

Mobile Diffusion and Development: Issues and Challenges of M-Government with India in Perspective

Kavita KARAN¹, Michele Cheng Hoon KHOO²

¹ Nanyang Technological University, 31 Nanyang Link Singapore 637718
Tel: (65) 6790 4570, Email: TKavita@ntu.edu.sg

² Nanyang Technological University, 31 Nanyang Link Singapore 637718
Tel: (65) 6790 4182, Email: michele_khoo@pmail.ntu.edu.sg

Abstract: Mobile telephony has emerged as the new frontier where governments around the world are making themselves more accessible through the remote delivery of government services and faster rate of data transfer. In developing countries, the lower cost of mobile technology as compared to Internet has allowed for the expansion of mobile government or m-government services to the poorer segments of the population. From a literature review on m-government, including the various strategies required and successive practices across the world, we build five parameters for a framework for evaluation of m-government services. These include *Infrastructural Investment, Regulatory and Political environment, Awareness and Acceptance, Security and Privacy, and Equitable Acceptance*. Using these factors, we review the m-government initiatives in selected countries both in the West, Asia and India. This paper provides an updated review of the current mobile government initiatives, including: m-government's facilitation of development; the issues and challenges in India; and, finally, proposes some strategies that can be adopted by India.

1. Introduction

Internet has enabled complete transformative changes in societies all over the world. According to Warkentin et al. (2002), governments are embarking on e-initiatives to improve the process and delivery of government services, transactions as well as communications with citizens and businesses. They recognize the potential of ICTs to bring about changes and increase efficiency and effectiveness in the public sector (Layne & Lee, 2001; Karan, 2004). Mobile telephony, on the other hand, can reach areas where there are infrastructure constraints for internet service or where wired phone service is not a viable option. Mobile telephony has emerged as the new frontier where governments are making themselves more accessible through the remote delivery of government services. These are subsets of the successful e-government strategies adopted by governments around the world.

What are the reasons for governments to embark on e-government initiatives? According to Heeks (2000), there are three main factors. First, the current level of expenditure on public services do not produce the desired level of efficiency and effectiveness due to wastage, delays, mismanagement and poor organization and management skills. Second, the revival of neo-liberalistic thoughts that emphasizes the importance of market competition, and the need for governments to adopt business mindsets. Third, governments are increasingly becoming aware of the tremendous potential of the rapidly developing IT sectors. Many countries around the world have been successfully using e-government tactics in delivering citizen services, feedback mechanisms, and there are greater levels of transparency and efficiency in

the transactions and levels of satisfaction among the citizens. However, though Internet is readily available in most countries, the people are either unable or unwilling to access public services over the Internet. As Fountain (2001) argued, the technology of the Internet does not mean the same thing to different governments and their people. Besides infrastructural constraints, there are also the concerns of digital divide and issues of inequalities amongst the people.

Hence, innovative efforts are being devised to deliver services through cheaper and easily accessible technology, of which the mobile systems are a great innovation. Using such wireless technology opens up new channels where governments can deliver services to the citizens through a more efficient and lower cost model (Ghyasi and Kushchu, 2004; Hossan et al., 2006). Through the review of studies done on m-government, we are proposing the following parameters of a framework for evaluation of m-government services: *Infrastructural Investment, Regulatory and Political environment, Awareness and Acceptance, Security and Privacy and equitable acceptance* (Sandy and MacMillan, 2005; Chandrasekhar, 2007; Karan, 2004). Using these critical success factors, through an in-depth case study, this study will review the m-government initiatives in selected countries in the West, Asia and India.

2. India – A move toward mobile telephony

India is on the threshold of mobile revolution. In a recent report, it is estimated that a large part of India's revenue comes from mobile data usage. According to Pyramid Research by 2012, India will be the fourth largest market for mobile data revenue in excess of USD14 billion, which is huge compared to USD 2.2 billion for all of 2007 (Pyramid Research, 2008). The government is planning to set up a 256 Kbit/s broadband service that encourages a majority of Indians to get enough data services from their mobile phones. Early 2008, one of the world's leading IT research and advisory company, Gartner Inc., predicted that India will have 6.9 million mobile and fixed Worldwide Interoperability for Microwave Access (WiMAX) connections by the end of 2011 (Lewis, 2008). At present, most states in the country are successfully delivering government-to-citizen services through e-government networks and are gradually using mobile channels, a move towards m-government. It is estimated that in the Government of India approximately 50%–60% of government services can be delivered via mobile channel through the m-government for mobile-enabled development (Chandrashekar, 2007). The Society for Promotion of e-Governance (SPeG) a non profit organization is also facilitating the various government agencies and helping them initiate mobile government projects in India. To date, the country has established various successful networks including *Nicnet* for connecting state and central Government offices; *Ernet* to connect Educational and Research institutions; *Railnet* to connect Railway networks and *Airline network* to connect the air ticket reservation and its services. Such initiatives are operationalized with minimum network bandwidth to ensure infrastructure longevity for at least ten to fifteen years (Ghosh & Arora, 2005).

