Abstract
India is the fastest growing mobile subscribers market in the world with more than 850 million subscribers. Mobile phones have become an important component in Indian household. m-Governance is envisaged to propel the functioning of the government, at the next higher level. In this paper, we analyze the true potential of m-Governance in the Indian scene. Also, we examine the areas where the e-Governance services can be made available through wireless and mobile technologies. The paper also rivets on M-Health as well studies some successful m-Governance projects implemented in other countries, and examines the M-PESA mobile commerce project in Kenya.

Keywords: e-Governance, m-Governance, m-Health, m-PESA.

Introduction
Information delivery to public is a key task in a democracy and often not an easy task. It is the responsibility of the government to keep their citizens informed of what is happening around them. Citizens need this information and sometimes are critical for them in making decisions and forming any opinions. Timely information delivery to public promotes democracy in the country and creates accountability. The basic and universal cornerstones of good governance are quality of service, quick response mechanisms and above all accountable and transparent process mechanism. With advances taking place in the field of e-Governance, the government is able to easily offer good governance for the convenience of the people. The first generation e-governance initiatives resulted in computerization of the legacy systems/practices in government with limited ability to internalize the advances in Information and Communication Technologies (ICT). The conventional e-Government efforts focus on providing services through internet portals, but it doesn’t cater to the mobility of the government and the mobile society.

Today, India is moving towards m-Governance, after its foray into e-Governance. The speedy diffusion of mobile ICT such as laptops, mobile phones, PDAs (Personal Digital Assistants), along with emails, instant messaging and other networking services have rapidly fuelled the mobilization of interaction. Our society is increasingly getting mobile, and people want everything available on their handsets. According to Wikipedia, nearly 850 million people in India own a mobile phone today. India is the second largest telecommunication network in the world in terms of number of wireless connections after China. The Indian Mobile subscriber base has increased in size by a factor of more than one hundred since 2001 when the number of subscribers in the country was approximately 5 million to 752 Million by Feb 2011. As the fastest growing telecommunications industry in the world, it is projected that India will have 1.159 billion mobile subscribers by 2013. According to recent reports, India was purported to overtake China to become the world's largest mobile telecommunications market by the year 2013.

These statistics provide an unprecedented opportunity for the Telecom Players, System Integrators, Industry Associations, Civil Society and Government Agencies to explore the utilization of the mobile / wireless applications for transforming public services. m-Governance not only improves communication between Government to citizen (G2C) and Citizen to Government (C2G) but also improves operations among government agencies and Government to Employees (G2E).

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**e-Government:** “e-Government” refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. e-Government aims to make the interaction between government and citizens (G2C), government and business enterprises (G2B), and inter-agency relationships (G2G) more friendly, convenient, transparent, and inexpensive.

**m-Government:** Mobile government, sometimes referred to as m-Government, is the extension of e-Government to mobile platforms, as well as the strategic use of government services and applications which are only possible using cellular/mobile telephones, laptop computers, personal digital assistants (PDAs) and wireless internet infrastructure. In addition, m-government is a better option compared to e-Government in delivering services and public information to citizens due to its nature of being available anywhere, anytime and from any internet enabled device. Mobile Government addresses the mobility of Government itself. m-Government is not meant to be a replacement for e-government but a complement to e-government.

