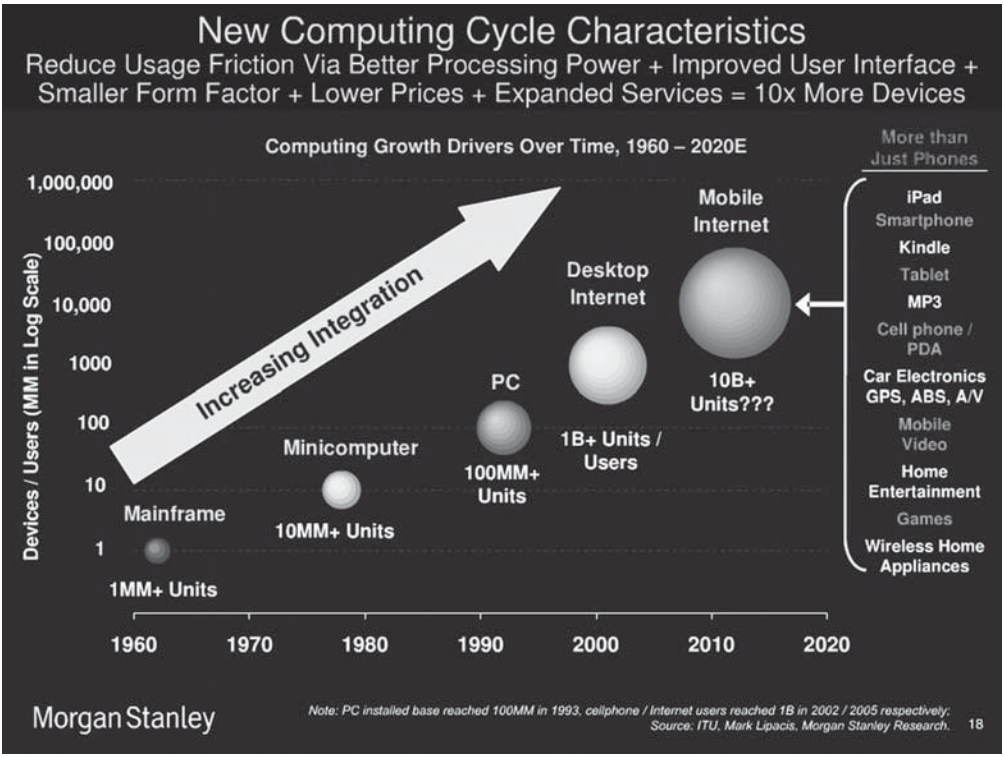
feature-rich handsets reach the market in the increasingly open mobile Web browsing environment.

Data applications and mobile web **–** Data service involves the transfer of data to or from the mobile telephone, now enhanced by the power and speed of 3G and 4G technologies.

According to a 2009 Morgan Stanley report,[10] the proliferation of better devices and the availability of better data coverage are two trends driving growth of mobile Internet. Having better services and smaller, cheaper devices has led to a huge explosion in mobile technology that far outpaces the growth of any other computing cycle, as seen in Figure 5.1.

Mobile web opportunities, with richer content and more complex applications, are expanding in both developed and developing countries. Free and improved browsers and applications are becoming available for lower-end

Figure 5.1. **Characteristics of new computing cycles**



Source: Morgan Stanley, The Mobile Internet Report Setup, 2009.

Figure 5.2. **Strengths and weaknesses of mobile channels**

CHANNEL	STRENGTHS	WEAKNESSES
Voice XML	• Portable voice-activated services • Voice- and phone-enabled Internet access • Fast time-to-market • Open standard • Supports natural language • Less expensive than traditional IVR • Ease of integration	• Limited capability and development tools • Web browsing must be specific • Inability to pause, resume, forward and rewind
SMS	• Simple, easy and convenient • Cost effective • Private communications • Fast communications	• Some security vulnerabilities • Fake SMS (spoofing)
USSD	• Simple and logical • Real-time, fast and responsive • Inexpensive • Harmonious with other technologies • Interactive navigation • Can be used for payments, mass usage	• Session-based timeouts • Codes more difficult to remember than Common Short Codes
WAP	• Minimal risk and investment • Independence from carriers • Based on Internet standards • Easier to maintain and iterate user interface/ design • Streamlined reporting • Good for pushing content • One version across platforms, except iPhone	• Small size of mobile screen • Not as popular as SMS or USSD • WML scripts not embedded in WML pages • Cannot update for offline consumption • Must leave WAP site for video or audio • Slow to update • Not great for user-generated content
MMS	• Direct and personal • Messages can be stored and forwarded • WAP push potential • Segmentation • Interactivity through multi-media • Easy bulk messaging	• Not compatible with basic phones • More expensive than SMS • Content adaptation limited by screen size and resolution variations • Read and response rates lower than SMS
Data Applications	• Self-contained experience • Graphics and user-generated content • Automatic updates and read content offline • Leverages device-native capabilities (camera, GPS) • Strong paid model	• Fragmentation, need to build for multiple platforms, with time and costs • Managing multiple releases • Client side changes • Need to submit app to some stores for approval
Mobile Web	• More economical than mobile apps • Mobile phones and smartphones supported • Mobility for content and services • Mobblogging, with videos and photos	• Less functionality, unable to use advanced phone features such as camera, GPS • Small display size • Low text input and low bandwidth

phones. Using a compressed data format, these browsers are able to perform well on a low-bandwidth link, such as GPRS. A summary of the strengths and weaknesses of mobile channels is provided in Figure 5.2.

Back-end information systems and enterprise architecture

Implementing mobile solutions within an organisation can be viewed as extending enterprise applications to mobile devices. This requires understanding what information can be obtained from which applications, and how it can all be integrated and tailored seamlessly for citizens and for the mobile workforce.

The extension process consists of three primary components:

- the enterprise application (*e.g.* CRM, ERP, supply chain management [SCM], work management [WMS] and Business Intelligence [BI]);
- mobile middleware, with emphasis on security, data synchronisation, device management and support for multiple devices;
- the mobile client application (software running on the device), with emphasis on data availability, communication with middleware, local resource utilisation, and local data storage.

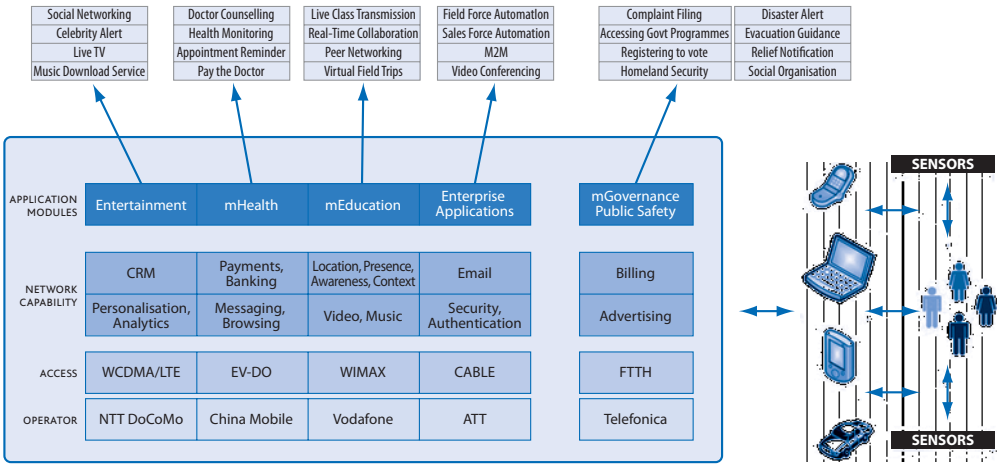
Data exchanges between citizens/mobile workers and enterprise applications may occur in different ways. A good wireless application gateway will operate in all of these modes:

- data is pre-fetched and aggregated on the wireless application gateway;
- data is fetched from enterprise applications on demand;
- data is pushed to the citizen or the mobile worker without a request;
- data exchange takes the form of desktop synchronisation.

Options for device platforms vary, such as online connectivity versus locally installed software and data synchronisation. Because mobile devices cannot display content or interact in the same way as a desktop PC, a user interface should be intuitive and appropriate to the user, job function and mobile device, to promote acceptance.

Decentralised framework – In *Mobile Services Evolution 2008-2018*, Chetan Sharma suggests a long-term mobile services platform with a decentralised framework, adding modules on-demand through Software-as-a-Service architecture. This approach, which is shown in Figure 5.3, can minimise complex integration and accelerate deployment.[11]

Figure 5.3. **Integrated m-services framework**



Source: Sharma, Chetan (2008), *Mobile Services Evolution 2008-2018*, Bellagio, Italy, 13 July-1 August.

Technical issues

The effectiveness of m-government depends upon the capacities of technology, which include the features and functionality of mobile technologies (*e.g.* screen sizes, storage space, processor power, input and output devices); supporting physical infrastructure (*e.g.* technology, equipment and networks); software, applications and systems; and related standards and protocols. The availability of multiple channels can raise issues of interoperability, data quality and transparency of delivery across systems. Essential to technology processes are the security, privacy, and policy structures that guide them.[12]

Governments should also ensure that websites (and website content) are accessible from all possible devices, and to all users. As citizens' use of mobile phones to access the Internet will very rapidly exceed the use of PCs to access the Internet, this fact will have consequences for the way websites are developed, as websites and their content will have to be available on different devices, including mobile phones. According to the World Wide Web consortium (W3C),[13] which is responsible for web standards and web accessibility, there is a significant overlap between making a website and making its content accessible for mobile devices and people with disabilities. In The Netherlands, for instance, the W3C guidelines are integrated in the Webguidelines, a quality standard for governmental websites. With the implementation of these guidelines a website and its content are accessible for all users; as a result, the development of a separate website for mobile users is not always necessary.

Experiences across countries also show that because many websites were not originally developed with the idea they would have to be accessible from various devices, more simplified versions of existing website are now often needed because of the amount and heaviness of the content which cannot be easily accessed via a smartphone. For example, the Dutch ministry of Economic Affairs, Agriculture and Innovation made a special mobile website for businesses, which helps businesses to navigate the tremendous amount of relevant information provided by the Dutch government. At a glance, businesses can see which laws, rules/regulations, licences and taxes apply to them. It also indicates which subsidies they may be eligible for. As part of the Ministry of Economic Affairs, Agriculture and Innovation, "Answers for Business" works closely with the entire Dutch public sector, including ministries, municipal authorities, provincial authorities and water boards, and includes links to the websites of these organisations. Because so many entrepreneurs have a smart phone, "Answers for Business" has developed a mobile site. This mobile version (*http://m.antwoordvoorbedrijven.nl/*) contains a simplified version which helps businesses by providing the most important information about rules/regulations etc. If the answer is not there they can contact the contact centre directly by telephone.

Security and identity management

The growth of mobile usage brings with it concerns about security issues. As the extension to mobile devices increases an organisation's security risks, mobile solutions must effectively balance information access and information protection. Security and identity management are strategically important and should include mobile device security policies, asset discovery and inventory, information security, encryption and authentication, secure coding processes for mobile applications, and ongoing risk assessment, security testing and threat monitoring. Most governments integrate mobile security policies, standards and protocols into their existing information technology policies. Many of the same techniques that help secure wired devices can be applied to portable and wireless technology. With the rapid expansion of Internet-connected devices, security is becoming as important a foundational element as energy-efficient performance and connectivity to define computing requirements. Embedding security into chips may provide new options for secure mobile solutions.[14]

By year-end 2013, location or profile information from mobile phones will be used to validate 90% of mobile transactions, according to Gartner, Inc. Gartner indicates that the rapid adoption of smartphones is forcing banks, social networks and other e-commerce providers to implement the kinds of fraud detection capabilities that have become mainstream with fixed-line computing. Such tools for mobile devices are in early development stages and are not expected to work easily across diverse mobile networks until at least 2012.[15]

Almost 40 countries across the world have implemented legislation establishing standards and validity for electronic signatures. A number of these countries provide electronic signature service and eIDs (electronic identification) through mobile applications. For example, Austria's Bürgerkarte, which is a smart card embedded with an electronic signature and a digital certificate, allows citizens to securely access electronic public services and complete administrative procedures electronically. Sweden and Austria also utilise digital signatures and citizen IDs to enable citizens to access public services through their mobile phones. Finland uses mobile SIM IDs that make it possible for citizens to make secure transactions and may even use the handset as proof of identity at a physical point of sale. In Estonia, mobile digital signature and eID-cards are widely used, with over 90% of citizens having the national ID-card with a smart chip. Card owners can communicate with the government by electronic means through the qualified digital signature. The Estonian ID card can be used for electronic voting through Internet. In addition, since the Estonian qualified digital signature is equal to a handwritten digital signature, it can be used over the Internet when establishing new companies and can be extended to be used to certify transactions even with other countries.[16]

M-Government service offerings will need to make security and privacy a top priority, as very strong security will be required for applications or services that contain sensitive information. Some of the reinforced needs to ensure security are related to the increasing use of mobile signatures – there is a need for additional measures to be taken to identify an individual, so that theft or loss of their phones does not allow an impostor to engage in transactions or access private data via that device – or to the fact that SMS messages can be spoofed today, which could potentially lead to credibility issues related to SMS messages used to deliver m-government.

