Emerging Trends in M-GOVERNMENT

BY Silvana Trimi AND Hong Sheng

The emergence of new information and communication technologies (ICTs) has not only revolutionized the way business is conducted but also transformed the delivery mechanism of governmental services. Since the 1990s, public-sector organizations across the globe have been applying Internet technology and other ICTs in innovative ways to deliver services, engage citizens, and improve efficiency: a set of practices commonly known as electronic government (e-government). An explosion in the use of mobile technologies (m-technologies), such as mobile phones, laptops, and personal digital assistants (PDAs) to connect to wireless networks has enabled governments to transit from e-government to mobile government (m-government). Here, we present the potential of m-government (compared to e-government), the general trend of m-government practices in key leading m-government countries, some of the challenges and issues involved with those practices, and expected future trends.
E-government, which refers to the use of wired-Internet technology by public-sector organizations to better deliver their services and improve their efficiency, has achieved significant improvements through the deployment of many innovative applications and thus it has become a global phenomenon [5]. Based on the segment served, e-government practices can be classified into government-to-citizen (G2C), government-to-business (G2B), government-to-government (G2G), and government internal effectiveness and efficiency (IEE). Based on the type of transaction performed, e-government functions are categorized into: informational, transactional, and operational. Informational functions provide access to governmental information through Web portals, including online publishing and broadcasting. Transactional functions allow citizens to interact with government agencies via the Web such as online procurement and payments. Operational functions refer to internal governmental operations that focus on internal efficiency and effectiveness of operations and the interoperability across different e-government practices at different levels [5].

Citizens use government Web sites as central points of access to government information and services across different agencies and they normally do so via wired Internet access. In general it is the end users who are the initiators of transactions that involve e-government services. There are two technological challenges to widespread adoption and implementation of e-government. First, on the provider's side (government), technological infrastructure needs to be built to support the transformation to e-government [5]. Second, on the end user's side, there exists an inherent inequitable access to e-government services due to the digital divide among demographically, economically, and socially diverse groups of population within a country as well as among different countries.

M-government is an extension or supplement of e-government. M-government is the strategy and its implementation for providing information and services to government employees, citizens, businesses, and other organizations through mobile devices [6]. M-technology has emerged as the next wave in the IT revolution as its advantages come from two unique characteristics: “mobility” and “wireless.” Mobility is the most touted advantage of m-technology. Mobile devices, typically including PDAs, laptops, cellular phones, tablet PCs, and Blackberries, free users of physical ties to the desktop. The "wireless" characteristic of m-technology refers to the method of transmitting information between a computing device and a data source without a physical connection. In recent years there has been a phenomenal growth in the use of mobile devices due to several factors including: low cost of the devices, the only infrastructure choice for many undeveloped/developing countries, changes in lifestyles, and increased functionality. According to eMarketer data, the number of wireless Internet users will surpass the number of wired users by the end of 2007, with 56.8% of all Internet users connecting wirelessly.

M-technology enables location-based services (LBS)—personalized services delivered to a mobile device user at a remote location. Since a mobile device is usually used by one user who carries it at all times, it also provides the “identity” of the user thus making it a venue for personalized services and/or for tracking/identification. The direction of communication flow for m-devices can be truly two ways, as compared to typically one way (user-to-government) for wired devices. These unique features/advantages of m-technologies increase the opportunities for governments to provide more, better, and different types of services to citizens.

M-government is value-added e-government because it offers the following advantages:

- It improves the delivery of government information and services. Citizens can get immediate access to certain government information and services on an anywhere-anytime basis. For governments, they can use the scalable and swift wireless channels to send time-sensitive information, such as terror and severe weather alerts, to citizens quickly and directly.
- M-technology may be the best solution to overcome Internet connectivity problems and digital divide issues faced by e-government applications. Unlike wired technologies, m-technologies have been more evenly distributed among different layers of society and are growing faster in economically and technologically challenged nations [4]. M-technology helps remove infrastructure constraints for countries with poor or nonexistent wired infrastructure. For example, in Africa, cell phones accounted for 90% of all African phone subscribers in 2007.
- Compared with wired networks, wireless networks appear to be a more cost-effective choice for countries with dense populations and difficult terrain. For example, Macedonia will build a Wi-Fi mesh network that will cover 1,000 square miles of difficult terrain and its service will reach more than 90% of its population for a planned price of $12 a month.
- M-government applications can help avoid problems faced by some countries, such as corruption
and low productivity of governmental agencies. India, for example, has introduced e-payment for some governmental services to avoid corruption and bribery [1].

- **M-government increases efficiency and effectiveness of government employees.** With the help of m-technology, government employees can access the information needed in real time and update records on the spot. This not only reduces some burden of logistics and decreases data entry errors but also facilitates employees to make informed decisions and actions.

Finally, m-government can open up additional channels for citizen participation, thus increasing constituent participation. Communication through mobile devices encourages citizens to make use of the technology to express their points of view to government officials, lawmakers, and community representatives.

