

# Enhancement in M-Government and Mobile Computing in Developing Countries

**Abstract**—Mobile devices such as cellular phones (including smartphones), tablet computers and Personal Digital Assistants already run a wide variety of software such as business enterprise applications, productivity software, mobile learning etc. New prospects are emerging for applications that run on these devices, especially in this post-PC era where mobile devices are used often for personal use, for commercial use and for government services. To this end, the proliferation of mobile devices in every layer of society has confronted the social community with many opportunities and responsibilities. With mobile computing and its outcomes entering the government arena, the challenge becomes how to harness these potentials in ways that are beneficial to the government and the community at large. In this paper, we provide an introduction to the application and new enhancement of mobile technologies and mobile computing in technical government systems. Mobile devices allow every citizens to access government resources every time in anywhere. With respect to the wide application possibilities of mobile government, it is essential to investigate user attitudes and acceptance. The paper presents the M-government approach as the next generation of E-Government, wherein the next generation of the governance systems will provide easy access and wide availability to all.

**Keywords**—Mobile Government, Mobile Technology, government, users E-Learning, Smart Phones, PDA.

## I. INTRODUCTION

**E**LECTRONIC government is the manner by which the providers of public services interact with citizens and businesses via electronic means. The Internet is the most common electronic channel. E-government can provide major benefits to citizens and businesses by making the delivery of public services better as they become more efficient and effective. However, the term mobile refers to the fact that activities are taking place in different locations or while travelling in between destinations. Mobile technologies thus comprises multiple subject areas using either static or portable equipment such as wireless laptops, Personal Digital Assistants (PDAs) and smart phones. Mobile technology has been referred to as the fastest developing computing platform with an estimated 5.9 billion mobile device users worldwide in 2012 (World Bank, 2012).

Mobile technologies also make it possible to deliver services to citizens who have no access to government services (for example, people living in rural areas) and to those who are

continually on the move, such as business professionals. The mobility of people and the use of mobile devices enable the provision of “anytime, anywhere” access to government services and resources through mobile-government, or m-government. Recent developments in mobile technology have offered the potential to support government services at various levels.

Due to this, mobile government has become a subject of discussion as research and actual services are gaining energy within the field of electronic government. Currently, m-government has allowed for a quicker, more suitable and often value-added delivery of public services (Mansoor and Rohan 2010). It has begun the reforming and rethinking of processes in many administrations, which has helped to produce new and enhanced access to various services, and also has supported citizen participation in political processes (Sharma and Gupta 2004). Even where it is not noticeable to “front-end users” like citizens, m-government has, in many cases, boosted the more efficient gathering and processing of data. Information and Communication Technology (ICT) in governmental organizations has reduced cost, redundancies, and errors, thus speeding up the handling of services (Blessing *et al.* 2007).

Mobile government by itself can still be considered in its “infancy” (Blessing *et al.* 2007); when it comes to governmental organizations in developing countries, we can assume a “transitive state” (Kushchu and Borucki 2004). The services currently considered to deserve the label “mobile government” range from W-LAN in public buildings to stand-alone mobile applications where access to government services are defined. They depend on, or integrate, features of mobile technologies. In-between these two extremes, we can observe a vast variety of services such as mobile information via SMS, mobile tickets for parking or trains, mobile payment for traffic fines etc. Hence, it is rather unclear what we talk about when we actually refer to mobile government.

The definitions given in the literature vary slightly. Some describe m-government as “a functional subset of all-inclusive e-government”, respectively arguing that technologies used for m-government are restricted to mobile and/or wireless technologies (Arazyan 2002) in assessment with e-government. To others, m-government is “a composite approach for efficient exploitation of all wireless devices” (Zálešák 2003), with the aim of improving benefits to the parties involved in e-government (Kushchu and Kuscu 2003).