Broadband connectivity

In the early 2000s, 3G networks brought more clarity, faster transfer speed, broadband multimedia applications and seamless global roaming. Fourth generation mobile technologies, beginning in 2006, offer all-IP packet-switched networks for mobile ultra broadband Internet access, multi-carrier access, and significant enhancements for multi-media access. Each generation of mobile communications has been based on a dominant technology, which has significantly improved spectrum capacity.[17]

3G networks **–** With speeds from 144Kbps to 2.4Mbps, roughly from three times a 56 K dial-up modem to near cable-modem speed, 3G cellular technology brings wireless broadband data services to mobile phones and a web experience similar to a computer broadband connection.

ITU statistics indicate that 3G subscriptions grew almost tenfold in the four years from the start of 2006 to the start of 2010. There were more 3G mobile cellular subscriptions globally by the beginning of 2010 (667 million) than there were total cellular subscriptions globally at the start of the decade (491 million).[18]

Mobile broadband subscriptions are set to exceed 1 billion in 2010, with the largest penetration in Europe (see Figure 5.5).

Box 5.1. **Finnish Mobile Signature**

In an initiative led by the Finnish Population Register (VRK), a department of the Finnish Ministry of the Interior, mobile specialists are helping mobile users in Finland to securely identify themselves and sign for goods and services across a range of public and private sector providers using just their mobile phone.

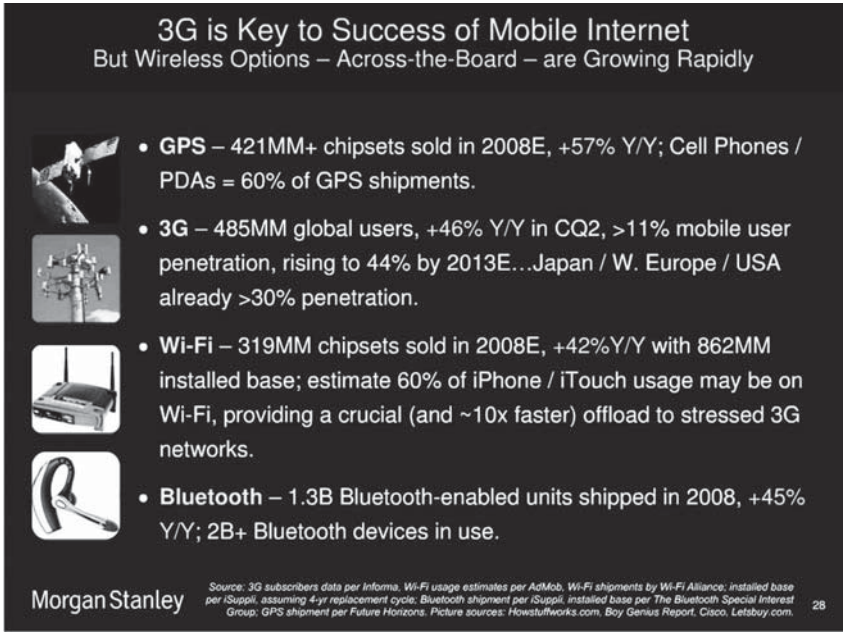
Since 1999, VRK has been responsible for issuing State Citizen Certificates, a national ID card driven by the Finnish Government and seen as an important means of identification within an electronic information society. Now, in the advanced mobile market of Finland, the security functionality contained within these cards (based on the EU Directive for electronic signatures) has been incorporated into the SIM card, turning the mobile phone into a personal trusted device able to remotely authenticate an individual, protect identities and create a legally binding digital "signature". Agreements have been signed with three Finnish operators, including Elisa, who will issue new SIM cards containing the State Certificate to subscribers.

Using the new SIMs in the handset will enable users to access a range of public and private sector services, including electronic banking and government web and mobile services. With their mobile phones, Finns will be able to authenticate themselves when electronically filing tax returns, registering for social security and paying for goods online. Creating a digital signature from the handset may even be used as proof of identity at a physical point of sale.

The mobile phone and SIM card have, by default, become the world's most pervasive smart card/card reader combination. Unlike the existing ID cards (the size of a credit card) that Finns carry around in their wallets, the SIM-based certificates do not require the user to be present when authenticating himself via an independent card reader. In this instance, the handset acts as the card reader, requesting the user to authenticate himself through a PIN code request, and sends an electronic digital signature to the service provider.

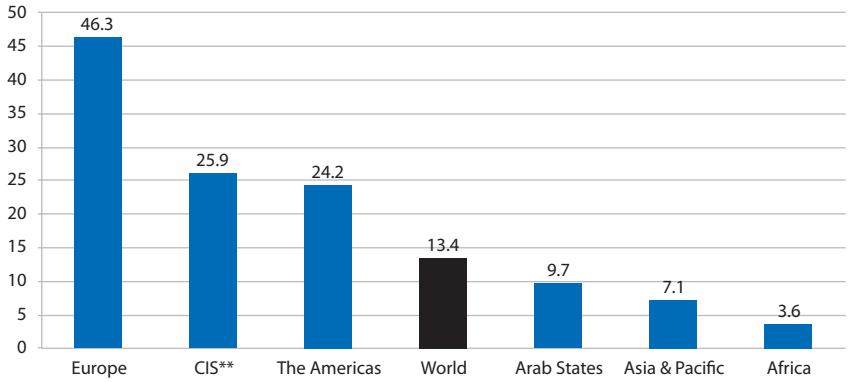
Source: http://digital-lifestyles.info/2005/07/18/smarttrust-provide-sim-based-state-id-to-finland/#ixzz1BgB8tc62.

Figure 5.4. **Growth of mobile Internet**



Source: Morgan Stanley, The Mobile Internet Report Setup, 2009.

Figure 5.5. **Mobile broadband penetration by region, per 100 inhabitants, 2010***



* Estimate

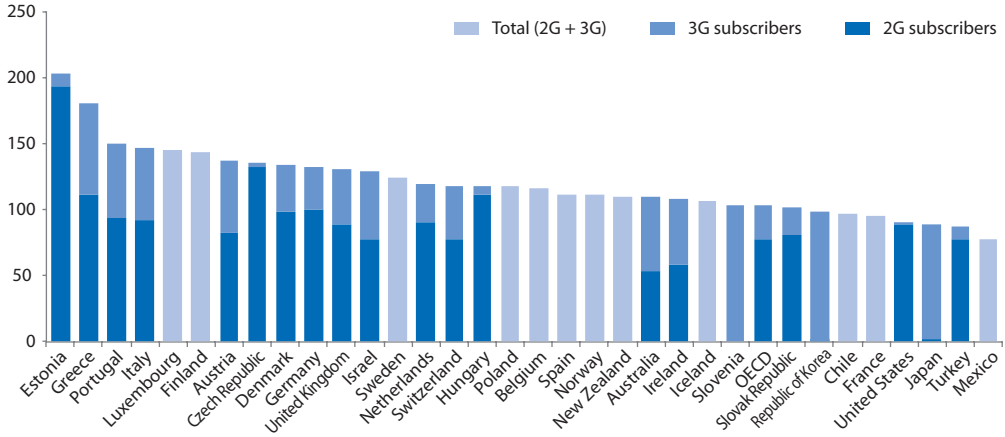
** Commonwealth of Independent States

Note: Regions are based on the ITU BDT Regions; see: *www.itu.int/ITU-D/ict/definitions/regions/index.html*.

Source: ITU World Telecommunication/ICT Indicators database.

According to the OECD, mobile subscription went to 1 billion in 2006 and 1.26 billion in 2009 and grew at a compounded annual growth rate of 4.6% over the previous two years.[19] There were 102.6 mobile subscribers per 100 inhabitants in OECD countries in 2009 (Figure 5.6).

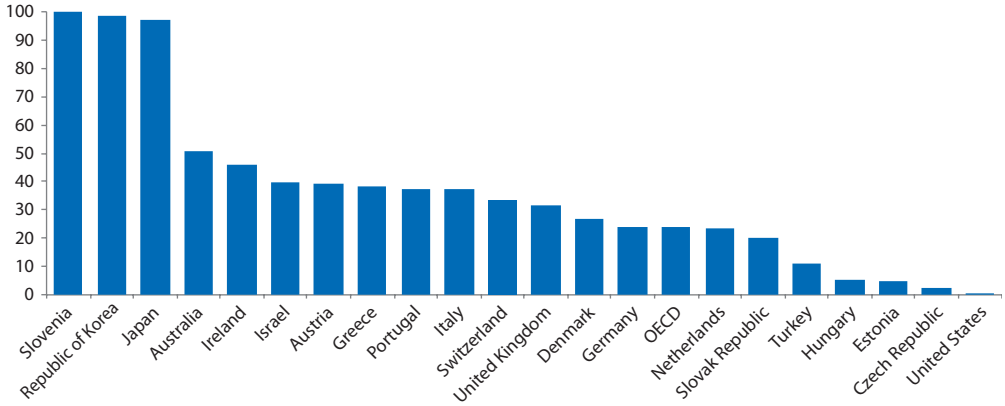
Figure 5.6. **Cellular mobile subscribers per 100 inhabitants, 2009, 2G and 3G**



Note: Portugal's 2G data include both 2G and 3G subscriptions.

Source: OECD Communications Outlook 2011.

Figure 5.7. **3G cellular mobile adoption. 3G subscribers as a percentage of total subscribers**



Source: OECD Communications Outlook 2011.

Moreover, mobile 3G growth is very strong in a number of OECD countries with Slovenia and the Republic of Korea leading with 99% of mobile subscribers with 3G handsets. The main reason explaining the growth appears to be that operators effectively convinced subscribers to upgrade from 2G networks.[20]

LTE – Long Term Evolution is the next step for many already on the GSM technology curve and for others, such as CDMA operators. LTE-Advanced extends the technological principles behind LTE into a further step change for faster mobile broadband and additional innovations. The move from 3G to 4G technology has begun. A number of LTE implementations have been completed and a number are planned. In August 2010, Uzbekistan became the first nation to offer two different LTE networks.[21] Mobile broadband speed influences usage, with faster speeds supporting more widespread take-up.

Integration

M-Government can complement existing e-government applications, or provide new and unique features and functionality to government services. Both efforts require co-ordination and integration at some level.

Primary challenges for integration with existing e-government solutions are how to pull data from a server-side system and how to represent it on the mobile device. This challenge is compounded in older systems. Key considerations include requirements for connectivity, security, data integrity, and devices.

Many governments in developed countries have centralised knowledge bases, CRMs, work management systems, and interfaced enterprise systems to support their customer contact centre operations, web-based services, asset management and performance reporting. As system providers have become less proprietary, governments have moved to open source systems. New mobile application developers are joining the market and mobile web toolkits become readily available, integrating mobile applications technology is becoming less challenging. Developing countries, which lag in their e-government initiatives, may avoid integration barriers and actually have the benefit of up-front planning and co-ordination of their e-government and mobile technology deployment, with the incentive of users who have greater access to mobile devices than to computers.

Because of the prolific usage of mobile telephony, many enterprise systems and many new systems are now including some type of mobile application or, at least, a much greater openness to system interfaces. The popularity and expanding use of Web 2.0 tools and social networking also support mobile telephony as an integral communication tool.

Interoperability[22]

The concept of interoperability has different meanings. The technical definition of interoperability is the ability of software and hardware on different machines from different vendors to share data. A more general definition of interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged. Not only is the ability to share data required, but also the capacity to use the data as relevant information. Both definitions are quite narrow, as they are limited to communication. A broader definition, relevant for m-government and public administration, extends beyond just communication. M-cooperation requires not only technical interoperability (as defined above), but also semantic interoperability: the partners in the co-operation have to give the same meaning to the terms used. In other words, a common framework allowing data to be shared and re-used across applications and institutional and community boundaries is needed, and it must establish syntactic structures for describing data to allow its automated processing. Furthermore, organisational interoperability (the shared information must fit the organisational routines of the participants) and institutional interoperability (the shared information systems must fit into the legal, cultural and professional codes of all participating parties) are also necessary. The requirements of all these kinds of interoperability have to be fulfilled for a successful co-operative deployment of ICT applications.