Over the past decade India has seen a tremendous boom in cellular phone users. Today companies in India see the cellular phone as an advertising medium just like the radio, television and the internet. In the Telecom Regulatory Authority of India (TRAI) report released on Jan 1, 2008, Internet subscribers increased to 9.63 million at the end of September 2007. This means a higher proliferation of Internet across India and with the wireless market grown by 13% with an addition of 24.15 million subscribers in quarter ending September 2007, there is a substantive increase in the mobile phone users. The net savvy generation also increased the Broadband subscribers to 2.67 million at the end of September 2007. People are looking for higher speeds for better content and online advertisements. The subscriber base for wireless services has increased from 184.92 million in June 2007 to 209.07 million in September 2007, whereas subscriber base of wireline service has decreased from 40.09 million in June 2007 to 39.58 million in September 2007. According to Kurrup (2008), it is estimated that today one in four Indians owns a mobile

phone and that by 2020, every employed adult in the country would have one. However, it is true that network coverage and mobile penetration are still limited in some of the remote rural areas (Adler and Uppal, 2008).

3. Objectives of Research and the Methodology for the study

The objectives of this research are to examine the strategies of mobile usage by governments across the world and evaluate the factors facilitating development, particularly in moving from e-government to m-government. Through the factors identified, and from examples from around the world, we study India as a case with the challenges faced by the country and propose a framework, which the Indian government could consider in their mobile government applications. Secondly, we felt that this framework is a holistic roundup of the issues surrounding the successful implementation of m-government initiatives that are relevant to India. It is mooted after detailed review of past and present research on m-government projects around the world. Thirdly, this framework and analysis would serve as a reference point for most of the developing nations in their adaptation and use in implementing m-services.

A case study method was used (Reinard, 2001; Wimmer and Dominick, 2006). The framework was developed from the literature review across the countries around the world. Sandy and MacMillan (2005) on examining the available literature on m-government conclude that there are six factors critical to any m-government success. These include: Cost, Business re-engineering, Education, Acceptance, Security and Access. Further studies in other countries added to the factors that influenced the success of m-services and the study was built on the framework of five factors; see above (cf. also Welch and Wong, 2001; Trimi and Hong, 2008; Shin, 2007; Kushchu and Kuscu, 2004; Sandy and MacMillan, 2005; Gupta, Dasgupta and Gupta, 2008). The framework with the five factors will be applied to analyze the m-government initiatives in India.

4. E-Government to M-Government

What is the difference between electronic government (e-government) and mobile government (m-government)? Simply put, mobile government is one of the manifestations of electronic-government. It also appears as the natural move from the e-government efforts, where citizen services are being delivered through the computer networks building epistemic societies and easing the lives of individuals particularly among the people in rural areas (Hossan et al., 2006; Karan, 2004). According to Zálešák (2003), m-government is a subset of e-government but with the unique feature of allowing freedom of mobile access to services and information at any time and from any place. It goes beyond just provision of information via mobile phones to the citizens, but includes more complex utilization of all wireless-based devices and platforms including mobile phones, PDAs and the ubiquitous Blackberry.

Governments in Asia are beginning to see the tangible gains in using mobile government applications. According to Business News & Technology News (2008), global mobile phone subscribers were 3.1 billion in 2007 and are expected to reach 4.5 billion in 2012. In Asia, 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, and every country in the region has mobile telephone usage exceeding Internet use. This gap is in fact even more pronounced in developing countries. With pre-paid mobile services, poor economies are also able to reap the benefits of mobile communication technologies as governments are able to tap on the mobile channel to communicate with the people. For example, in the Philippines, more than half the government departments use mobile channels to deliver services to the citizens (Smith, 2005).

According to Zálešák (2003), government's mobile services contribute in two general ways. First, mobile services allow for the easy sending of information to citizens through Short Message Services (SMS) directly to their mobile phones. The second way is almost

transparent to the citizens as it involves the streamlining of government processes and making them easily available to the citizens. For developing countries, with limited ICT or Internet penetration, mobile services present interesting opportunities for the government in both investment and technological points of view as this does not require extensive infrastructure or hardware, and, equally important, the issue of training in the use of this technology is circumvented as it is easy to manage mobile phones.

5. M-Government Applications, Strategies and Best Practices

In this section, we will discuss some of the m-government applications around the world, and specifically in Asia, learning from their successes and challenges of the various m-government applications within these countries. The tacit assumptions of most m-government initiatives is grounded largely within the power-knowledge framework linking technology to development and the need for the undeveloped to play catch-up with the developed. This is essentially the essence of modernization theory (Schelkle et al., eds., 2000).