**m-Governance** can be defined as ‘a strategy for the implementation of Governance and its implementation involves the utilization of all kinds of wireless and mobile technologies, services, applications, and devices. It improves upon the benefits for those involved in e-governance, including citizens, businesses, and all government units’. For example, the following table shows the applications of m-Governance in various fields for delivering several services.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Industry Segment</th>
<th>Segment details</th>
<th>Information requirement</th>
<th>Applicability for m-Governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agriculture</td>
<td>Harvesting, Marketing, pest control, crop rotation</td>
<td>Online advice, Transactions, information retrieval</td>
<td>Alerts, Advice, transactions can be handled by SMS based applications or via thin client mobile browser based interfaces</td>
</tr>
<tr>
<td>2</td>
<td>Health Care</td>
<td>Hospitals, clinics, doctors, nursing, and other health services.</td>
<td>Data sharing, Expert advice, registration for public health service, appointment, alerts, notifications</td>
<td>SMS based applications for information/alerts and transactions based on Wi-Fi / GPRS connectivity at home and hospitals for real time heavy data uploads / downloads</td>
</tr>
<tr>
<td>3</td>
<td>Financial Services</td>
<td>Banking, securities, insurance.</td>
<td>Mobile Banking, Financial transactions, Micro finance, Micro Insurance Information retrieval (account, loan inquiry, status check), Banking transactions, payments, requests (DD, Cheque book, etc)</td>
<td>SMS / WAP based applications. Thin client mobile browser based interfaces.</td>
</tr>
</tbody>
</table>
m-Governance projects implemented in other countries: Mobile technology allows developing countries to leapfrog in adopting new technologies. This is very important to the development in developing countries. Realizing the benefits of mobile and wireless technologies, many countries are now implementing and developing solutions to better deliver government services to public. Developing countries seems to be embracing these technologies too. Here we look at some of the m-Government cases which have been taken up in different parts of the world, and look at the feasibility with respect to the Indian setting.

- Citizens in Singapore receive passport renewal notifications via SMS. This service can be very useful in a country like India, which such large population. The only drawback is when a citizen changes his/her mobile number.

- In rural parts of South Africa, domestic violence against women and children can be reported via SMS. This kind of service has a useful function in India, where nearly 60% of population lives in rural areas, and domestic violence against women and children has always been a cause for concern for the government. This will also help in women empowerment.

- Mobese or Mobile Electronic System Integration is one of the pioneer mobile government applications in Turkey. This application is a G2G mobile government application for law enforcement agency. This project is mainly an infrastructure enabling the law enforcement units to be more efficient and effective. It connects the law enforcement units to their respective police stations via a GPRS internet connection allowing the mobile law enforcement units to query citizens regarding validation of their identity, checking their record history. This service allows the mobile law enforcement units to be more efficient in their job.

- Trafik Bilgi Sistemi (TBM) or Traffic Information System is another major mobile government application in Turkey. Mobile traffic units are equipped with tablet PCs to quickly conduct queries regarding offending drivers’ license and vehicle information. This increases the efficiency of the mobile traffic units. In addition, location of each mobile traffic unit can be extracted and the respective unit be dispatched instantly to a particular location such as a traffic incident.
• TXT CSC - an SMS service launched by Civil Service Commission (CSC) in Philippines. Its aim is to increase the efficiency and speed of service delivery. Citizens use this service as a weapon to pressure the government agencies to move towards this goal. This is useful in ensuring government accountability.

• A city in Estonia has introduced municipal m-Governance services wherein citizens can enquire about security, law and order, utilities, and disaster management by way of SMS. This is a useful service as it catsers to times when there is an emergency situation like Tsunami, earthquake, floods etc. This way it provides information to citizens who are in remote areas, and in the vicinity of danger area.

• Many countries like Estonia have enabled M-Voting, where the parliament approved mobile technology for the 2011 elections. Polling coverage through SMS is another area where big media houses in Philippines have partnered to provide real time polling statistics during elections. This service gives the citizens convenience, ease and mobility in getting updated polling information.

• Crime denunciation. Mobile technology has made easier the denunciation and reporting of crime in Ireland and Peru by providing real-time exchange of information between citizens and law enforcement units. In Ireland, MMS (multimedia SMS) has been used to send photos of criminal suspects to law enforcement agencies; in Peru, crime reporting systems have helped in the reduction of crime.

Technology advancement in healthcare sector has a great potential to promote a healthy lifestyle, improve decisions taken by health care professionals as well as by patients while improving quality of healthcare services. Real time access to medical information and facilitating instant communication was not possible earlier. The increased usage of technology in the health care sector has resulted in lowered cost, convenience and enhanced efficiency.