That is why enhanced interoperability at legal, organisational, semantic and technical levels should progressively lead to the creation of a sustainable ecosystem. This would facilitate the effective and efficient creation of new mobile public services.

At the same time that an exciting landscape for current and future m-government opportunities are being created by the rapid development and diversity of new mobile technologies, the technology itself is outpacing the capacity of governments to respond. Alleviating much of the anxiety for decision making about new technologies, providers and stakeholders in the mobile technology industry are collaborating to develop global standards.

The ITU regulates information and communication technology issues, co-ordinates the shared global use of the radio spectrum and establishes worldwide standards. Since 2007, for example, by co-ordinating the efforts of government, industry and the private sector, IMT-2000 (known as 3G) has more than 1 billion worldwide subscribers. IMT-Advanced systems are mobile systems that include new capabilities of telecommunication services, including high-quality multi-media applications.[23]

Other efforts include the Open Mobile Alliance (OMA), which is also working "to facilitate global user adoption of mobile data services by

specifying market driven mobile service enablers that ensure service interoperability across devices, geographies, service providers, operators, and networks, while allowing businesses to compete through innovation and differentiation". OMA is the focal point for the development of mobile service enabler specifications, which support the creation of interoperable end-to-end mobile services.

Also through the Mobile Web Initiative, W3C and mobile industry leaders are working together to develop best practices for creating mobile-friendly content and applications, enabling easy access to device descriptions, setting up test suites for interoperability of mobile browsers, and exploring ways to use the Web on mobile devices to bridge the digital divide.[24]

Accessibility

Around 10% of the world population lives with disability problems and many more have functional impairments which limit their capability to use mobile phones. These situations are particularly frequent among senior citizens. In order to avoid the creation of new forms of digital exclusion, it is therefore indispensable to adopt solutions that ensure that all users have equal access to m-government services. From a legal standpoint, accessibility of information and communication technologies and services is mandated by the Convention on the Rights of Persons with Disabilities (CRPD) which was signed as of July 2011 by 149 countries and ratified by 103. As a result of ratifying the CRPD, governments should strive to launch m-government services that are accessible to persons with disabilities.[25]

Important categories of impairments addressed by solutions that ensure accessibility include: vision, speech, hearing, dexterity and cognitive impairments. Digital illiteracy, while not classified as a disability, is an important factor in many countries which hinders m-government accessibility. This can be tackled with solutions such as text to speech, screen readers, voice recognition and pictures interfaces, which may be applied to vision or cognitive impairments.[26]

Since the percentage of persons with disabilities is often underestimated, it is essential to ensure that proper demographic analysis is conducted in the country[27] before proceeding with the development of any m-government service. When accessible, mobile services are in fact more useful to persons with disabilities than to any other segment of the population: often, persons with disabilities are isolated due to mobility related limitations. In many countries, they also represent a higher proportion of the population in rural areas than in urban areas. Addressing their needs may also benefit all users at large: 57% of all adult users of personal computers benefit from accessibility features.[28]

Strategies to ensure that m-government is accessible to persons with disabilities include making sure that: *(1)* accessible handsets and services are available to all users who live with disabilities, or are digitally illiterate and that; *(2)* developers of m-government services and web application are aware and trained to develop accessible content and interactive services. Key actions include:

- Working with the Telecommunications Regulatory Authority to ensure that guidelines for mobile operators are in place to make handsets and services accessible to persons with disabilities.[29]
- Promoting among mobile service providers the benefits of accessibility and of offering accessible customer services.[30]
- Involving the Universal Service Fund to enlist its support to cover the extra costs that may be associated with accessibility solutions for mobile users living with disabilities, or digitally illiterate persons, as an additional incentive for mobile service providers.
- Training web sites and mobile applications developers to ensure respect of the Worldwide Web Consortium Accessibility Guidelines.[31]

While developing accessible services does not really increase costs if done at inception of a web site or application development, retro-fitting is often extremely costly and sometimes impossible to undertake. It is therefore indispensable to incorporate accessibility at an early stage of development, as stipulated by Article 9.2.h of the CRPD.

Location-based services

Location-based services, leveraging GPS chips, are emerging as a significant aspect of mobile systems. Mobile industry insiders indicate that enhanced location and location-related APIs will become core offerings of major platforms, whether it is iPhone, Android, BlackBerry or the Web. Eventually, all apps will have location-based functionality built in, as location-based ads become mainstream and brands start to use location-based apps to drive sales and marketing.[32] Some exciting initiatives for location-based services[33] are expansion of free downloads and open tools, shared services, crowd-sourcing to help build community maps, and free software and templates made available to NGOs and other groups for targeted services, such healthcare, to leverage data and mapping for social and economic improvements.

Social networking

Social networking sites on mobile devices and mobile broadband-based PCs now account for a large percentage of mobile data traffic. For example, over 200 mobile operators in 60 countries are deploying and promoting Facebook mobile products, with over 100 million active users accessing Facebook through their mobile devices.[34]

The trend described as "Mobile Web 2.0" or simply "Mobile 2.0" – services that integrate the social web with the core aspects of mobility – is a key underlying factor for m-government services. A basic aspect of m-government devices is that they, in principle, do not approach groups, but individuals. Personalisation is, next to location-based services and contextualisation, the core of m-government. Therefore, the mobile phone is central to the Web 2.0 paradigm, because it is carried with the user at most times (presence), is ideally placed to capture information at the point of inspiration (location), and is a key enabler of user-generated content (UGC) and social Web interaction (collaboration).[35]

Together with the ongoing migration to Internet protocol-based messaging, mobile access to Web 2.0 is driving pervasive disruption throughout the mobile industry ecosystem, significant innovation in services and hardware/software and, crucially, rapid subscriber adoption of the mobile Internet. However, these changes also might result in a gradual proliferation of services being offered to mobile users. In the future, the number and diversity of available services might in itself be a burden, since users may be dissuaded from searching for services they require because of the difficulty of identifying those services most appropriate to their needs. A potential solution to this problem is the introduction of facilities that would automatically identify and generate appropriate service bundles that are tailored to the needs of individual mobile users, and adapt the operation of these services as users' needs change. In the m-government context, for example, a citizen passing a government office may be reminded that the car tax is due next week and needs to transfer the required amount. Depending on the service level and the availability of mobile payment solutions, in the future, this might possibly be transacted via mobile phone.

Because of the technical and physical constraints of mobile, Web 2.0 does not translate directly as "Mobile Web 2.0". Mobile Internet evolution lags behind that of online space by at least five years.[36] Nevertheless, due to the ubiquitous role of mobile technology, its presence as an increasingly integral and invisible part of the lives and social relationships of citizens of all ages, and the increasing significance of wireless data transmission, the trend is clearly building up the mobile information society. Bottom-up and user-driven initiatives are going to spread in an increasingly persistent

manner. Meanwhile, the task of maintaining and learning new technology skills will be all the more challenging. Still, the spread of Mobile 2.0 services is less driven by the technology. They are more of a signal that the industry is moving into a new era, driven by developments such as smartphones, better data plans, and social web.

Many Web 2.0 mobile services combine multiple application features, including geo-location, social networking, user-generated content (UGC), instant messaging[37] and, in some cases, Voice-over-IP (VoIP).[38] This mash-up of application functions and communications channels sets Web 2.0 on mobile apart from previous offerings, and has given fresh impetus to long-hyped services, such as location-based services and presence, albeit as service enablers as opposed to direct revenue streams.

Widely regarded as a collaborative Web 2.0 service enabler, presence provides the basis for a number of mobile applications, including "chat" (chat rooms and/or mobile IM), enhanced/intelligent network-based address books (NABs), and social web communities combining multiple communications channels, such as mobile IM and mobile VoIP, which are launched OTT (over the top) of the mobile browser or client. On the other hand, the types of applications, programming languages and communications protocols that can be executed in the mobile phone environment are far more limited by the constraints imposed by the phone's form factor, processing power and battery life.

Over the past few years, there have been significant advances in infrastructure and end user device technology. Virtually all of these have contributed to opening the door for mass market adoption of Mobile 2.0 services and applications in some way. The deployment of high-capacity network infrastructure is well advanced in developed markets, with some 20% of mobile users having access to 3G services in North America and Western Europe. This will have reached over 80% by 2014, with many having access to next generation technology (4G). Although the absence of high bandwidth services does not preclude the development of mobile services, it does influence the pattern and speed of development.

Open source

Mobile applications present unique usability challenges, and developers should follow best practices. Builders of mobile applications selecting from a range of platforms should determine the target audience, required technology power and the future of the platform. As mobile applications become more competitive and fragmented, some developers are turning to cross-platform open source development solutions. Popular open source tools include PhoneGap,[39] QuickConnect, AppceleratorTitanium, as well as Funambol, appMobi, Core

Plot, Ocify, and Tweetero. A number of mobile operating systems are now open source.

The Open Mobile Consortium is a community of mobile technologists and practitioners working to drive open source mobile solutions for more effective and efficient humanitarian relief and global social development. Their goals are to implement joint mobile solutions in the field, maximise interoperability and data-sharing capabilities between technologies and streamline development, deployment, and use of open source mobile technologies. They share code, standards, plans, progress, and lessons learned.[40]

Next trends on the mobile market

It is becoming evident that smartphones and the associated applications are revolutionising the entire mobile market in a number of ways. Linking the hardware device, the smartphone, to a content delivery platform enables a powerful hardware/content combination. This type of initiative can remove one of the main conundrums within the industry: how to generate revenue out of content. A good example is the US government, which launched a selection of applications that allow smartphone users to access its services while on the move. Accessible through a dedicated website (apps.usa.gov), mobile apps offer a variety of useful tools, from finding the nearest post office to figuring out the UV index in a given city. Most are available as mobile websites, but the government has also been building apps for other major smartphone platforms (*i.e.* Android and BlackBerry).

In addition to this, software trends (like the advent of the open source mobile operating systems), hardware trends, and trends related to touch screens, battery, display, operating systems, the user interface, and design will have an important impact on the development of the smartphone market. Successful advances in hardware may spread rapidly to all smartphone manufacturers. For example, battery life is an issue for everyone, but will be a more serious issue in developing countries where there is little to no electricity, for which reason they will need to rely on solar powered battery chargers. Several important developments in particular will be seen over the next five years:

- Smartphones increasingly will be equipped with HD video recording capabilities. Economies of scale will reduce the cost of this component as more OEM handset vendors will adopt HD video.
- High-end smartphone devices will have dual core processors, with most smartphones having dual core processors by the end of 2012. (With a dual core processor, different applications can be split between the processors, saving on battery life and improving processing speed).

- New form factors are expected to emerge, particularly as smartphone devices become smaller, typically to the size of a standard handset.
- 3D technologies for video and still photos are being developed by several handset manufacturers. This is achieved by mounting two cameras on the device to replicate the distance between the eyes.
- Some last generation smartphones (*e.g.* Samsung's pico projector phone, called Beam, launched in 2010) are expected to be the first of several handsets that are equipped with projectors to get over the problem of limited screen "real estate" inherent in the smartphone device.

The smartphone market also has to be seen within the context of the broader communications hardware market. Perhaps the most important trend is the development of new forms of devices, typified by the iPad. Given the described innovation developments, when designing mobile government services, a mid-term perspective and technology trends outlook should be taken into account.

With the market producing more smartphones and inventing new value-added services, the number of mobile phones that support later technologies

Box 5.2. **Generating innovation**

Bob Hitching noted several "awesome, innovative and disruptive things about mobile", including:

- Long after mobile phones become ubiquitous, we will still buy them because of the continual advancement of hardware, battery life and software.
- A lot of mobile software is written to enable high-end smartphone features in lower price-point mobile phones.
- Apple's Push Notification Service, launched in 2009, allows an iPhone to receive short messages from a server controlled by an app developer. The cost to the sender reduces by a factor of 100, from an average of USD 0.10 for an SMS, to a few hundred bytes of mobile data, average cost around USD 0.001.
- The launch of mobile number portability in large markets, including China, India and Indonesia, will also encourage subscribers to switch and telcos to compete on voice and data pricing.
- 60% of the 421 million GPS chips sold in 2009 were put inside a mobile phone.