### M-GOVERNMENT INITIATIVES IN THE LEADING COUNTRIES

Promoted by demands for a more responsive government, governments all over the world have recognized the potential of m-technology and are exploring the potential utility and feasibility of m-government. However, m-government development worldwide has been uneven. This is attributed to two factors: the development level of e-government and m-technologies. M-government is a value added of e-government and therefore it will be more advanced wherever a solid foundation (e-government) exists, for example, in developed countries. Second, m-technologies are quite advanced (such as 3G wireless), cost-effective, and widely used in the developed countries. Because of the relatively lower cost (compared to income) of owning and using a wireless device, the percentage of people that own and use wireless devices in developed countries is much higher than developing ones (in Hong Kong for example, mobile penetration is 125%).

New important technological advances, such as WiBro (wireless broadband) service recently introduced in South Korea, and a greater variety in both platform (different types of devices) and functionalities (convergence of different devices, such as smart phones), have increased the number and types of services that end users in these countries can utilize. Consequently, while m-technology can help remove infrastructure challenges and present tremendous opportunities for the development and growth of m-government in less-developed countries, m-government applications are prevalent in the developed countries. Thus, we will focus our discussion of m-government practices in the following regions/countries.

**North America.** In the U.S., m-government projects have proliferated. Virginia has been a leader in implementing m-government applications. Its “My Mobile Virginia” was the first wireless state portal in the nation that made government services available via mobile and wireless devices [7]. It offers a variety of downloadable information on handheld devices including emergency weather conditions, legislative information, lobbyist lists, election notices, tax-related information, and tourism information.

Text messages have also been used by government agencies to communicate with citizens. For instance, the Parking Day text service in Iowa sends text messages to drivers reminding them to move their cars on street-cleaning days and opposite side of the street days. These reminders can help drivers avoid getting tickets. “My California on the Go” was introduced in July 2001 as a way for citizens to receive immediate updates on energy warnings, traffic jams, state lottery results, and press releases from the governor’s office.

The Global Positioning System (GPS) is used to provide the Mobile Traffic Map in Seattle to help commuters make better drive-time choices using a small-form-factor device. The traffic map covers 176 miles of the area’s major freeways and provides instantaneous information on traffic slowdowns, traffic lights, and traffic flows.

In Canada, the “Government of Canada Wireless Portal” is an evolving project that enables citizens to access government information using mobile devices. Services and information currently available include: members of the Parliament contact information, border wait time, economic indicators, passport services, and Canadian government news releases.

The large number of mobile government workforces such as those involved in law and compliance enforcement, transportation and logistics, and health and social services, depend on deployment of IEE and G2G mobile applications. Police officers can be equipped with mobile devices to access databases, issue tickets, check vehicle registrations and license tags, among other things. Examples include Wi-Fi networks in San Francisco, CA and Lincoln, NE where police officers have in-vehicle access to a variety of broadband applications such as crime databases, record-management systems, and traffic-video feeds. Field inspectors can also benefit from IEE applications using mobile devices to check inspection results, issue violations on the spot, print inspection reports, and transmit inspection information wirelessly to the agency’s database. The GPS system can track a work-
er’s mobile device to pinpoint his or her location and movements. The system can be used to make task assignments to workers who are closest to the job. Table 1 lists current m-government applications in North America grouped according to the segment being served into two categories: G2C and IEE.

Western Europe. Europe is quite advanced with regard to m-technology. The penetration rate of mobile phones in Western Europe has grown from 90% in 2004 to 98% in 2006, and is reaching 100% in 2007. The wide acceptance and use of m-technology in Europe has provided a platform for m-government applications. The London Police Department’s Short Messaging System (SMS) is used to inform citizens about security threats and emergency alerts. The Bus Operator Metroline uses a mobile tracking system to monitor the status and location of buses, then send text message alerts to its drivers requesting them to speed up or slow down to maintain more even intervals between buses.

M-technology in Western Europe is used in law enforcement to provide instant access to critical data and services. For instance, German police use GPS and mobile phones to track suspects’ movements. In Austria, parking inspectors are equipped with handheld devices that connect to a central parking database for an immediate confirmation of whether or not sufficient payment was made by the driver.

Sweden is one of the leading countries of m-technologies in the world with over 95% of the population using mobile phones. Wide-ranging m-government services are available throughout the country. Some of the innovative practices include SMS applications for city job postings in Stockholm, a mobile parking fee payments system, government inspector service, tax services, mobile healthcare providers, and MapMate as a wireless map system, among others [8].

A Finnish telecommunication firm, Sonera, has developed technologies to turn any mobile phone into an identity document. Since every mobile phone has a unique Subscriber Identification Module (SIM) card code, personal identification can be embedded into that code and become as safe as the current paper passport system. The Finnish government is currently upgrading the country’s electronic ID card to enable citizens to make secure transactions over mobile phones and also use it as an official travel document (instead of paper passport). Table 2 provides a summary of sample m-government applications in Europe.