This paper provides an introduction to the application and new enhancement of mobile technology and mobile computing in technical government systems. It presents the M-government

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approach as the next generation of E-government, wherein the next generation of governance systems will provide easy access and wide availability to all. Section II of this paper gives an overview of E-government and of the transition from E-government to M-government. In section III, the paper discusses M-government within developing countries while Section IV discusses the benefits and barriers associated with the implementation of M-government. Section V takes a look at mobile computing as it relates to M-government. Section VI discusses M-government technology and how it can be adapted to deliver services to various government customers especially in developing countries where mobile devices are seen as the computer in the pockets of the majority. The paper provides a brief conclusion in Section VII.

## II. E-GOVERNMENT

### A. Overview

Governments are playing a critical role in ensuring that information and communication technology (ICT) is used for political transformation as well as for the creation of a socially all-encompassing information society. The World Summit on the Information Society (WSIS 2003) plan of action proposed the formation of a citizen-centered, inclusive and development-oriented information society where every citizen of a particular country can utilize, access and share information with every other citizen as well as with the government. South Africa has taken an important step toward meeting the proposed plan of action of the WSIS by making some government services available through the use of the internet. This is known as E-government implementation.

*“E-government is the use of ICT to promote more efficient and effective government, facilitate more accessible government services, allow greater public access to information and make government more accountable to the citizens”* (Farelo and Morris 2006). According to Evans and Yen (2006), the implementation of E-government has been widely appraised such that it offers new momentum to deliver government services quickly and efficiently, and provides benefits to both government and citizens.

Therefore, E-government is about modernizing existing government business practices through Information and Communications Technology to facilitate the unified exchange of information across all tiers of government in order to offer citizens secure access to government information and services. However, ICT plays the crucial role of enabler of this modernization of government business practices. E-government offers both individual citizens and companies the opportunity to interact (even to conduct business) with government 7 days a week and 24 hours a day via an internet connection.

### B. From E-government to M-government in developing countries

Although some governments have made significant progress

towards the implementation of e-government, the state of e-government in some developing countries is still in the rudimentary stages (Mutula and Mostert 2010). Among the reasons for this are the lack of facilitation to update and adopt E-government services by the majority of the citizens as well as an insufficient evaluation of the expectations of the citizens who are the primary users of the system (Kaisara and Pather 2009).

However, the challenges, such as no or limited access to the internet by many citizens have led some governments to shift their attention to M-government as the ultimate target of E-government. (Sharma and Gupta 2004). The above argument applies to the failure of fixed telephony providers to provide access to majority of citizens in developing countries. The ability to provide access by means of mobile telephone communications in today’s world brings about economic, social and political benefits to the society (Kholadi *et al.* 2007). The ubiquitous nature of mobile phone technologies forms an important part of the lives of individuals, families, businesses, governments and the broader civil society (Kholadi *et al.* 2007).

The proliferation of mobile phone technologies has revolutionized the field of mobile telephony. In addition to this, the proliferation of mobile devices such as smartphones, tablets, etc opens new ways for developing new mobile application systems (such applications as Mobile-commerce, Mobile-Banking, Mobile government etc.). In view of this, the line between desktop computers and handheld devices has started blurring (Abrahamsson *et al.* 2004). The device capabilities are becoming less important while the contents are becoming king, such that new applications are developed every day to advance the productivity of these devices.

More than 90% of the citizens of some developing countries have access to or own mobile phones (Rawlinson 2011). This high penetration of mobile technologies presents an opportunity to reach an exceptionally broad base of citizens in these developing countries (South Africa, Nigeria, and Kenya to name a few). This has dramatically strengthened the motivation for mobile government service implementation through mobile computing.