Source: www.mitchellake.com/news-item-details/nitemId/87/catId/2.

and the number of mobile phone users who know how to use those technologies are increasing. The readiness of a society for m-government services can be assessed on the basis of three aspects:[41] the maturity of technology; the capacity of service providers; and the level of interest among users. So far, the tendency has been that the public sector approaches new technologies and builds on them once the capability and availability of those technologies has reached a mature status in the private sector. This adaptation process can take a leap forward.

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Chapter 6

M-Vision and a call for action

As citizens across the world increasingly turn to mobile technology as their main source for news, information and connecting with others, m-government is expected to continuously expand. Governments understandably want to reach out to citizens in innovative ways in order to streamline administrative processes, facilitate accessibility and improve the quality of services in a number of areas such as finance, banking, weather emergencies and citizen engagement. The checklist in this chapter provides a preliminary guide to orient governments and help them improve their understanding on how to translate the new trends in the m-government field into a valuable tool to improve their performance, both internally and vis-a-vis the interaction with citizens and businesses.

Reaching the critical mass

As citizens across the world increasingly turn to mobile technology as their main source for news, information and connecting with others, m-government certainly will continue to expand. Governments understandably want to reach out to citizens in innovative ways in order to streamline the administrative process. Despite all the excitement with m-government, one fact is certain: no one purchases mobile devices so they can receive the benefits of mobile government. Entertainment (in the form of games, movies, and audio/video clips), family communications, and commercial applications will remain the main drivers, with governments taking advantage of the evolving trends. By 2018, the number of mobile subscriptions is expected to be almost the same as the number of global citizens, with mobile penetration estimated to be 96%.

Just as laptop sales surpassed desktop sales, texting and data services have outpaced voice communications. In 2007, when the iPhone first hit the market, there were only 500 apps available; today, there are more than 350 000 iPhone apps. Well over 100 000 applications became available for Android operating systems in just the first 18 months.

The device that most experts panned was the adoption of the iPad. According to the experts, tablet computers had failed often enough in the past, and that was before the low-cost netbooks became all the rage. But Apple made everyone take notice by selling over 15 million units in just nine months. After less than a year of sales, over 69 000 iPads had been sold. The iPad 2, with built-in front and rear-facing cameras, is predicted to do even better. It appears the market for smaller and lighter, feature-rich mobile devices will continue to capture consumers' imaginations, as well as create a rather abundant market for second-hand equipment sales. As the technology matures, there is every reason to believe that this market will expand and will extend to less affluent citizens.

In 2008, the District of Columbia, Washington, DC, created the "Apps for Democracy" programme, where citizens were asked to submit ideas and software code for applications that would benefit citizens. There were a number of winning entries, with 47 applications submitted within 30 days. It was reported that the very first submission was from an individual who created a location-aware iPhone application that can identify the locations of crime incidents in the surrounding area, as well as tell the user where the nearest Metro train station is and when the next train will arrive. This may be one of the first programmes of its type to get a sense of what citizens want, as opposed to what government would expect them to need. Moreover, with the new mobile apps technology, there will be much greater opportunities for a wider base of application designers to draw upon. And citizens now have the tools to create apps too.

Today, public safety agencies often struggle to capture data from citizens who send photos and video taken at crash scenes, weather-related disasters, fire emergencies and other at-the-incident locations. What's more, citizens are often at the scene of a disaster sooner than first responders. This type of reporting is further encouraged by the news media. Governments have been rather slow to respond and develop the systems to capture the necessary information and, in turn, transform it into useful and actionable information.

The eyewitness accounts from the past in the form of nervous words or disbelief at a tragic scene can now be replaced with pictures that often contain the exact latitude and longitude, time, and owner of the device in seconds, all automatically. Government agencies that have invested heavily in e-government systems now find themselves facing a new technological and social environment that contains a new set of challenges.

Today there are no less than three types of mobile apps:

- apps that utilise text messaging and perhaps voice-guided prompts;
- apps that are maximised to take advantage of mobile device web browsers;
- apps that are designed specifically for mobile devices, usually in the language of the device operating system.

In the third type, governments are either forced to choose which device to develop an app for, or simply develop different versions for the many types of operating systems, such as Symbian, iOS, Android, BlackBerry, or still others. To reach critical mass, public administrators will need to keep careful eyes on what types of devices are being used by their citizens. Officials also will need to better understand the latest trends and features being used and planned. Since the drivers for mobile device growth are consumers, the equipment manufacturers are vital to what will be made available, at what price, and when. Public administrators and government technologists will always be playing catch-up with the race to have better and more meaningful apps.

There are a number of indicators from today's markets that can provide planners with a view of what most likely will continue to grow upward in the mobile device arena and identify opportunities for government agencies.

An important consideration that planners should take into account at an early stage of development of new m-government services is the accessibility of those services for marginalised citizens, which include persons with disabilities and inadequate levels of digital literacy. As mentioned in Chapter 5, solutions that ensure accessibility exist and are implemented today around the world by regulators and mainstream mobile service providers. Accessibility solutions which benefit users with disabilities and ICT illiterates will

considerably improve the ease of use and the experience of all users, will avoid the creation of new forms of digital divide, and will ensure a greater success for m-government applications and services.

Examples of m-government application in policy areas

Finance and banking

For some time now, online banking has been very popular in many countries. People can pay bills wherever they are by just pushing buttons and either paying by credit card or debiting their personal or business checking accounts. Some of the latest applications allow a user to "cash" a check by simply using the built-in mobile device camera to take a photo of the front and back of a check. They can also look up balances and move funds from one account to another. For governments, this has the potential of becoming a means for paying tickets, taxes, fees, and other service charges. For whatever a government charges for services, the mobile device can be a means of input. Likewise, government agencies can deposit money in citizens' accounts and alert them through a mobile application sent to a mobile device.

While industry players are focused on providing new financial services to consumers, the role of government need not be limited to regulating these new services.

Governments themselves have an essential role in helping drive demand for new mobile financial services through their own programmes, with a special emphasis on Government-to-Persons Payments (G2P), including social transfers (*e.g.* social benefits, conditional cash transfers, vouchers or conditional aid, payments of salaries, pension). Governments can become the largest payer in the country, driving the scaling up of m-services to outreach the critical mass. Delivering these payments via mobile phones would have a significant impact on the daily life of people and on the evolution of the mobile financial services sector, as it would help expand the user base, stimulate collaboration to deal with security and business model challenges, and bring in new revenues for mobile operators, financial institutions and others involved to cover their network, application and service investments.

The device as the payment medium: Near Field Communications (NFC)

One of the newest technologies is called near field communications, or NFC. Many mobile devices already are coming to market with NFC chips installed. This technology will provide citizens with the ability to use their mobile device much the way they use a credit card. This will be particularly useful with transportation systems, where a passenger merely passes his or her mobile device by

a small terminal and the payment transaction is made. NFC can also be used for identification purposes, such as substituting for a physical security card. Since NFC is capable of receiving and transmitting data as well as instant verification at the same time, it functions as a smart contactless card and enables real-time processes and verification. NFC can be used for ordinary shopping, but perhaps it will be used for admission to municipal museums or sporting events. Since there is no physical swipe, NFC-enabled devices can allow for large numbers of people to pass easily through a mobile or fixed point.

Augmented reality

Just as many video games have embraced virtual reality, "augmented reality" is now being used as a commercial layer that sits upon a digitised map. Augmented reality apps used in business applications might include a picture of a street or landmark where signs and active directions are superimposed, letting one know where the nearest metro stop, or nearest coffeehouse or bank, might be. This type of technology makes it particularly easy for people who may otherwise be challenged by following maps to find specific stores or locations. Regardless, it is a more graphically pleasing presentation and has just begun to feature in applications public transportation.

Location-based mapping

As so many new mobile devices include built-in GPS chips, finding a location or knowing where one is located, is becoming a vitally important process. People are spending far less time getting lost and more productive time getting to where they intend to be. Users now have choices of directions for walking, driving, or taking public transportation from one point to another. Thousands of new commercial apps utilise mapping feature (GEO – Tracking chips) which is one of the key elements which enable the provision of critical data through the submission of a message or a photo.

Weather and emergencies

From police activities to earthquakes and fires, mobile devices are being used more and more as primary information platforms for microblogs like Twitter, social networks like Facebook, or other outbound communication applications. Government agencies have taken a lead in storm and forecasting alerts, such as flooding, forest fires, tsunamis, and other natural disasters. So far, the impact of m-government applications is strongest when it comes to utilising social and civic media applications to broadcast information, letting citizens know what to do, or where to go for shelter and help. At the same time, having the ability to receive, interpret, and respond to incoming data can be quite a challenge.

Citizen engagement

For many countries, citizen engagement has become a new means of communicating with citizens for multiple purposes via multiple channels. Examples of citizen engagement are applications in which citizens are encouraged to report on garbage pickup shortcomings, street potholes, flooding, tree removal, graffiti, and other services citizens would have previously had to call or write about. Thousands of new mobile applications have been designed to enable someone to simply pull up a form and fill in the required information – and perhaps add a photo taken with the mobile device too.

In the United States, the Federal Communications Commission established 311 dialling systems. While 911 is by far the most popular, 311 was designated for non-emergencies. Citizens were increasingly frustrated by not knowing who and what government agency to call when they wanted information or wanted to report a problem. Old paper-bound telephone directories, which used to carry such information, have disappeared in many places. Originally, it was thought that people could simply dial 311 on their rotary phones and obtain the advice they were seeking. When 311 systems initially were being planned, mobile phones had not been invented for mass use, let alone the Internet. Today, 311 is more of a description of a type of service, as it now is embedded in many government websites, takes information from mobile phones and other smartphones, with some very sophisticated apps. Photo-taking and report writing now are considered standard features for some of the new citizen engagement apps.

As social media grows and spreads, largely for social reasons, governments have found that they need to be where citizens are, and realise that no single communications solution will be the sole information channel. Public administrations now develop multi-channel communication systems among many different platforms and apps.

Translation

While still somewhat futuristic, a number of translation apps have been developed which suggests that, in the very near future, citizens will be able to type in words and have them instantly translated. What's more, it is only a matter of time for people to be able to speak into their mobile device in one language and have it instantly translated into speech for someone to actually hear and comprehend. This can be of great benefit to public safety agencies that must often deal in real-time emergencies with language barriers and, in general, as global business transactions and interactions expand rapidly.

Crowd sourcing

Crowd sourcing is described as taking a basic task usually assigned to an employee or department, and instead posting either questions or tasks online for a group to respond to, allowing them to provide shared responses, solutions or simply feedback en masse.. Some local governments are experimenting with this type of technology in order to gain greater citizen participation. Crowd sourcing, like many other social media or Web 2.0 applications, was never designed with governments in mind. However, like so many other applications, governments have been able to create hybrid apps that satisfy a civic need. Crowd sourcing, along with mapping, has demonstrated value in emergency situations; for example, in a fire or extreme weather emergency, citizens at the site of an incident submit real-time updates, pin-point locations and provide photos.

Authentication

Reliable identification has never been more of a challenge, especially regarding authenticity and balancing the rights of citizen privacy with the need for government to know who people say they are. Identification documents such as passports, driver's licenses, library cards, institutional ID's, and badges all have some weaknesses. Many governmental bodies have begun to experiment with m-government-designed devices that take advantage of biometrics, iris detection, bar coding, RFID, NFC, where the mobile device serves as the principal form of identification. Advantages include:

- real-time processing, authentication and updating;
- ability to rescind or reject in real-time environments;
- ability for real-time updating;
- reduced overall costs in processing ID cards, etc.

Open data

Open data is becoming a key component of citizen demand and government efforts for transparency, accountability and efficiency. This means greater collaboration with citizens, businesses and other agencies to ensure that shared data is current, accurate and accessible. Mobile platforms, especially with better location precision, are facilitating this transformation. Open data empowers citizens to hold governments accountable for the use of taxpayer money, provides access to important business development information, enables governments to both provide and obtain specific and current information in emergencies, and assists in targeting relevant data for diverse citizen needs, interests and geographic locations. Tracking the use of open data helps governments to identify the priorities of the people and groups they serve,

improving decision making and service delivery through better analytics. For maximum effectiveness, the evolving process for open data should allow governments to focus on what is most beneficial for social and economic development, rather than what is easiest to implement from a technological perspective.