This paper does not seek to critique the process of technological development per se as there are indeed many positive contributions that the various electronic and mobile government initiatives have brought to people. Rather, we want to understand the factors that contribute to the success of such initiatives and discuss how that could be applied to India's emerging m-government initiatives.

5.1. Infrastructural Investment

For developing countries, one of the main hurdles in jumping into the bandwagon of m-government is perhaps the cost of infrastructure development. Managing this factor is indeed critical for the success and failure of any m-government project. Granted that not all e-government or m-government initiatives entail huge financial investments, most of the projects do require a certain portion of the nation's budget. Researchers such as Rahul and Sen (2004) have shown that with the appropriate business model, these projects can be successful and self-sustaining. To move forward and garner more private sector support and participation, it is proposed that the government leverage on the advantages of public private partnership (PPP) to move towards providing mobile services to its citizens.

To date, though the Indian government is portrayed as a main driver of infocomm development in India, it is unfortunately unable to motivate many private operators to join in the broadband bandwagon. This is largely due to the low PC penetration in the country resulting in low demand for broadband usage. Though the PC penetration rate is very low in India, the mobile penetration rate is extremely high. According to a report published by Paul Budde Communication Pty Ltd (2007), a research company, the Ministry of Communications and Information Technology (MCIT) of India is targeting 250 million telephone subscribers by end-2007 and 500 million by 2010. The government recognizes the great potential of telecommunication industry in helping the country to move forward. Besides telephone subscribership, the country is also seeing a mobile market boom, with annual growth rate approaching 90 percent in 2007. Overall, India with total revenue of US 22.4 billion in 2006 for the telecommunication market (ibid.) is an indication that there is much room for the private sectors to come in and play a pivotal role together with the government in developing m-government initiatives.

Public Private Partnership (PPP)

Hall and Soskice (2001) suggest that one of the main purposes of privatization of public services is to establish a possible comparative advantage though cost effectiveness. Governments are increasingly working with the private sector to jointly develop the required infrastructure and the subsequent management of nation-wide technology services. M-Taiwan is an example of the "*Build and Operate*" model where PPP allows the government to invest only a minimal sum to get the required infrastructure and the subsequent maintenance and

delivery of services. The entry of the private sector encourages efficiency and value-added services with profits as a strong motivator. It is a win-win situation for all parties – government will be able to deliver the required services; the private companies are able to generate profit and the citizens are able to gain wider mobility and access to information and services.

There are similar costs sharing initiatives in Singapore where industry players have been playing active roles in many government's IT projects. The Infocomm Development Authority (IDA) of Singapore reported that in 2007, about S\$730 million worth of ICT tenders were called with a total of S\$2.12 billion committed on 654 contracts. Overall, the Singapore government will be spending a total of S\$1.14 billion (US\$833 million) from 2008 to 2009 on new infocomm projects. One of the more ambitious projects is that the country will be building a broadband network to deliver high speed connectivity to all homes as well as offer wireless broadband network throughout Singapore. Though the IDA is overseeing the project, the network rolling out is executed through a PPP. This move will not only create the required public service broadband network at a much reduced cost to the government, but will also spur the growth of the related sectors such as broadcasting and digital media.

One of the recent PPP project in India as announced in 2008, is a \$2-billion PPP to provide broadband and internet connectivity in India's rural areas. \$1.5 billion for the project would be generated from the private sector and the balance would be funded from government sources. It is felt that the concept of PPP is important for the Indian government to further develop the mobile technology in the country, including broadband and mobile communication especially in the rural areas, as they do need private sector's contribution to bring the country to the next level of m-government.

Common Service Centers

The Common Services Centers (CSC) are part of India's National e-Governance Plan (NeGP) developed by the government in 2006 to launch e-governance nation-wide. CSCs promise to deliver cost effective and high quality video, voice and data on education, health, government services as well as entertainment to the end users. Importantly, such centers are able to introduce web-enabled government services to the rural areas of India such as service application forms, payment services and certificates. The CSC scheme is a good example of how the private sector can become a partner of the government in the development of the rural sections. As discussed earlier, PPP is a viable option when implementing m-government services. Under the PPP model of CSC, there are currently three-tier structure where the first tier is the Village Level Entrepreneur (VLE); the second tier is the Service Center Agency (SCA) which takes care of around 500 to 1000 CSCs and finally at the top of the structure will be the State Designated Agency (SDA) which is selected by the State government to oversee the implementation of the scheme at the state level.