Government has the responsibility to deliver quality service and information to its citizens at all levels of life. These services and information, which are sometimes critical, are needed by citizens in making decisions and forming opinions. This helps them to feel a part of the government (Farshid and Kushchu 2004). This also allows timely service delivery to the public and therefore helps to promote public participation in democracy, creating accountability and transparency (Farshid and Kushchu 2004). To this end, mobile technology has proven to be a critical channel through which the government delivers services and information to the citizen. This is called government to citizen (G2C) service delivery (Farshid and Kushchu 2004) and citizen communication with the government (C2G and M-democracy) (Brücher and Baumberger 2003). This also includes government’s delivery of service to the business (G2B) and business interacting with

the government (B2G)

### III. M-GOVERNMENT AND THE DEVELOPING COUNTRIES

As stated earlier, E-government is the use of information and communication technology to improve the efficiency and effectiveness of public sector organisations. In the case of m-government, access is by means of mobile and/or wireless technologies such as cellular/mobile phones. M-government can help make public information and government services available "anytime, anywhere" to citizens and officials; thus M-government forms a powerful complement to E-government. (Kushchu and Kuscü 2003). M-government is particularly suited for the developing world where access to traditional internet is low but mobile phone penetration is growing rapidly, particularly in urban areas (Zálešák 2003). Globally, the number of mobile phones has surpassed the number of fixed/wired phones (WSIS 2003).

#### A. *The Three Stages of M-Government and Mobile Computing*

M-government is not simply a matter of offering government officials mobile devices or making old practices mobile. Neither the use of mobile devices nor the automation of complex procedures can bring about greater effectiveness in government or promote citizens' participation. Aiming solely at technological solutions will not change the mentality of officials who view the citizens as neither customers of government nor participants in decision-making.

Understood correctly, m-government utilizes technology to accomplish reform by encouraging transparency, eliminating distance and other divides, and empowering citizens to participate in the political processes that affect their lives through the use of mobile devices. It must, however, be noted that m-government is not a replacement for e-government; rather, it is a complement to it.

There are different strategies available to build M-government. Some of these strategies have created comprehensive long-term plans.

To support policymakers in devising their own plans and initiatives, this research paper divides the process of M-government implementation into three stages. These stages are not dependent on each other, nor does one phase need to be completed before another can begin, but conceptually they offer three ways to think about the goals of M-government.

#### **Stage 1: Distribute**

Governments produce huge volumes of information, much of it potentially useful to individuals and businesses within the particular country (Sas 2012). Mobile technologies and other advanced communications technologies can help bring this information quickly and more directly to citizens. Implementations of M-government differ widely in their design and content, but developing countries generally, can start the process of m-government by distributing government information via mobile technologies (i.e. mobile devices), beginning with rules and regulations, documents, and forms.

As stated earlier, this is due to the fact that more than 90% of the population of many developing countries have access to mobile devices (Rawlinson 2011). Empowering citizens and businesses to readily access government information without having to travel to government offices and stand in long lines can be a revolutionary advance for nations wracked by inefficient bureaucracy and corruption.

Distributed mobile applications seek to disseminate information about government and information compiled by government so as to capture as wide an audience as possible. In doing so, such systems serve as the leading edge of M-government.

#### **Stage 2: Interact – Widening Civic Participation in Government**

Distributed mobile systems, however rich in content, are just a leading stage in M-government project implementation. M-government has the possibility of involving citizens in the governance process by engaging them in interaction with policymakers throughout the policy cycle and at all levels of government, such as applying for various basic government services. Consolidating civic engagement adds to building public trust in government.

Interactive M-government involves two-way communications, starting with basic functions like email contact information for government officials. Further to this, a feedback form that allows citizens to submit comments on legislative or policy proposals, etc are some of the ways government can use to interact with the citizens via their mobile devices.

#### **Stage 3: Transact: Making Government Services Available Online**

The possibility for governments to go further in M-government implementation cannot be over-emphasized. A more advanced implementation of M-government implementation allows users to conduct transactions via their mobile devices. Just as the private sector in developing countries makes use of mobile technologies to offer M-commerce services (such as mobile banking etc), governments in these countries are also expected to do the same with their services. Cost savings, accountability through information logs, and productivity improvements are important drivers to achieving this.