Planning ahead

M-Government offers a new world of opportunities to build smarter and more open governments. This report is intended to identify the most promising avenues ahead, as well as to define a vision for the mobile and ubiquitous government of the future. This requires thinking beyond some of the traditional intellectual boundaries. Government officials examining the fast-moving m-government environment should begin the planning process by asking "why" before asking "how". Each governmental unit may have unique needs, opportunities, limitations and perhaps restrictions. Some limitations may be technical, while others may be administrative or political. Some m-government applications may work in one setting but not in another.

Taking stock of recent experiences, this publication is intended to share best practices and provide some lines of reference, and possible guidance, to stimulate ideas and solutions, and help governments address the challenges associated with m-government development. The checklist below offers a preliminary guide to orient governments and help them to improve their understanding of these most recent trends, and make the most of the new available opportunities to deliver better services to their citizens and businesses. The checklist invites policy makers to focus on four key areas through a set of 17 actions.

A checklist for the future

Better monitoring of m-government development

- Research, evaluate and understand regularly the latest trends regarding new mobile devices, features, and adoption.
  - How many people are using which types of devices?
  - How well do these devices operate, under what conditions?
- Constantly monitor, evaluate and report on the latest trends in new mobile devices, technological advancements and social and civic media applications, in order to prepare a road map for future m-government applications.
  - What are the basic usage trends?
  - What do we know about the people who are most likely to use them?
  - How do they match the government communication goals?

- Begin and continue to experiment with new m-government applications to continuously foster innovation.
- Be aware of and optimise the use of technological innovations that will make it easier and less expensive to deploy new m-government services; and consider interoperability of new mobile public services at legal, organisational, semantic and technical levels.
- Analyse, prototype and evaluate m-government services to understand whether any changes leading to new forms of information or service delivery, and/or access, will be accepted by citizens.

Strengthening the public sector's capacity and enabling an environment favourable to m-government

- Strengthening the public sector's capacities and strategic planning skills. Often, high-level public officials worldwide express concern with the fact that not all civil servants may embrace e-government and/or m-government. Some see these new developments as a threat to their jobs. Governments are concerned with the need to:
  - Develop civil servants' capacity to familiarise with, and effectively manage, m-government applications.
  - Improve internal communications between and among government units in order to better integrate m-government applications.
  - Provide rewards and incentives to increase civil servants' buy-in and adoption of m-government.
- Adopt relevant policies and procedures for the use of the new tools (*e.g.* social media site standards, how these will be used and monitored, what and how performance metrics will be tracked). Without policies and procedures, there is no way to know if a particular programme or service is working or not, or if it is being used as intended.
- Ensure continuous updating of the legal and regulatory framework to make it suitable to m-government (*e.g.* including social and civic media, digital signatures, security, authentication, identity, content, payments, privacy, terms of service). For instance, as many of the new m-government applications are accepting payments, personal information and legal documents, the need increases to ensure that such efforts are covered and supported by national laws and regulations.
- Provide clear guidance to government departments on issues related to privacy and security. From a technology perspective, as the use of wireless communications to access government services for both citizens and public servants will increase, privacy and access to

information will be an important challenge and additional security will be required (*e.g.* user authentication is an important challenge to address fraud in the case of lost or stolen mobile devices).

Seizing the potential of m-government to foster open, responsive and transparent government and citizen engagement

- Secure government agencies' responsiveness to citizens' expectations in terms of accountability, transparency, and improved delivery of public services. This implies adopting policies and procedures for managing citizen expectations. Citizens using the latest mobile devices and gadgets have high expectations for service availability and responsiveness. This would certainly extend to any new m-government offering. Any m-government service should be planned fully and tested well in advance to ensure that the system works as it is supposed to.
- As m-government is now becoming firmly entrenched into an increasing array of government business and administrative functionalities, more is needed by way of research, best practices, training, and mutual peer learning. Identifying, reviewing and disseminating best practices for citizen engagement applications will help civil servants and policy makers to spot what other agencies are doing, what works and what doesn't work, and why it is beneficial in determining innovative and relevant applications. There is a need for international organisations such as the ITU, OECD and DESA to continue to collect and disseminate best practices from countries worldwide.
- Expand and implement citizen engagement opportunities through web-based applications, which will benefit governments and citizens.
- Continue researching the topic to identify best practices regarding technology applications, training and citizen satisfaction.
- When building a new website ensure it is accessible to citizens from a technical standpoint and in terms of content.

Developing and adopting broader strategies

- Leverage the increased use of smartphones and other mobile devices throughout society, as this will produce a significant impact on m-government.
- Be aware of the need to adopt different strategies (i.e. an infrastructure strategy, a service delivery strategy – based on users' needs assessment – and an organisational change strategy).

- Continue to innovate and experiment with new mobile applications.
- Ensure that the input of a few, however well-intentioned, does not replace the will of the many. Systems and safeguards will need to ensure that a "digital mob scene" does not substitute for democratic values and institutions. Regardless of m-government adoption rates, there will remain a significant part of any given population that will not have the resources or understanding and will thus require alternate ways to communicate with government. M-Government policy actions should therefore try to avoid widening the digital gap.
- Raise national awareness of the need to invest in the development of broadband availability and emerging technologies.
- Strengthen public-private partnerships in line with the trends that have emerged in many countries worldwide, where government agencies are working with private companies to develop applications that will have market appeal to be sold and adopted by others. Partnerships with global mobile suppliers/providers are key to the success of m-government for functionality and cost reduction/funding. The main advantages of this type of relationship are:
    - Upfront start-up costs can be amortised among a larger pool of users;
    - Governments lacking in technology application development expertise can turn to those who do have the expertise and can be held accountable for their work.

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Annex A

M-Government projects compendium

G2C – Government to Citizens

1. Information and Education Services (Push services)

*General information for citizens (*e.g. *weather, tourism, recreation, contact information)*

► Wireless Portal of the Government of Canada

Country: Canada

www.m4life.org/proceedings/2005/PDF/42_R355CN.pdf;
www.parl.gc.ca/common/index.asp?Language=E;

A service designed for the public, available by cell phone, to access the Member of Parliament directory service; clients simply punch in their postal code on the wireless device to obtain the up-to-date contact information for their MP, etc. As years pass and MPs change or change location, this service keeps citizens in touch with their representatives. Moreover, this wireless portal of the Government of Canada provides airport info, passport services, etc. These are made available through cell phone menus.

► Mobile Information Gateway

Country: Bahrain

www.ega.gov.bh/downloads/resources/Strategy-English.pdf

The Mobile Gateway will provide selected information services for visitors to Bahrain, like National Contact Centre numbers, selected hotels and restaurants available in Bahrain, places to visit in Bahrain, regulations for visitors in Bahrain, etc. (P.168)

► E-Government Gateway

Country: Turkey

www.aradiom.com/QuickGovernment/mobile-governmentmgovernment-city-municipality.htm; www.prlog.org/10368698-turkeyreleases-aradioms-m-government-application.html;

www.aradiom.com/index.html; https://www.turkiye.gov.tr/bilgilendirme?konu=mobil

m-government (mDevlet), a new mobile application developed by Aradiom (Aradiom Mobile Framework™. QuickCity- Mobile Government) for Turksat (Turkey's e-Government Gateway operator) enables citizens to access government services from their phones (such as traffic flow with live camera support; city maps with zoom features; ferry, bus, metro schedules; guide to city services; etc.).

► Mobile Portal of the Government of the Republic of Korea

Country: The Republic of Korea

http://m.korea.go.kr/mbl/searchmgr/main.do#

A service designed for the public to access information provided by Korean Government. This mobile portal of the Government of the Republic of Korea provides information on not only policies, laws/regulations, statistics and URL of the public organisation but also lost and found, missing people. Also the dictionary for officialise, tour information for around 130 countries and the applications developed by the public sector are provided. This service is made available to iPhone, Android phone and Window Mobile phone.

► Information service on government offices

Country: Spain

Most of the major ministries, regional governments and local councils have a mobile version of their web sites. These sites offer basic information about their powers, services offered, organisation, press releases. Examples of these mobile versions of e-government websites are:

Ministry of Economy and Finance: www.meh.es/Movil/

Ministry of Industry, Tourism and Trade: www.mityc.es/movil/

Govern de les Illes Balears – Government of the Balearic Islands: www.illesbalears.cat/mobil/index.do
Local Council of Madrid: www.madrid.mobi/mobi

City of Castellón: www.castello.es/wap

Local council of Zaragoza: www.ayto-zaragoza.mobi

An advanced version of these kinds of sites for mobile devices is the application for iPad/iPhone developed by the Regional Government of Madrid. This application allows you to locate on a map geolocation service and government offices of the three levels of government in the region, positioning them so on the location of the city. In each of the offices offered their activities, schedule, responsible bodies and other useful information. Within the map also the public transport network is overlapping in order to facilitate access to service points for citizens.

The regional government of Castilla-La Mancha has also developed an application for Apple devices, in this case only for iPhone. It is worth mentioning the case because, unlike the case mentioned above, there is a version of the same for Android devices. The need for developing different applications depending on the mobile device is one of the great problems of the splintering of the Internet and breaking the unique web interface model.

In the area of vertical services, the city of Zaragoza has a pollen alert service in the city. The citizen subscribe by sending an SMS to those plants whose pollen activity he wants to be informed and receives the alerts of significant activity levels. Full details of the service: *www.zaragoza.es/ciudad/aprovecha/movil/diaria.htm*

Information on transport routes is another area of mobile application development in electronic public services. There are applications for Apple or Android devices of transport networks in large cities, but we highlight the value of a medium-sized city such as Murcia, which has made available an application for Apple mobile devices with information on its bus network.

► MiaPA: your voice to enhance PA

Country: Italy

www.innovazionepa.gov.it/comunicazione/notizie/2010/ottobre/25102010---innovazione-brunetta-presenta-miapa.aspx

www.innovazionepa.gov.it/media/596293/presentazione_miapa.pdf

www.lineaamica.gov.it/

Launched in October 2010, MiaPA is an innovative service accessible by smartphone (trough a free app) or PC which enable citizens to: *(1)* find public offices addresses, deploying geo-localisation; *(2)* give assessment of the services; *(3)* share comments with other citizens leveraging on a social check-in paradigm. This initiative combines mobile with open government, since the database of public offices addresses are covered by the first Italian Licence for Open Data – Creative Commons allowing for re-use of Public Sector Information.

*Specific information (*e.g. *scholarship decisions, exam results, tax notifications, renewal notifications)*

► MyeCitizen SMS Alerts

Country: Singapore

www.ecitizen.gov.sg/mobile/index.html;

www.gov.sg/;

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEDEVELOPMENT/0,,contentMDK:21180737~menuPK:3320268~pagePK:210058~piPK:210062~theSitePK:559460,00.html

Subscribers can receive timely and personalised SMS alerts and notifications for the following services: CPF account alerts and notifications; Passport Renewal; Road Tax Renewal; TV (Household) and Vehicle Radio License; URA Parking Offences and Season Parking; etc.

► Use of SMS to deliver tax information to citizens

Country: China

http://mobility.grchina.com/index.htm;

http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan034655.pdf.

Taxation Department in Beijing uses SMS to deliver information about tax collection.

► SMS notification for tenders and job information

Country: Oman

http://iisit.org/Vol6/IISITv6p817-824Naqvi678.pdf;

www.omanet.om/english/history/sultan.asp?cat=hist;

www.ameinfo.com/57665.html

Oman's Tender Board and Ministry of Manpower send notification messages to clients about their transactions and/or other issues such as new tenders and job vacancies, etc.

► SMS with exam results, scholarship decisions, etc.

Country: Hungary

www.e-government.hu/digitalcity/domainstart/urb_domain.jsp?dom=AAAAGCAI;

www.e-magyarorszag.hu/;

In Hungary, students receive exam results and scholarship decisions, and parents receive notices on students' absences from school, via SMS.

► "M-Government Initiative" in Malta

Country: Malta

www.gov.mt/newsletterarticle.asp?a=38&l=2;

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEDEVELOPMENT/0,,contentMDK:21180737~menuPK:3320268~pagePK:210058~piPK:210062~theSitePK:559460,00.html

The government of Malta in 2003 launched an "m-government" initiative: providing examination results by SMS. Other applications include notifications of court deferrals to clients and their lawyers, and sending renewal notifications for trade licenses.

► Cafe of Invention

Country: The Republic of Korea

www.kipo.go.kr/kpo/user.tdf?a=mobile.menu.MenuApp

KIPO (Korean Intellectual Property Office) launched "Invention Café" in December 2010 that provides patent information. A list of patents, terms for Intellectual property, news, information of policy and patent fee, etc… are available via smartphone. Specifically, the list of patents has recorded about 12,000 hits since it started the service in October 2010. These are made available through the iPhone.