Drivers of Growth for Mobile Services

Mobile Device penetration – one of the key drivers for the growth of m-government in India is the high level of mobile penetration in the country. As discussed above, mobile subscribership will reach 500 million by 2010. As with other developing countries, India's rural residents often perceive mobile phones as a valuable resource and are inclined to share its usage with family members and even friends at no cost at all. According to a LIRNEasia (2007) study, 80 percent of poor Indian households in which at least one member owns a mobile phone, close to half of them share their phones with family members and even non-family members.

Mobile Internet Services – One of the key to the success of m-government is the implementation of services that are relevant and useful for the needs of the end-users. These services are sometimes called hybrid services. One such example is the DakNet service by United Villages, Inc. to bring Internet connectivity to isolated rural villages in India. Villages are fitted with WiFi kiosks that villages can use to search for jobs and even make travel

arrangements. The implementation process is customized to suit the localized needs of the people. There are many mobile access points (MAPs) which are small base stations mounted on buses or motorcycles. When these vehicles pass through the villages, the kiosks, which have been storing information from the user's offline, will connect to the MAPs and the messages will be uploaded and downloaded accordingly. As the routes that are plied by these vehicles are mostly through the villages, most messages are delivered within 6 hours. DakNet hopes to expand to more than 50,000 villages by 2011.

Mobile Payment models – One of the promising services for mobile-phone initiatives is m-commerce. M-commerce would be important to India as in the country, as a small percentage of the population currently has a bank account. Some of the banks in India have already introduced mobile banking to their customers. For example, ICICI Bank and ABN Amro Bank have services where customers can check account balances, transfer funds and even pay bills. Telcoms such as Airtel has also partnered with VISA and the banks to promote mobile bill payment and prepaid phone top-up services. Subscribers can also pay for movie tickets, sporting events with their phones (Bollier, 2006).

5.2. Regulatory and Political Environment

Levels of Government

Political stability and a favorable regulatory environment to facilitate m-government initiatives are some of the most important concerns for effective functioning. The constitutional division of the government function in India is very much like that of the federal government system of the United States. It is basically divided into three levels – Central government level, State level and Municipal level. One area where mobile technology is deemed important in India is perhaps its contribution towards the democratization of access to government services. With the digitization of information and the convergence of technology, citizens are able to gain easy access to government information at all levels. Hence a crucial issue for India would be close cooperation and collaborations amongst the various levels of government which will harmonize their joint efforts.

Policy Development

In India, the government began to realize the importance of developing the telecom industry and decided to revisit its telecom policy and in 1999 set up the National Telecom Policy, which separated the licensing and service provisions, as a precursor to corporatizing. Subsequently, in the early part of 2001, the Indian Group of Ministers (GoM), chaired by Finance Minister Yashwant Sinha, formally approved the draft of the nation's Communication Convergence Bill (CCB). Perhaps the most significant component of the bill is its creation of the Communications Commission of India (CCI), which would act as a super regulator overseeing telecommunications, broadcast, and information technology (Menon, 2004). These policies have helped India to engage competitively in the information highway market. With strong centralized government and policy support, the Indian mobile market has moved from a duopoly market structure to a competitive market with the current four service providers in the market providing mobile services (voice and data).

In India, based on the targeted audience, there are now wide arrays of terrestrial and satellite based solutions to choose from for the service providers. For example, leading Internet service providers such as Sify, BSNL, Pronto Networks, and Dishnet Wireless have setup Wi-Fi networks in airports, coffee shops, and other locations in metropolitan areas allowing for mobile services via telecommunication devices. In Mysore, India, WiFyNet has installed a city-wide Wi-Fi network of 130 square km. In the Pune municipality, the state government has partnered with Intel and developed a city-wide Wi-Fi network of 400km square. Such partnership with governmental and policy support can create community wireless networks that can help the country reap rapid results.

5.3. Awareness and Acceptance

At the Division of Public Administration & Knowledge Management (DPADM) of the United Nations, there are often requests for support from the UN member states for their effort in programmes to raise awareness as well as in education and training in m-government initiatives for development (e-government development in Africa: Progress Made and Challenges Ahead, 2008). Once the required infrastructures are in place, the next step will be to look towards creating awareness and fostering acceptance amongst the citizens as well as the various government departments. This would include *increasing mobile wireless literacy; developing the relevant skills through training in the various agencies and departments, as well as redefining the various governments' products and services for implementation in the mobile arena*. Any e-government or m-government initiative would be pointless if the acceptance rate by the citizens is low. Process participation by citizens is crucial for the success of m-government programmes. The various government agencies need to coordinate the diffusion of the necessary information and services to the mobile platform. The high mobile penetration rate will facilitate a high level of acceptance amongst the citizens.