Asia. Because of the large and dense population,
Asian countries have great potential for the use of m-technology. By March 2007, there were 1.1 billion mobile subscribers in this region. The industrialized countries, such as Japan, South Korea, Hong Kong, Taiwan, and Singapore, have some of the highest penetration rates of mobile phones in the world. Therefore, governments in these countries have implemented various m-government projects.

Japan is one of the leaders in mobile and wireless technology. The number of third-generation (3G) mobile phone users is the highest in the world, making Japan the world leader in the percentage of mobile phones supporting Internet access (94.1%) [2]. However, m-government in Japan is not as widespread as in other developed countries. Deployed m-government applications have been related to tasks that are not legally binding, such as information on tourism, disaster prevention, and child rearing. The Vehicle Information and Communication System (VICS) project provides information to and collects information from vehicles so that citizens can receive timely information services such as traffic congestion, road work, car accidents, availability of parking lots, and weather information. The Japanese government considers m-government a somewhat old-fashioned term and is striving toward u(ubiquitous)-Japan to connect everyone and everything, anytime, anywhere.

In Korea, a project called “M-police” was implemented to assist police officers in capturing suspects and finding missing cars. The project enables the officers to retrieve detailed information on missing vehicles, driver’s licenses, vehicles’ histories, and pictures of suspects by using mobile devices. In Anyang City, parking inspectors collect parking information and print receipts on the spot using PDAs and small printers. The m-local tax management system, introduced in the cities of Uijeongbu and Kunsan, enables officers to access information on car taxes, obtain data on delinquent taxes, and immediately transfer data to the local tax database [3].

SMS has been widely used in many Asian countries. At the height of the SARS health scare in 2004, the Hong Kong government sent text messages to six million mobile phone users in an effort to calm citizens who were frightened by rumors. Singapore government agencies send citizens text messages such as parking ticket reminders, national service obligations, and passport renewal notifications. Table 3 lists and summarizes sample m-government applications in Asia.

**CHALLENGES AND ISSUES IN M-GOVERNMENT**

Despite the great potential and positive expectations, m-government is still in its earliest stage of development and its applications are limited. Governments are proceeding with caution to m-government applications due to issues, risks, and concerns inherited from e-government and some specific to m-technologies. Some of the challenges related to e-government include:

- Improving interoperability and integration since the public sector is legacy-system driven, not process-oriented driven. A radical reengineering of processes and supporting information systems is required that demands many technical, semantic, organizational, and managerial changes.
- Governments are not very receptive to private and public service providers who may contribute to innovative electronic service delivery.
- Many governments lack necessary incentives and institutional structures to realize the full potential of electronic service delivery. For less-developed countries, e-government is either nonexistent or very limited in scope. For example, China currently has more than 465 million mobile phone users, yet its m-government practices are still at the embryonic stage because of the inadequate e-government infrastructure.

M-government also faces some challenges that are unique to m-technologies. Security and privacy are considered to be the major obstacles for m-govern-
ment applications. Wireless network signals are broadcast over the public airwaves, making them vulnerable to hacking and interception. Being small and portable, mobile devices can be easily stolen or lost, putting the data stored in them at constant risk of falling into the wrong hands. Disclosing critical personal information on wireless Internet and location-based services makes citizens more concerned of privacy issues in m-government.

There are a number of inherent limitations for usability of wireless networked devices such as small screens and keypads. Wireless Application Protocol (WAP) phones can only access sites that are written in WML, which is not compatible with HTML. This means e-government Web sites must be rewritten in WML and have just enough information to fit the small screens of wireless devices. Time to translate HTML-WML along with the lack of enough broadband slows the access speed. Limited computational power and memory, shorter battery life, poor display resolution, and limited Web browsing ability are other limitations in using m-devices.

Accessibility and interoperability are also challenges. Wireless Internet access is still costly and the coverage area of existing wireless networks is limited. In the U.S. and throughout the world, a large number of areas do not have Wi-Fi or fixed broadband connectivity. The new technology of WiMAX (which is fixed broadband wireless technology) promises to offer standardization, interoperability, and lower cost. The cities of San Francisco and Philadelphia are planning to offer WiMAX wireless Internet connections for everyone, either with a very low cost or for free.

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<td>Korea</td>
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Table 3. Examples of m-government applications in Asia.

CONCLUSION

M-government has demonstrated great potential and shown a promising future. There is no doubt that m-government will be a part of the trend of m-commerce becoming a major part of the proliferating e-commerce in the private sector. As wireless technology rapidly advances, some of the technical obstacles for m-government could be overcome soon. Fourth Generation (4G) technology along with better wireless Internet access technologies will offer increased bandwidth for faster wireless access to the Web. More security features are becoming available, such as the Advanced Encryption Standard (AES). As the number of wireless users continues to increase, issues are resolved, and technology advances, more innovative m-government applications will emerge and m-government will become an increasingly important aspect of government functions.

REFERENCES

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