A transactional M-government implementation is one that offers a system that provides government services, available at any time. In the past, government services such as land registration or the renewal of ID documents required long waits, confrontation with sometimes uncooperative officials, and inefficient processes. Innovations such as mobile voting, application for citizen passports, mobile applications that allows citizens to apply for ID documents etc. can reach rural areas; this will allow governments in developing countries to bring governance directly to all the citizens of their respective countries.

#### IV. BENEFITS AND BARRIERS OF M-GOVERNMENT

Mobile access “anytime anywhere” is becoming a normal part of daily life; it is the responsibility of government to find ways to transform its services for the convenience of its citizens and to increase efficiency of interaction between those citizens and the government. According to Kushchu and Kuscus (2003), one of the benefits of M-government comes from the functionality of mobile government implementation supporting mobility of the citizens and internal operations of the government. For example, the ability to locate a government hospital for a particular medical service through one’s mobile phone could be a distinguishing benefit of M-government over conventional E-government implementation.

One of the major benefits of M-government is that it truly helps to create an integrated digital nervous system for the government (Rain *et al.* 2010). In addition, the propinquity and ease of use reduces the previous obstacles to public service with operations, which gives confidence to citizens in making use of the technology. M-government implementation also faces a number of barriers which are discussed below:

- **Privacy and Security:** This is seen as the most important concern that citizens have about M-government (Lanvin 2002). A common concern about this is that one often has to provide ID numbers and phone numbers where identification is crucial, when communicating with the government. The mistrust should be overcome, and an assurance needs to be given to mobile users that people’s privacy is protected.
- **Legal issues:** is Their create a barrier for M-government implementation and adoption. The reason is largely because many countries have yet to adopt the Law of Fair Information Practices, which states the rights of data subjects (i.e. citizens) and the responsibilities of the data holders (i.e. government). Also, in many cases, the law still does not recognize mobile documents and dealings. This means that there is no clear legal status for government mobile transactions (Farshid and Kushchu 2004).
- **Accessibility:** The success of any government to citizen (G2C) mobile government implementation will depend critically on the number of users i.e. the citizens. However, socio-economic issues such as level of income, education level, gender, age, disability, language variation as well as regional and ethnic discrepancies will affect the citizens’ attitude towards mobile government implementation and adoption (Farshid and Kushchu 2004). In order to improve citizens’ contribution to government and democracy and to provide citizen-oriented services, governments need to find a way to offer easy access to M-government services, and to be able to cater for and accommodate every user.
- **Compatibility:** One of the technical difficulties that may occur is the compatibility of the mobile government systems with the existing E-government

systems. This may get even more serious in the cases of government offices comprising legacy systems which may not be easy to incorporate in terms of functionalities and data management (Farshid and Kushchu 2004).

- **Infrastructure development:** For M-government to succeed, the information technology infrastructure must be at hand. This infrastructure is both ‘hard’ and ‘soft’. The hard infrastructure refers to the technology, equipment, and network required in implementing mobile government. No less important are soft infrastructures, such as institutional arrangements, and software that make M-government dealings achievable (Kushchu and Kuscus 2003; Farshid and Kushchu 2004).

#### V. MOBILE COMPUTING

The term "mobile computing" is used to designate the use of computing devices which usually interact in some fashion with a central information system while away from the normal, fixed location (Research 2013). Mobile computing technology enables the mobile user to (a) create; (b) access; (c) process; (d) store; and (e) communicate information without being constrained to a single location.

Mobile computing is a broad term used to refer to a variety of devices that allow people to access data and information from anywhere at any time.

This means that to display, collect, and transfer information to/from a mobile device to an information system requires the use of one or a combination of various data transfer methods.