Appropriate training and induction is essential to ensure minimal disruption to services or cause unnecessary stress for both the agencies involved and the users. In the Southern Indian state of Karnataka, land records have been computerized and there are also applications for monitoring activities covering developmental programmes, addressing public grievances and disaster management. There is also a VSAT based communication network that supports real-time data applications for power generation and distribution. For these changes to be implemented successfully there needs to be proper dissemination of information as well as educating the workforce about the potential benefits, and training is a must to ensure a smooth transition (Ghosh & Arora, 2005).

In India, with its diverse land areas and variations in social and economic status of its people, acceptance of any new e-government or m-government initiative is crucial for its success. In Madhya Pradesh, the *Gyandoot* project was welcomed in the drought-prone area as it provided the villagers with vital government information and documents such as income and residence certificates. Project FRIENDS (Fast, Reliable, Instant, Effective, Network for Disbursement of Services) in the Kerala State of India is well-received as it gives the people the convenience to process bill payments in one local centre. At the same centre, the AKSHAYA project provides diverse information and government services that local people can access. These two initiatives are very well-received by the people as they have helped to develop social networks and generate entrepreneurial activities that, in turn, increase the productivity of the local people (Zambrano and Dandjinou, 2005).

In Bangladesh, a survey by Hossain, Habib and Kushchu (2006) to understand *e-Citizens Service Application* system found that more than two thirds of the government officials were not clear about the government's initiatives, indicating that there is a lack of coordinated briefing within the various government departments. For future m-government strategies to work, then training of officials, managing information and instant feedback systems would be essential for disseminating such services.

5.4. Security and Privacy

Security and privacy concerns are perhaps the most important considerations for both the government as well as the citizens in any m-government projects. There needs to be *data integrity* particularly in relation to loss and theft as well as *transaction audit and transparency*. There should also be secure storage of data. Security issues are of special concern for policing work, which is a highly networked activity. A mobile network must be highly secured in order to enhance police efficiency. In New South Wales, Australia, the NSW Department of Health maintains a high level of system security as they are sending health warning messages as well as health-check reminders to its citizens' mobile phones (Al-khamayseh et. al., 2006). In the United States, the Virginia state was the first to launch a

wireless state portal, “*My Mobile Virginia*” that allows government services to be accessed via wireless and mobile devices. According to Moon (2004) the Virginia m-government system is protected by encryption and subscription requirements to prevent any possible tampering and the mobile services are protected by the same security measures as the Virginia government portal, hence generating trust and acceptance from the citizens.

According to Chang and Kannan, (2002) mobile technologies are more susceptible to security breaches as the devices are easily stolen and have relatively weak built-in security measures. There are three main areas of security concerns for mobile technology – *network infrastructure, software applications and device problems*. Other researchers such as Mitra (2004) propose that factors including *IT skills, system security* as well as *network acceptability* are crucial for e-government or m-government police activities.

Examples from around the world have shown the importance and problems of security and privacy to both the government and citizens. In the Philippines, the success of the Text 2920 project where crimes can be reported with SMS was hindered by the lack of public trust for the security and privacy of the people. The citizens are concerned that their particulars are not secure and will be leaked out if they were to make a report (Alampay, 2002). In Kenya, the M-PESA project would not have been a success if the users are not confident that their money is secure in the system as the M-PESA system allows the user to use their mobile phones like a bank account, where they can credit their account at their local telecommunication provider, and then use it to pay for a wide range of services without the need to use cash (From e-Government to m-Government, 2007).

In India, the Information Technology Act which came into effect in 2000 allows for official documents to be authenticated with digital signatures and also provides for various security measures for digital signatures.

5.5 Equitable Access

Equitable access to information is one of the most vital principles in the emerging global information economy. In countries around the world, with the rise of mobile technologies, there is an increase in the number of services being developed that cater to the localized needs of the people. Ideally, the interface must be able to adapt and cater or facilitate the needs of the various socio-economic groups. Gender differences, illiteracy, poverty and urban rural divides have been some of the causes of digital divide (Luca and Sylla, 2003; Mathison, 2003). Some researchers, e.g. Lee, Tan and Trimi (2006), have argued that m-government initiatives can help to bridge the digital divide caused by uneven distribution of internet connectivity, especially in developing countries.

In China, the 150 million mobile phone owners can now send SMS to the officials of the National People’s Congress. In the Philippines, half of the cabinet agencies have SMS-based services that allow citizens to ask for information or to comment and complain about government officials and services. In the UK, the London police has a service that sends alerts to businesses in London about security threats; including bomb alerts and other attacks. At the height of the SARS incident, the Hong Kong government sent a blanket text message to six million mobile phones in a bid to allay fears from rumors about the disease (From e-Government to m-Government, 2007).