Emergency alerts

► SMS Security warnings in case of security threat

Country: UK

http://travel.state.gov/travel/cis_pa_tw/cis/cis_1052.html;

http://unpan1.un.org/intradoc/groups/public/documents/CAIMED/UNPAN028992.pdf

Security warnings sent to all mobile phones in a certain area of the city (London) in case of security threat.

► DMH PROTÉGÉ- SMS broadcasting system to send alert messages to citizens

Country: Mexico

www.cft.gob.mx/en/Cofetel_2008/idioma;
http://smsegov.info/images/smsegov.pdf

In Mexico City, the SMS broadcasting system sends alert messages to citizens in the district regarding meteorological and high rain risks, low temperatures, potential disasters, and emergency locations as well as contact numbers.

► SMS notifications during the SARS outbreak

Country: Hong Kong, China

www.textually.org/textually/archives/2004/01/002758.htm;
www.immd.gov.hk/ehtml/20040120.htm

In Hong Kong, China, SMS were sent to some 6 million mobile phone users during the SARS outbreak to keep them calm and reduce fear.

Education (learning using a mobile)

► Text2Teach

Country: The Philippines

www.apecdoc.org/trackbacks/12/6093;
www.gsmworld.com/documents/mLearning_Report_Final_Dec2010.pdf

The Ayala Foundation convened the Text2Teach (T2T) Alliance – consisting of Ayala Foundation, the Department of Education, Globe Telecom, Nokia, SEAMEO INNOTECH, PMSI-Dream Satellite, and Chikka Asia – to roll out T2T in the Philippines in 2003. T2T allows teachers to download short videos to a mobile device and screen their classroom. The project was originally satellite-enabled education equipment consisting of a machine called a Media Master, a television set, and a mobile phone. However, the T2T technology has since upgraded from this satellite-based delivery to a full cellular platform, using a 3G-enabled device such as the Nokia N95 8GB and N86 8MP, equipped with an application called Nokia Education Delivery (NED). NED makes it easier for teachers to select and download video clips to be used in their day-to-day lessons.

2. Interactive Services

Security services (report a crime; law enforcement)

► Police notices sent to stolen mobile phones

Country: The Netherlands

http://articles.cnn.com/2001-03-28/tech/SMS.bomb.idg_1_handset-subscriber-identity-module-mobile-phones?_s=PM:TECH;
www.politie.nl/English/

In the Netherlands, repeated police notices are sent to stolen mobile phones. After a user reports his GMS handset stolen, the police start sending out one Short Message Service text message to the phone every three minutes: "This handset was nicked, buying or selling is a crime. The police."

Filing claims, reporting a problem

► The Lead PNP SMS Project

Country: The Philippines

www.philstar.com/Article.aspx?articleid=517510

The Philippine National Police will launch a short messaging service (SMS) system that will enable police officials nationwide to receive daily management tips, operational instructions and even birthday greetings from the office of PNP chief Director General. The system will make use of the present OCPNP (Office of the Chief PNP) SMS Center to receive feedback and complaints from the public. As such, the new system will entail no additional cost to the PNP. It has been shown that an informed leader is an empowered leader. As such, efforts should be made to provide key leaders with essential information, guidance and direction that will help them connect their operational activities with the strategic goals of the PNP.

► "iBurgh" application: Open Government Data

Country: USA

www.post-gazette.com/pg/09230/991552-53.stm;

http://appshopper.com/utilities/iburgh;

www.headstar.com/egblive/?p=250

Citizens can use the "iBurgh" application to photograph problems around the city, add a description and send the information to the council's complaints department. As the photos are automatically "geo-tagged", council officials can quickly locate the problem site.

► Lokvani – "The Voice of the people" – an innovative model of Citizen Service Centers (CSCs)

Country: India

indiagovernance.gov.in/download.php?filename=files/Lokvani.pdf;

http://unpan1.un.org/intradoc/groups/public/documents/UN/unpan037362.pdf

Citizens can register and then track the status of their petition via a nearby Kiosk center. The complaint is then transferred to designated officials, who can read but cannot modify it. It has many unique features including one which enables citizens to follow the movement of their complaint with the help of a mobile phone (IVRS and SMS).

► Using mobile devices to file complaints

Country: Malta

www.egov4dev.org/transparency/case/eccsmalta.shtml;

www.eccnetmalta.gov.mt/home;

www.epractice.eu/en/document/288319;

www.gov.mt/

In Malta, citizens and business can use their mobile devices to file complaints about government agencies' actions, or inactions.

► Mobile reporting of illegal waste deposits

Country: The Philippines

www.ncc.gov.ph/files/sms_report0610.pdf

In the Philippines, services being offered can be as simple as accessing information; sending complaints, comments, or recommendations; or as specialised as reporting crimes or paying taxes. One such service is illegal waste deposits reporting via mobile.

► The DMH ESCUCHA- the SMS channel for the district mayor

Country: Mexico

www.cft.gob.mx/en/Cofetel_2008/idioma;

http://smsegov.info/images/smsegov.pdf

Citizens of Mexico City can bring their concerns directly to the president or mayor by sending messages such as complaints about government services, projects, or officials; opinions about new policy; enquiries about new programmes; or reporting about corruption.

Employment services

► Job seeker SMS service- CELEPAR

Country: Brazil

www.celepar.pr.gov.br/;

www.brasil.gov.br/para/worker/work-job-and-income/jobseeker2019s-allowance/br_model1?set_language=en;

http://lists.w3.org/Archives/Public/public-mw4d/2008Oct/att-0026/PDF-Presentation-M-GovBrazil.pdf

Job seekers in Brazil have to register his/her skill at the State Agency. When a new position is available and the job description matches, a SMS message is sent. He/she has 24 hours to show up for an interview.

► Jobs openings via SMS

Country: Sweden

www.statskontoret.se/in-english

There are other areas of the employment services that are better tailored to the mobile phones. One service is that it is possible to subscribe to information on job postings that match the profile of "the type of job I'm interested in". Hits will be emailed or SMSed. Another service is that mobile phone numbers for SMS can be published in the job seeker's CV so that job provider can get in touch via SMS. Also, SMS are sent to a pool of registered workers who are willing to work as temporary.

► Job Hunt System

Country: The Philippines

http://unpan1.un.org/intradoc/groups/public/documents/Other/UNPAN024834.pdf;

www.phil-job.net/index.php?action=faq;

http://smsegov.info/images/smsegov.pdf;

www.dole.gov.ph/

The Department of Labor in the Philippines provides a service to job seekers which sends information via SMS on both domestic and international employment opportunities.

Information inquiry services

► The SMS-based vehicle detail system

Country: Indonesia

http://bnp-indonesia.com/VMS_Details.htm;
http://smsegov.info/images/smsegov.pdf

In East Java, Indonesia, the SMS-based vehicle detail system enables citizens inquire about a vehicle (tax, model, and owner) by sending the vehicle registration number. The system obtains an accurate position from the satellite-based Global Positioning System (GPS) operated by the United States Department of Defense, which provides world-wide 24-hour coverage from a system of high orbit satellites. The communications link for transmitting position information from the vehicle can be via radio (HF, UHF, VHF, Trunked radio), cellular telephone, or satellite link, whichever suits the application or environment.

► Tourist information through mobile phones

Country: Estonia

www.mgovworld.org/PractitionerViewPoint/hannes-astok-member-of-parliament-former-deputy-mayor-city-of-tartu-estonia

In the Estonian city of Tartu, visitors can get tourist information through their mobile phones.

► Municipal Transport Company of the Cities of Madrid, Zaragoza and Malaga

Country: Spain

www.emtmadrid.es/

The Municipal Transport Company of the City of Madrid offers real-time information on its bus network. Sending an SMS stating the code of the stop and the bus line number, is answered with the approximate waiting time until the arrival of the next bus. A similar service has been deployed by the Municipal Transport Company of the City of Málaga.

The City of Zaragoza has deployed a similar service for municipal bus network described in cases of Madrid and Malaga. Additionally, to improve mobility in private transport, it has developed an appealing application for Apple and Android devices to visualise traffic conditions

in the locality, which allows drivers to choose the best route to travel between two points in the locality.

The Network of Public Airports (AENA) facilitates real time information on takeoffs and landings at airports in Spain to mobile devices of any kind. This information is accessible on WAP technology.

3. Transactional services

► Electronic Benefits Transfer (EBT)

Country: USA

www.homelandcouncil.org/pdfs/digital_library_pdfs/delivery_of_benefits_in_an_emergency_ibm.pdf

During the Katrina Hurricane in New Orleans, some remarkably successful relief efforts were identified. Using its existing electronic benefits transfer (EBT) infrastructure, the Food and Nutrition Service in the U.S. Department of Agriculture worked with state governments and private EBT vendors to deliver USD 907 million in emergency food stamp benefits to 2.3 million households. The American Red Cross provided emergency financial assistance to over 4 million survivors, amounting to some USD 1.5 billion cash, checks, and electronic benefits, by April 2006.

The EBT Council began in September 1995 as an organisation composed of federal agencies, states, merchants, payments networks, financial institutions, and other EBT service providers, including consultants and processors. The federal government, through the Office of Management and Budget, encouraged these stakeholders to meet in a deliberative group to develop operating rules for the electronic delivery of government benefits, including food stamp and cash benefits. Currently all states and the District of Columbia offer statewide EBT programs, and 40 of these use the rules developed by the EBT Council, which is now known as the Electronic Benefits and Services (EBS) Council. Electronic Benefits Transfer was a critical means of delivering assistance to hundreds of thousands of people in the aftermath of Katrina.

► Dowa Emergency Cash Transfer Project (DECT)

Country: Malawi

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.114.9379&rep=rep1&type=pdf

www.wahenga.net/node/797

The Dowa Emergency Cash Transfer (DECT) project was designed and implemented by Concern Worldwide Malawi, as a humanitarian response to a localised food and livelihoods crisis in Dowa District in Central Malawi. DECT aimed to provide cash transfers to 11 000 needy households for five months (December 2006 to April 2007) to enable them to cover their "missing food entitlement" (MFE) through food purchases. DECT also aimed: (1) to develop and test innovative modalities for delivering cash transfers, including mobile banking and the use of technology (smart-cards and biometric recognition) for beneficiary registration and verification; (2) to explore market responses to cash transfers in rural areas.

DECT incorporated several innovative design features that had first been devised by Concern Worldwide for its Food and Cash Transfer (FACT) project in 2005/06. These included linking the cash transfer level each month to the local price of food, to protect poor purchasers of staple foods against extreme price rises; and adjusting transfer payments by household size, as this *per capita* approach ensured a more equitable access to food than a uniform payment per household.

Taxes and other payments

► SMS based services for Challan status enquiry

Country: India

http://tin.nsdl.com/;

www.mgovworld.org/News/income-tax-department-of-india-launches-sms-based-services-for-challan-status-enquiry

Tax Information Network (TIN), hosted by National Securities Depository Limited (NSDL) on behalf of Income Tax Department (ITD), offers a facility to verify whether banks have correctly uploaded the details of tax deposits to ITD through SMS. The tax payer will get the information against which TAN/PAN the payment has been accounted with the confirmation whether amount entered is matched or not. There will be special charges for these SMS. These charges may vary from one mobile

service-provider to another. The charge structure can be obtained from the concerned service-provider.

► SMS Claiming Tax Credits

Country: Ireland

www.ireach.ie/failid/ireach_booklet_2007.pdf

An SMS enquiry in Ireland allows citizens to claim tax credits and request a number of tax forms and information leaflets via SMS. Citizens send a message to a dedicated number (51829) including their personal identification and a relevant service code.

► Comprehensive Tax Services

Country: The Republic of Korea

m.nts.go.kr

Through the Home Tax Service, tax payers in the Republic of Korea can check their mobile phones to see what has been filed electronically by their agents on a real-time basis. Home Tax Service users subscribing to electronic billing service can retrieve billing information such as tax items and the amount from the day of billing to the due date of payment. The amount of tax return, left uncollected by tax payers for the last five years, can be retrieved and by entering the business registration number on mobile phones, citizens can retrieve the business type and operation status.