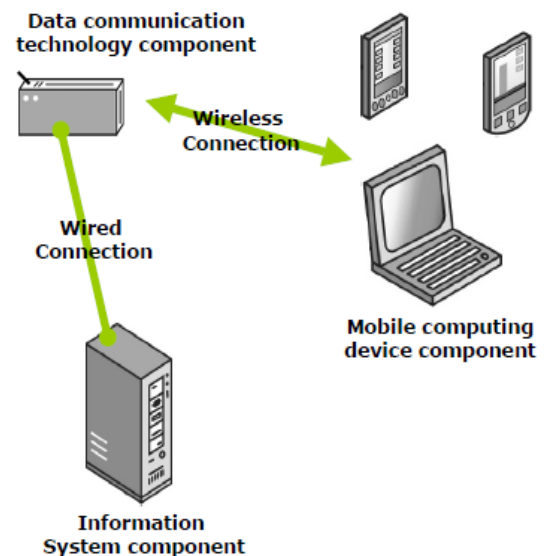


Fig 1: Data communication technology components in mobile technology

#### VI. M-GOVERNMENT TECHNOLOGY

The reality of mobile learning is impossible without the use of the mobile devices. These vary significantly in their

abilities, sizes and prices. The common ability which unites them is their mobility and possibility of making wireless connections. The main types of mobile devices used in the education process are:

**Tablet Devices:** These have small sizes and significant processor power. New models support more than 65000 colors, recognize handwritten text and can play different types of multimedia files. The main operating systems used are, Android, Apple's iOS Palm and Microsoft Pocket PC.

**Cellular phones:** The low class devices can mainly be used for voice communication and for sending and receiving text messages (SMS). Some of their disadvantages are low memory capacity and low data transfer rate. The cellular phones from the higher class can be used to access the internet via WAP or GPRS technologies. They also can be used to send and receive multimedia messages (MMS). Their prices continuously decrease.

**Smart Phones:** These are hybrid devices which combine the abilities of cellular phones and PDA. They have smaller sizes than PDA and bigger than cellular phones. Typically they haven't full sized keyboard and can recognize handwritten text. They use Symbian, Windows Mobile, Android, iOS, Blackberry etc. As they have internet browsers, they have potential to be used in mobile multimedia education.

Today there are several communication technologies which are used in mobile devices. Their abilities vary vastly as well as data transmission range and range [3].

**Global System for Mobile Communications (GSM)** is one of the leading digital cellular systems. It uses narrow band TDMA (Time Division Multiple Access). Originally a European standard for digital mobile telephony, GSM has become the world's most widely used mobile system in use in over 100 countries. GSM networks operate on the 900 MHz and 1800 MHz waveband in Europe, Asia and Australia, and on the MHz 1900 waveband in North America and in parts of Latin America and Africa. It provides integrated voice mail, high-speed data, fax, paging and short message services capabilities, as well as secure communications. It offers the best voice quality of any current digital wireless standard.

**General Packet Radio Service (GPRS).** A packet-linked technology that enables high-speed wireless internet and other data communications. GPRS provides about four times greater speed than conventional GSM systems. Currently 288 operators around the world have commercial GPRS services.

**IEEE 802.11** is a type of radio technology used for wireless local area networks (WLANs). It is a standard that has been developed by the IEEE (Institute of Electrical and Electronic Engineers). Wi-Fi (802.11) is composed of several standards operating in different radio frequencies: 802.11b is a standard for wireless LANs operating in the 2.4 GHz spectrum with a bandwidth of 11 Mbps; 802.11a is a different standard for

wireless LANs, and pertains to systems operating in the 5 GHz frequency range with a bandwidth of 54 Mbps. Another standard, 802.11g, is for WLANs operating in the 2.4 GHz frequency but with a bandwidth of 54 Mbps.

## VII. CONCLUSION

Implementing a mobile government system has a promising future, even as a field of research study. In mobile technology, both appropriate mobile hardware and suitable software applications are necessary components for the provision of M-government. The enhancement of M-government and Mobile computing is useful in governance systems. M-government makes the merge and connection between technology and technical system possible. This paper has discussed the background of M-government and Mobile computing and how they can be used to enhance the whole technical governance system.

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