In the city of Turino, Italy, the government has launched an m-government initiative, *BluTo*, which uses Bluetooth technology to provide inherent located content to citizens and tourists. As the Bluetooth technology is based on short range connectivity, it is able to provide data transfer at zero cost; the public administration of the city feels that it is an important and useful technology to overcome the concern of digital divide as all individuals with a mobile Bluetooth device will be able to receive useful information and services (Carcillo, Marcellin and Tringale, 2006). Likewise, in the city of Mexico, there exists an intelligent city project, *Digital Talpan* that incorporates electronic services through mobile technologies linking the government departments, the universities, hospitals and the private

sectors. One expected outcome of this initiative is to bridge the digital divide between the people through the creation of digital community centers.

6. Discussion and Conclusions

M-government is the new emerging system of delivering citizen services and a subset of e-government. The latter is a platform where information and communication technologies are used to enhance public sector services or the delivery of the government services. When m-government initiatives come into force, the switch is to a platform that focuses on wireless technologies such as mobile phones, laptops and PDAs that are connected to Local Area Network (LANs) making services available anytime and almost anywhere to both government officials and citizens.

Through this paper, we have attempted to sieve through the huge amount of research that has been done on ICTs and e-government as well as the emerging researches that are being done on m-government to identify some factors which we feel will impact the success of an m-government project. We identified five factors – *Infrastructural Investment, Regulatory and Political environment, Awareness and Acceptance, Security and Privacy and Equitable Access*. Through a preliminary review of some of the projects around the world and in India, it is proposed that in order for India and any country to successfully implement a full-fledged m-government platform with a plethora of public services, the following issues based on the five factors need to be addressed.

First, the domestic telecommunication device manufacturing industry will need to keep up with the demand in the services sector, as the majority of the demand for telecommunication equipment and technologies is currently met through foreign imports. According to a World Bank report in 2006, there is a huge untapped market in the Indian mobile sector with the country's three key growth drivers in telecommunication: a) *competition* which has ensured that India currently has one of the lowest tariffs in the world; b) *effective regulator* in the form of TRAI, an effective and trusted independent regulator; and c) *market potential* as India positioned to take over China as the next telecom sector boom with the falling tariffs resulting in increased usage levels.

Second, related to the infrastructural development, is the extension of telecom services to the rural areas of India to aid in developmental projects. As proposed in the earlier section, a public private partnership (PPP) may be the most viable option for the country. Given the uncertainties involved in undertaking such large-scale investment, more cohesive business models with co-sharing of risk and greater interlink between the private sector investors, and the government would be more desirable. We feel that it is a win-win situation with the government and the operator sharing the cost of building the required infrastructures. As Gupta and Jana (2003) conclude, India is lagging behind due to poor infrastructure and the corresponding slow response to the emerging cyber-culture.

Third, India still lacks a robust framework for data protection and ensuring the privacy of the users. As Gupta and Jana (2003) suggest, India will need time to catch up with the big cities such as New York, which has had huge investment and much more lead time to build up a system that protects the citizens' information from unauthorized access, damage, modification or disclosure.

Four, the adoption of an m-government platform does present India with the opportunity to bridge the gap between the haves and have-not in the country. As Singh and Sahu (2008) suggest, mobile phones distribution, unlike computers, is not restricted to those with higher socio economic status. The mobile phone penetration in India is much higher than its internet penetration rate. Moving to a mobile platform may be the right direction for India in the bid to bridge the digital divide. Already the changes are apparent as the mobile systems are being used extensively for commercial purposes, as Indians are being targeted by local and transnational companies for promoting products and services

Finally, if privacy, security and control measures are put in place through various hardware mechanisms, m-government services will greatly enhance efficiency of the

government sectors, greater government – citizen interface, political participation, transparency, reduction in mediating and exploitation by middle men and corruption, which are already being felt through the e-government strategies in India and other Asian countries (Chand, 2006; Ghosh, 2003; Karan, 2004). Therefore, in conclusion, though India is still at the initial stage of most of its m-government projects, it certainly has the potential to adapt the ways the country can leverage on the emerging mobile technologies to enhance the quantity and quality of its public services.