► National Tax Agency sends SMS

Country: Spain

https://www.agenciatributaria.gob.es/AEAT.sede/tramitacion/ZN01.shtml

The National Tax Agency sends SMS alerts to various citizens regarding their tax obligations (statistics on the use of this technology are available on the website of the National Tax Agency). Based on this technology, the Agency has developed a simple system to make the annual tax return. The citizen can ask to be sent by SMS a code that allows you to view a draft of his tax return and then confirm whether he agreed with it. In 2011, in the first two days of campaigning they have been confirmed over 160,000 drafts using this service (official data in the near future on the statistics will be made available online).

► Payment gateway for services in the Basque region

Country: Spain

www.tecnimap.es/es/portal.do?IDM=28&NM=1

The Spanish governments of the different tiers have electronic payment gateways. These gateways integrate financial institutions with e-Government services that require payment of fees by citizens or businesses. There are specific face-to-face services (*e.g.* traffic fines, taxes and customs ports) that could be benefit from e-payment solutions. For this purpose, the Basque regional government has developed a mobile application (Android and Windows CE) device that allows the collection of fees remotely on face-to-face services, integrated with the payment gateway for e-government services. This solution was awarded in 2010 at the national event on Information Technology in Public Administration, TECNIMAP.

► Ticket payment online

Country: Spain

www.malaga.eu/

The Municipal Transport Company of the City of Málaga since 2008 offers the possibility to pay your ticket using your mobile device. There are two versions of the service, an operational one based on the use of SMS and another pilot version using NFC technology.

Booking appointments

► Telephone Booking Service

Country: Hong Kong, China

www.gov.hk/en/residents/immigration/bdmreg/marriage/bookgivingmarriage.htm;

www.gov.hk/en/residents/immigration/traveldoc/hksarpassport/booktraveldoc.htm

In Hong Kong, China, SMS is used to book appointments at document and marriage offices. Besides the online appointment booking service, citizens can make an appointment for giving of notice through the 24-hour telephone booking system. To use the telephone booking service, users dial (852) 3102 3883 using a touch-tone telephone.

► SMS rescheduling an appointment

Country: Malta

http://e-healthsolution.com/Malta.aspx

This service offers also various electronic methods of notification and reminders to the patient such as text messaging (sms) and e-mail. It also provides the means for the patient to manage his own appointments through an electronic facility for rescheduling and cancellation of an appointment.

► Booking medical appointments

Country: Spain

www.castello.es/

The City of Castellón deployed in 2008 a service for medical appointment for the hearing impaired using SMS. The service allows disabled citizens to make an appointment at the Hospital of the town by using the mobile device.

► Vivifacile: services for school and motoring

Country: Italy

www.vivifacile.gov.it/

https://scuolamia.pubblica.istruzione.it/

https://www.ilportaledellautomobilista.it

In the framework of an overall strategy regarding convergence and multichannel approach, Italian government has been developing in the last years several initiatives, more recently (2010) integrated in a single portal "Vivifacile" which provide a multichannel service delivery (including web, email, phone and SMS messaging). Two main areas of services are fully enabled so far:

- ScuolaMia (School services): services concerning, on the one hand, the relation between family and the school, such as digital report, communications relating to school life of students, booking appointment with teachers and notification to parents, in real time, by SMS about the absence of students; on the other hand, services concerning organisational matters (see example for G2E).
- Portale dell'automobilista (Driver's Portal): services related to driver license, on line payment, data consultation about vehicles, status of

procedures and registrations of vehicles. To access the drivers portal, the ministry of transport and infrastructure has also developed an application for iPhone (“ iPatente”).

Transportation services (buying train tickets; paying for a car park with SMS)

► SMS Parking Payments

Country: Estonia

www.tartu.ee/data/Mobilepercent20servicespercent20inpercent20Tartu.pdf;

www.mgovworld.org/PractitionerViewPoint/hannes-astok-member-of-parliament-former-deputy-mayor-city-of-tartu-estonia;

In the Estonian city of Tartu, 50% of parking payments are made through mobile devices.

► SMS Public Transport Tickets

Country: Finland

www.vr.fi/en/index/junaliput/liput/matkakortti_hslalue.html;

www.hel.fi/hki/HKL/en/Etusivu.

In Finland, SMS tickets can be used for Helsinki’s public transport system. These tickets can be ordered by sending a text message, and the user is billed through his or her regular mobile phone bill. The ticket itself is also delivered to the commuter by SMS.

► SMS Rail Ticket

Country: Austria

www.orange.at/Content.Node/presse_englisch/press_releases/press_releases/20040929.de.php;

www.nfc-forum.org/resources/presentations/Christoph_Koessler_Mobilkom.pdf;

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEDEVELOPMENT/0,,contentMDK:21180737~menuPK:3320268~pagePK:210058~piPK:210062~theSitePK:559460,00.html.

In Austria, train e-tickets can be purchased by passengers before boarding the train.

► Gozo Channel SMS Notification

Country: Malta

https://mygov.mt/portal/(o10pxlvmjbarbc55w5d1i445)/webforms/faqs.aspx.

This service provides an automated notification about: *(a)* changes in the trip timetable due to weather conditions, service diversion from Cirkewwa to San Maison or any unforeseen circumstance; *(b)* the recommencement of service following a cancellation; *(c)* reminders about seasonal timetable changes; *(d)* information about promotional schemes and travel incentives; and events happening in Gozo.

► Trenitalia mobile

Country: Italy

www.trenitalia.com/cms/v/index.jsp?vgnextoid=e5b343c296a3e110VgnVCM1000003f16f90aRCRD

Trenitalia developed several mobile application to access the services, the main are Prontotreno and mobile.trenitalia.com:

- Prontotreno is the new service to download into all "java" mobile phone to see timetables, buy tickets, make booking changes and check on punctuality.
- Mobile.trenitalia.com is a web based service that allows to buy train ticket, change booking, get information on timetables and train punctuality, directly from mobile phone with an Internet connection.

Signing transactions with mobile signatures

► Access Public Services via Mobile Digital Signatures

Country: Sweden

www.ireach.ie/failid/ireach_booklet_2007.pdf;

www.sp.se/en/digitalsignature/Sidor/digitalSignaturesFAQ.aspx;

www.symantec.com/connect/articles/digital-signatures-and-european-laws

Citizens can use their mobile phones to access public services via digital signatures and unique IDs. A mobile channel to find temporary daycare workers has been set up. This enables the integration of social welfare

services, as citizens can access a range of services from their mobile phones via the Swedish online social welfare portal using eIDs and digital signatures.

► Mobile phone signature "Handy Signatur"

Country: Austria

www.digitales.oesterreich.gv.at/site/6791/default.aspx

www.buergerkarte.at/index.en.php

As an alternative to smartcard-based eID, Austria has developed a mobile phone signature ("Handy-Signatur"), which is an eID and at the same time a qualified electronic signature. The signature itself is not created inside the mobile phone (SIM card), but it is instead created remotely in a hardware security module. The citizen card concept offers functionality for the identification and authentication and – by using qualified electronic signatures – constitutes the foundation for legal security. As the citizen card concept is built upon open standards, it allows all signature cards and storage mediums, which fulfill citizen card specifications and legal requirements to be used. The concept just determines certain standards in terms of functionality. There are no restrictions to the concrete, technical implementation as long as the legal requirements (such as usage of "secure signature creation devices") are met. This fosters solutions in different technology sectors such as the mobile phone sector.

This server-based citizen card solution for qualified electronic signatures means a further important step towards usability and dissemination of modern e-government services. Users can indeed benefit in several ways from the further development of the citizen card concept – they will save money and time. Users do no longer have to install certain software on their PC, they don't need special computer skills or technical knowledge to use their mobile "citizen card", *i.e.* to place their qualified electronic signature on contracts; for official applications; in the fields of electronic billing, e-banking, e-payment or logon processes. The use of familiar technology (mobile phone) helps citizens feeling confident with the new provided opportunity. Furthermore, acquisition costs for smartcards or smartcard readers – so far a big hurdle in the rollout process – will not represent a problem any longer.

4. Governance services

Citizen engagements (to strengthen citizen-centered approach to government, to involve citizens in policy development and decision making)

► M- government @ m- city

Country: Estonia

http://mgov.edicypages.com/

Estonia elaborated the project M-government @ m-city, which provides m-democracy services, enhancing citizen participation in government, and m-administration services, which improve the efficiency of government agencies and quality of information provision to citizens.

► AMS anti-corruption and transparency initiative

Country: The Philippines

www.partnershipfortransparency.info/uploads/completedpercent20projects/ecolinkprojectcompletionreport.pdf;

http://newsinfo.inquirer.net/inquirerheadlines/nation/view/20100719-281942/Harnessing-people-power-in-fight-against-corruption;

http://spa.hust.edu.cn/2008/uploadfile/2009-4/20090427230800732.pdf

This project hopes to prevent/curb corruption at the local-government level through a series of components that will increase citizen participation, strengthen local mechanisms, and reduce funds; for instance, using SMS or text messages to report acts of petty corruption by civil servants. Using their cell phones, people can report graft as it occurs and yet remain anonymous. For example, when a clerk at City Hall asks for grease money, the citizen quietly sends a text message to the hotline number of the Office of the Ombudsman. When the names of the same offenders keep appearing on the database, the claims are investigated. Another example is the possibility for soldiers in the Philippines to use SMS messages to communicate with their leaders if they suspect corruption in the ranks.

► SMS to email channels

Country: UK

http://smsegov.info/images/smsegov.pdf;
www.stirling.gov.uk/bustimetables;
www.stirling.gov.uk/index/council/jobs/jobvacancies.htm

The Stirling Council (UK) receives citizens' messages through the SMS gateway, which converts the messages to emails. The contact center officers respond immediately to the emails. Responses to customers will automatically be converted back into a text message and sent back to their mobile phones.

► e-People: The People's Online Petition & Discussion Portal

Country: The Republic of Korea

www.epeople.go.kr/jsp/user/on/cu/CU02_07.jsp

By allowing real-time reception of civil complaints and policy suggestion on mobile websites, the Republic of Korea is facilitating citizen participation in policy-making.

► Open government

Country: Spain

http://opinaextremadura.es/categories/sanidad/

Among the activities related with the development of "Open Government" in Spain, two regional governments have developed iPhone/iPad applications for the use of these devices in their areas of citizen participation. The Basque Government in 2010 began the development of the initiative Irekia (Open Government in Basque language), in January 2011 the App to access to the service was deployed at the Apple Store. For its part, the Extremadura Regional Government launched its "Open Government" initiative called "Opina Extremadura" at the beginning of 2011, at the same time the application for the Apple devices was deployed.

Several local councils have deployed in different electoral calls a service to provide the citizens access to his census information (voter registry) through mobile devices. An example is the city of Avilés, where citizens can access his census information by sending an SMS containing a password and the National Identification Number. Also during the election day was provided information related to participation in elections.

Civil Services

► Internet Civil Services

Country: The Republic of Korea

www.minwon.go.kr/new_info/customer/AA090_CM010_mobile_info.jsp

The Republic of Korea provides frequently used civil application services through smart phones and citizens can now view the process of their application regardless of time and place and in a more convenient way via smart phones rather than visiting public offices in person or accessing to the Internet. Particularly, mobile security features encrypting communication sections and personal information as well as prohibiting storage of process information leads to stability of mobile services.

Elections and voting

► SMS Results of the Presidential Elections Alert

Country: France

www.textually.org/textually/archives/2007/05/015745.htm;

www.consulfrance-jerusalem.org/france_jerusalem/spip.php?article578;

http://messagebuzz.blogspot.com/2007/05/presidential-election-results-by-sms.html;

www.textually.org/textually/archives/cat_sms_and_politics.htm

An SMS alert with the first estimated results of the presidential elections was sent in France in 2007. To sign up, French mobile users need only to type in their cell phone number on the Presidentielles.com website.

► SMS broadcast general election information

Country: Indonesia

http://news.xinhuanet.com/english/2009-03/20/content_11041933.htm;

www.textually.org/textually/archives/2009/03/023060.htm;

www.textually.org/textually/archives/cat_sms_and_politics.htm

Indonesia broadcasted information from the 2009 general election via SMS to around 155 million cell phone users nationwide. With the help of 10 telecommunication operators, the SMS service subscribers were made

aware of the importance of the general election. A total 162 million phone numbers will receive election messages via SMS, consisting of 135 million cell phone numbers and 27 million wireless fixed phone numbers.

► SMS-Voter registration

Country: Kenya

www.ictworks.org/tags/voter-registration;
http://allafrica.com/stories/201005051017.html;
http://allafrica.com/stories/200801080868.html;
www.w3.org/2008/10/MW4D_WS/papers/hellstrom_gov.pdf

In the run-up to the 2007 Kenya elections, the Electoral Commission of Kenya (ECK) launched a voter registration service where citizens could SMS the register by sending an ID number to receive verification of voter registration.