References

- Al-khamayseh, S., Hujran, O., Aloudat, A., & Lawrence, E. (2006) Intelligent M-Government: Application of Personalisation and Location Awareness Techniques [Electronic Version], from www.mgovernment.org/resurces/euromgvo2006/PDF/1_Al-Khamayseh.pdf
- Adler, R. P., & Uppal, M. (2008) *m-Powering India: Mobile Communications for Inclusive Growth*. The Aspen Institute. <http://www.aspeninstitute.org/site/c.huLWJeMRKpH/b.4618345/>
- Alampay, E. A. (2002) People's Participation, Consensus-Building and Transparency through ICTs: Issues and Challenges for Governance in the Philippines. *Kasarinlan* Vol. 17, No. 2 pp. 273-292.
- Bollier, D., (2006) *Connect and Catalyze: Can India Leverage ICT for Inclusive and Sustained Growth?* Washington, D.C.: The Aspen Institute
- Carcillo, F., Marcellin, L., & Tringale, A. (2006) *BlueTo: a location-based service for m-government solutions*. Paper presented at the Euro mGov, 2006
- Chand, V. K. (2006) *Reinventing public service delivery in India: Selected Case Studies*. NY: Sage
- Chandrashekar, R (2007) *M-Government: The New Frontier in Public Service Delivery*. Paper presented at the eGovWorld, Mobile Government Consortium International, IIS-Russia, eGov Monitor and the Development Gateway, New Delhi
- Chang, Ai-Mei, and P.K. Kannan. (2002) *Preparing for Wireless and Mobile Technologies in Government*. IBM Center for the Business of Government.
- Easton, J. (2002) *Going Wireless: transform your business with wireless mobile technology*, HarperCollins, USA. Pp. 187-196
- e-government development in Africa: Progress Made and Challenges Ahead* (2008) Paper presented at the Special Capacity Development Workshop organized by the United Nations Department of Economic and Social Affairs, Kampala, Uganda
- Emery, G. R. (2002) Virginia government portal No. 1 in Nation. *Washington Technology*
- Fountain, J. (2001) *Building the virtual state: Information technology and institutional change*, Washington, DC: Brookings Institution
- From e-Government to m-Government (2007) [Electronic Version]. *ICTD Project Newsletter*
- Garg, S., Sundar, D. K., & Garg, I. (2005) M-Governance: A Mobile Computing Framework for Integrated Disease Surveillance in India [Electronic Version]. Retrieved 10 September 2008, from www.mgovernment.org/resurces/euromgov2005/PDF/21_R357GS.pdf
- Ghosh, A., & Arora, N. (2005) *Role of E-Governance Frameworks in Effective Implementation*. Paper presented at the 3rd International Conference on E-Governance, Lahore, Pakistan.
- Ghosh, N. (2003) Two Indian states lead e-govt revolution. *Straits Times*, 22 January 2003. Retrieved 6 August 2006 from http://it.asia1.com.sg/newsdaily/news002_20030122.html
- Ghyasi, A. and I. Kushchu (2004) *Uses of Mobile Government in Developing Countries*, mGovLab, <http://www.mgovlab.org>
- Global Mobile Phone Subscribers to Reach 4.5B by 2012. (2008) *Business News & Technology News* Retrieved 10 Sep, 2008, from <http://www.wirelessdesignasia.com/article-8031-globalmobilephonesubscriberstoreach45bby2012-Asia.html>
- Goodhue, D. L., and R. L. Thompson (1995) Task-Technology Fit and Individual Performance, *MIS Quarterly* 19 (2), pp. 213-236.