► Voting through the use of text messaging using mobile phones

Country: UK

www.ipswich.gov.uk/downloads/E-government_Strategy_2003.pdf;
www.ipswich.gov.uk/site/index.php;
www.m4life.org/proceedings/2005/PDF/23_R353DD.pdf

Norwich City Council and Ipswich Borough Council (UK) are providing new means for voting through the use of text messaging using mobile phones.

► SMS to find the polling station

Country: Venezuela

http://personaldemocracy.com/content/sms-monitored-venezuelas-election;
www.textually.org/textually/archives/2006/12/014414.htm;
www.textually.org/textually/archives/cat_sms_and_politics.htm

During the recent Presidential Election in Venezuela (2006), nearly 8 million voters used SMS to find their polling station. The SMS application to handle enquiries from the 16 million registered voters was used by 7.8 million voters. The Consejo Nacional Electoral (CNE) also used SMS to tell with the 350 000 electoral witnesses where and when they should receive their training. The text in number was widely promoted by TV, broadcast radio and newspapers.

► Mobile Voting

Country: Estonia

http://gizmodo.com/5108828/estonia-will-be-the-first-country-to-elect-politicians-using-mobile-phones;

www.phonearena.com/news/Estonia-to-allow-voting-via-SMS-by-2011_id3579;

www.electricpig.co.uk/2008/12/15/estonia-adopts-sms-voting/;

www.textually.org/textually/archives/2008/12/022032.htm;

www.textually.org/textually/archives/cat_sms_and_politics.htm

In 2011, Estonians will be able to elect their representatives using cell-phones. The voters will just need to previously obtain a free authorised chip. This chip will have an encrypted digital signature, which will allow them to identify themselves and vote using a text message.

G2G – Government to Government

Coordinate government's activities for inspections, controls and supervisions

► Fire Department Mobile Inspection Service

Country: Brazil

http://lists.w3.org/Archives/Public/public-mw4d/2008Oct/att-0026/PDF-Presentation-M-GovBrazil.pdf

In the Fire Department Inspection Service in Brazil, all information on safety conditions of a building is stored in a PDA device. Data is transmitted to a central station using a cell phone connected to a PDA via infrared. No form manual filling and no data typing.

► Wireless fleet management solution using in the Insecticide Control

Country: USA

www.keysmosquito.org/

In the Florida Keys Mosquito Control District, 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 1 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).

► Mobile Government Initiative in Beijing

Country: China

http://mobility.grchina.com/mGov_presentation.pdf;
http://mobility.grchina.com/

In the Case of Dongcheng District in Beijing, the mobile system, together with the grid management and process re-engineering, has enabled the District to better manage its mobile work with both efficiency and effectiveness. Through the split of the enforcement and supervision, the process is changed, and stimulated the resolution of the problem. The reinforcement of the coordination functionality of District Integrated Municipal Administration has facilitated the information flow between the fragmented departments.

Security Services (law enforcement, citizens security)

► TBS (Trafik Bilgi Sistemi) or Traffic Information System

Country: Turkey

www.milasguvenlik.com/modules/news/article.php?storyid=25;
http://tkm.ibb.gov.tr/its/itsMbs.aspx

In Turkey, mobile traffic units are equipped with tablet PCs to quickly conduct queries regarding offending drivers' license and vehicle information. This increases the efficiency of the mobile traffic units. The command center and mobile users can communicate via a real-time messaging system, using custom or pre-designated messages. The mobile units can conduct real-time queries regarding drivers' license information, vehicle registration, citizen identification and drivers' point status. The online queries decrease the waiting time significantly, increasing the effectiveness and the efficiency of the mobile units.

Emergency management

► Disaster and Management of Information System for implementing mobile technology for disaster management

Country: Bangladesh

www.dmb.gov.bd/;

www.m4life.org/proceedings/2005/PDF/25_R373CG.pdf

In the proposed model, the Disaster Management Bureau (DMB) will play the central role of co-ordination for implementing mobile technology for disaster management. This DMB has a line of communication with other weather forecasting agencies. The weather forecasting agencies will forecast the disaster (cyclone, for example), and pitch this information to the DMB. Disaster warning, rescue and recovery information will be disseminated through two separate but complementary approaches. One is the formal channel of communication, like local authority and local disaster shelters. To implement this channel, the prerequisite is that all local centers will have at least one mobile phone. It is also possible to select a local representative who owns a mobile phone to keep communication with the centers that don't have mobile phone. The central co-ordinator (DMB) will send updated information to the local centers which in turn will be distributed using both online and offline media. This weather information will be highly specific depending upon the cell of the mobile phone.

► Earthquake Monitoring and Information System

Country: Turkey

www.iitk.ac.in/nicee/wcee/article/13_272.pdf;

www.arkitera.com/haberler/2002/08/16/aria1.htm

www.koeri.boun.edu.tr/depremmuh/eski/EWRR/EWEngWeb/TurAnaSayfa_eng1.htm

The Government of Istanbul promotes a project which links the 100 seismographs in Istanbul via GSM. In case of an earthquake, the seismographs send information to the observatory via SMS. The collected and analysed information is then disseminated to the involved governmental organisations (such as civil defense, emergency units, municipalities, local governor, military and etc.) via GPRS. The system is expected to be of extreme use in case of an earthquake, where officials and governmental institutions that are mobilised in the disaster area need real-time and accurate data.

Wireless Communication System in the field in case of fire

Country: USA

www.nyc.gov/html/fdny/html/home2.shtml

In New York City, the fire department has installed a wireless system that allows, among other things, "mobile access to the e-mail system." The system also uses "BlackBerry technology and customised Mail Extension software." This software provides communication between FDNY headquarters and firefighters in the field. This infrastructure is powered by "end-to-end (Triple DES) encryption, FIPS 140-1 certification, and optional support for the S/MIME security standard".

Electoral process

Country: Spain

http://elecciones.mir.es/locales2011/Visitas_virtuales/Mesa_Administrada_Electronicamente/Mesa_Administrada_Electronicamente.htm

In different electoral contests since 2008 the national government and regional governments have used mobile devices to facilitate the proclamation of election results. The officials present at the recount are equipped with PDAs with access to mobile networks; these devices are used to communicate the results to the data processing centre. This solution is necessary given the high number of municipalities in Spain (over 8000), a large proportion of them in rural areas. This solution is implemented by INDRA, a Spanish multinational company specialised in electoral processes. The description of the solution for the case of the Catalan regional elections can be consulted in the website of the company.

Additionally, new electronic voting stations are going to be used in the forthcoming elections on 22 May 2011 in five pilot councils and mobile technologies will play an important role (for a virtual visit of the application use the URL provided above).

G2B – Government to Business

► SMS Alerts in case of the security threats

Country: UK

www.cityoflondon.police.uk/CityPolice/Departments/CT/Services/alertschemes.htm

In the UK, the London police have included text messaging in their alerting service options. This service sends alerts to businesses in London about security threats, including bomb alerts. The 24-hour service contacts all users in real time with a message that is sent within 30 seconds of the alert being received by the police. Despite a monthly fee for the pager/text message service and the existence of a free email service, more businesses signed up for the pager/text message alerts (1 121 firms in total) than for the email alert system (589 firms). Such figures indicate the popularity of m-government services.

► TradeNet – a nation-wide Electronic Data Interchange (EDI) System

Country: Singapore

www.thailandnsw.org/News/TradeNet-ADB-v2-Eng_Singapore.pdf

The Singapore TradeNet allows various parties from the public and the private sectors to exchange structured trade message and information electronically. It links multiple parties involved in external trade, including 34 government controlling units, to a single point of transaction for most trade-related transactions such as Customs clearance and payment of duties and taxes, processing of export and import permits and certificates of origin and collecting trade statistics.

► SMS service for agribusiness – CELEPAR, State of Parana IT Agency

Country: Brazil

www.cidadao.pr.gov.br

http://lists.w3.org/Archives/Public/public-mw4d/2008Oct/att-0026/PDF-Presentation-M-GovBrazil.pdf

A SMS message is sent for each registered farmer with the daily price of the products they grow. An alert message is also sent for the region with very low temperature forecast.

► Single Window for Business Support Services

Country: The Republic of Korea

http://m.g4b.go.kr/svc/mob/sma/aut/mIndex.do

The Republic of Korea has introduced various information service required for business activities such as industry information, business news and government aid programs on a single mobile website (*m.g4b.go.kr*). Moreover, it provides information on the progress of test inspection and certification application registered online by businesses and offers services issuing and retrieving performance reports and certificates.

► Mobile Message Service

Country: The Republic of Korea

www.mgov.go.kr/mgov_portal/index.mgov

In the Republic of Korea, National Computing and Information Agency carries out integrated operation and management of information systems of each government organisation. It provides information on failure alerts, maintenance status and results to each officer through SMS. In addition, the Republic of Korea provides government organisations with SMS/MMS, mobile civil complaint service, and an environment for MSG and WAP services to achieve m-government.

G2E – Government to Employee

Mobile workers

► Mobile Field Inspection System

Country: Hong Kong, China

www.m4life.org/proceedings/2005/PDF/7_R133CB.pdf;
www.palm.com/hk/ie/business/learn/success/stories/hk_edp.html;
www.epd.gov.hk/epd/eindex.html

The Environment Protection Department (EPD) of Hong Kong, China, is the authority in charge of environmental issues; it conducts regular inspections on chemical waste collectors and compiles the compliance results. Prior to the implementation of the Mobile Field Inspection System, the inspectors were writing their reports on paper and then re-entering the same data into the database at the office. This business process was not very efficient. Therefore, EDP introduced a mobile field inspection system

which uses touch-screen PDAs to enter the inspection information at the scene. The inspectors are also able to review the results of past inspections through their PDAs to have better knowledge about the inspected waste collector. Once the data is stored in the PDA, it is transferred directly to EDP's back-end system.

► North London Strategic Alliance Street Wardens Project

Country: UK

www.nlsa.org.uk/

Street wardens fill in information regarding the incident at the scene using a mobile device like a XDA2 smartphone or Pocket PC, which have GPRS and Bluetooth connectivity as well as mapping capabilities. These mobile devices allow instant transfer of the information to a password-secured database accessible via the Internet, significantly enhancing responsiveness, as well as the accuracy of the information. Using their mobile devices, the wardens can also now take pictures of environmental crimes to support their formal letter to the citizens involved.

► M-Signature for civil servants

Country: Spain

Spain is pioneering the use of electronic signature not only for its use in services for citizens and businesses, but also internally to support G2E applications, often through applications specialised in the management of e-signatures. The use of electronic signatures on mobile devices has limitations, which is why the Ministry of Industry, Tourism and Trade has developed a specific application for Blackberry and iPad devices for the usage of the senior staff. This application allows the senior staff to use e-signatures remotely without implementing the signature algorithm in the mobile device. The application is integrated with the electronic signature platform of the Ministry and has won awards at the national fair of information technologies ASLAN.

► ScuolaMia – Convening substitute teachers

Country: Italy

https://scuolamia.pubblica.istruzione.it/

Within the services enabled by ScuolaMia, schools can contact substitute teachers sending SMS (or certified e-mail depending on the choice made by the teacher).

► Open Government Data Initiative (OGDI)

Country: The Republic of Korea

The Republic of Korea pushed forward two core initiatives in 2010:

- Developing a "Government Shared Services Platform" to guarantee interoperability of Open API and ease of use (there are 126 services in 13 areas which are provided through a "Utilization standard link platform"). The government will develop shared services through a yearly survey, and plans to lead resource utilisation and value creation for up to 100 shared services.
- Developing and providing 13 open API services which have high reuse demands and impact.

The "Government Shared Resources Platform" provides a basis upon which usable open API services can be searched easily and reused. The Korean Government is expecting these open API services to be utilised and mashed-up in various fields such as mobile applications, smart TV, legacy system, etc. Also, the platform provides technical standards, regulations and common functions to reuse and mash-up services.

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M-Government

MOBILE TECHNOLOGIES FOR RESPONSIVE GOVERNMENTS AND CONNECTED SOCIETIES

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Annex A. M-government projects compendium

Further reading

OECD e-Government Studies: Denmark: Efficient e-Government for Smarter Public Service Delivery (2010)

OECD e-Government Studies: Rethinking e-Government Services: User-Centred Approaches (2009)

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