- Gupta, B., Dasgupta, S., & Gupta, A. (2008) Adoption of ICT in a government organization in a developing country: An empirical study. *Journal of Strategic Information Systems*, 17(2008), 140-154.
- Gupta, M. P., & Jana, D. (2003) E-government evaluation: A framework and case study. *Government Information Quarterly*, 20(2003), 365-387.
- Hall, P.A. & Soskice, D. (2001) An Introduction to Varieties of Capitalism. In: Hall & Soskice (eds.): *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*. Oxford: Oxford Univ. Press, pp. 1-68.
- Heeks, R. (2000) *Reinventing Government in the Information Age*, Routledge Press, London
- Hossain, C. G., Habib, M. W., & Kushchu, I. (2006) Success and Failure Factors for e-Government projects implementation in developing countries: A study on the perception of government officials of Bangladesh [Electronic Version]. Retrieved 10 September 2008, from www.mgovernment.org/resurces/euromgvo2006/PDF/9_Chowdhury.pdf
- India – Financing Infrastructure: Addressing Constraints and Challenges*. (2006) The World Bank.
- Paper presented at the 3rd International Conference on E-Governance, Lahore, Pakistan.
- Karan, K. (Ed.) (2004) *Cyber communities in rural Asia: A study of seven countries*. Singapore: AMIC/ Marshall Cavendish.
- Kushchu, I., & Kuscus, M. H. (2004) From E-government to M-government: Facing the Inevitable [Electronic Version]. <http://www.rswan.gov.in/resources/Concepts/egovtomgov.pdf>
- Kurup Saira (2008) India's new mantra: Talk more, work more 7 Sep 2008, 0337 hrs IST, TNN <http://timesofindia.indiatimes.com>
- Layne, K. & J. Lee (2001) Developing fully functional E-government: A four stage model *Government Information Quarterly*, 18, pp. 122-136
- Lee, S. M., Tan, X., & Trimi, S. (2006) M-government, from rhetoric to reality: learning from leading countries. *International Journal of Electronic Government Research*, 3(2), 113-126.
- Lewis (2008) Gartner Says India to Have 6.9 Million Mobile and Fixed WiMAX Connections by the End of 2011 <http://www.gartner.com/it/page.jsp?id=631808> Retrieved, November 10,2008
- Luca, H. & Sylla, R. (2003) The global impact of the Internet: widening the economic gap between the wealthy and poor nations? *Prometheus*, vo.21, no.1, pp. 3-22.
- Mathison, S. (2003) *Digital dividends for the poor. ICTfor poverty reduction in Asia*, Global knowledge part., http://www.globalknowledge.org/gkps_portal/index.cfm?menuid=269&parentid=179 Accessed 12 August, 2006.
- Menon, S. S. (2004) India's convergence policy within its communication sector: A long road ahead. *Government Information Quarterly*, 21(2004), 319-336.
- Mitra, R. K. (2004) Issues and challenges of E-governance in Indian Police: A study. *PhD thesis, Indian Institute of Technology, Delhi*.
- Moon, M. J. (2004) *From E-Government to M-Government? Emerging Practices in the Use of Mobile Technology by State Governments*: IBM Center for The Business for Governments.
- Nodari, Simonjias. (1992) *Synthesis of tradition and modern in the evolution of Third World societies*. New York: Greenwood Press.
- Paul Budde Communication Pty Ltd (2007) *2007 Asia – Telecoms, Mobile and Broadband in India*. <http://www.mindbranch.com/Asia-Telecoms-Mobile-R170-863>.
- President Committee on Government Innovation and Decentralization. (2003) *The Vision and Principle for e-government in Participation Government*.
- Pyramid Research (2008) *The Philter: India's Mobile Data Explosion*. Retrieved on 21 September from http://www.lightreading.com/blog.asp?blog_sectionid=217&doc_id=164009
- Rahul D. & Sen C. (2004) The Complex Nature of e-Government Projects: Case Study of Bhoomi, an Initiative in Karnataka, India.
- Reinard, J (2001) *Introduction to Communication Research* (3rd ed.) Singapore: McGraw Hill

- Sandy, G. A. & McMillan, S. (2005) A Success Factors Model For M-Government [Electronic Version.] www.mgovernment.org/resurces/euromgov2005/PDF/36_R348SG.pdf Retrieved 10 Sep 2008.
- Schelkle, W., Krauth, W.-H., Kohli, M. & Elwert, G (eds., 2000) *Paradigms of social change: Modernization, development, transformation, evolution*. New York: St. Martins Press.
- Shin, D.-H. (2007) A critique of Korean National Information Strategy: Case of national information infrastructures. *Government Information Quarterly* 24(2007), 624-645.
- Singh & Sahu (2008) Integrating Internet, telephones, and call centers for delivering better quality e-governance to all citizens. *Government Information Quarterly* Volume 25 (3), July 2008, pp. 477-490.
- Smith, J. (2005) Cutting the wires: Why Asian governments are going mobile. *Public sector technology and management*, 2.2.
- Telecom Regulatory Authority of India. Study Paper on financial analysis of telecom industry of China and India. *TRAI Study Paper 2006*(1):1–13.
- TRAI Telecom Regulatory Authority of India (2008) Indian Telecom Services performance Indicators July –Sept 2007 (<http://www.trai.gov.in/trai/upload/Reports/38/report1jan08.pdf>)
- The Mobile-Taiwan Project Will Show a Multi-billion Dollar Economic Growth (2007) [Electronic Version]. *COMPUTRADE*, 274. Retrieved 10 September 2008, from http://cti.acesuppliers.com/meg/meg_1_8028013262008742582777844_983.html
- Trimi, S., & Sheng, H. (2008) Emerging Trends in M-Government. *Communications of the ACM*, 51(5).
- Warkentin, M., Gefen, D., Pavlou, P. A., & Rose, G. M. (2002) Encouraging Citizen Adoption of e-Government by Building Trust. *Electronic Markets*, 12(3), 157-162.
- Welch, E. and Wong, W. (2001) Global information technology pressure and government accountability: The mediating effect of domestic context on Website openness, *Journal of Public Administration Research and Theory*, 11(4): 509-538
- Wimmer, R.D. & Dominick, J.R. (2006) *Mass Media Research: An Introduction* 8th Edition. Belmont, Calif.: Wadsworth.
- Zálešák, M. (2003) Overview and opportunities of mobile government. Retrieved 10 September, 2008, from egovernment.developmentgateway.org/uploads/media/e-government/mGov.doc
- Zambrano, R., & Dandjinou, P. (2005) *E-governance service delivery: India and South Africa*. Paper presented at the UNDP e-governance Sub-practice Event