In the current scenario most of the developing countries like India are facing health care related challenges. Diseases and lack of preventive care have taken a significant toll on both growing population as well as on the economy. Despite of current economic advancement there is still pressing need to improve health care services. The following facts are of critical importance to understand the reasons:

1. A child born in developing country is 33 times more likely to die within the first five years of life than a child born in any developed country.
2. Every year around 250 women per 100,000 die due to complications related to pregnancy or child birth.
3. There are more than two million people who are infected with HIV in India.
4. Due to lack of access to proper drugs and medical treatment diseases such as TB, malaria continues to claim people’s life.

The increasing cost to plug in wired devices has paved way for the usage of wireless technologies in several hospitals. More advanced mobile phone technologies are enabling the potential for further healthcare delivery. Smartphone technologies are now in the hands of a large number of physicians and other healthcare workers in low- and middle-income countries. Although far from ubiquitous, the spread of Smartphone technologies opens up doors for M-Health projects such as technology-based diagnosis support, remote diagnostics and telemedicine, web browsing, GPS navigation, access to web-based patient information, and decentralized Health Management Information Systems (HMIS).

m-Health, mobile health, is a term used for the practice of medical and public health, supported by mobile devices. The term is most commonly used in reference to using mobile communication devices, such as mobile phones and PDAs, for health services and information. e-Health can mean creating electronic versions of patient records across a national system while m-Health can serve as access points to provide remote information to healthcare providers. ICT plays a major role in m-health implementation and deployment. The deployment of m-health in any health care organization provides the opportunities to maximize their IT infrastructure and deliver valuable solutions which provide the meaningful ROI to the organization. Applications in the field of m-Health: Education and awareness: SMS messages are sent directly to user’s phones to offer information about various subjects, including testing and treatment methods, availability of health services, and disease management. This helps user to be up to dated and well informed.
**Helpline:** This involves a dedicated phone number which an individual can call to get access to a range of medical services like availability of drugs, information on facilities, availability of mobile health clinics etc. Eg: - Health Management and Research Institute (HMRI-104) in Andhra Pradesh, Dr.SMS was another project in this direction, undertaken in Kerala.

**Telemedicine:** Patients take a photograph of a wound or illness and allow a remote physician diagnose to help treat the medical problem. Diagnosis and treatment support projects attempt to mitigate the cost and time of travel for patients located in remote areas. Eg: Tele-doc and mQure. In order to provide effective patient care and enhanced nurse access for quality care and knowledge transfer, mobile technology is playing a vital role. The training through mobile enhances professional development and improves quality of care for the patient. M-Health applications in other countries: There are varieties of M-Health applications in other countries, which can be incorporated in India by the Government. There are projects in the area of disease surveillance, remote data collection and epidemic outbreak tracking in countries like Brazil and Kenya which operate to utilize the mobile phone’s ability to collect and transmit data quickly and efficiently. These kinds of projects can be particularly useful during emergencies, in order to identify where the greatest medical needs are within the country.

In places like South Africa where HIV/AIDS made serious stigma, people can receive text messages personally which helps in creating awareness and education. HIV Confidant, running on palm500 was successfully used in Africa to manage the HIV test result of a patient. Figure 2 shows the working of HIV confidant.

![Figure 2.Palm-500](image)

Asia Pacific has been characterized as a region that has significantly low quality healthcare when compared to the western world. The introduction of web cameras and other mobile technologies can aid in extending health services in these areas. With the advent of mobile technology in the rural areas, efforts can be taken to provide real-time monitoring of health related issues. SMS alerts can be used to target people in areas where clinics and healthcare workers are limited. Also, data collection programs can be offered through smart phones, mobile phones and PDAs than manual entry which can contribute to bridging the gap that exists in the current scenario. Usage of mobile phones can be helpful in improving communication amongst the healthcare providers to enhance patient care. This can also be used to monitor outbreak of infectious disease.

Additionally, m-Health has not been practiced in an organized, regular way, and thus has not produced enough definitive evidence and science that M-Health produces concrete beneficial health outcomes. Nor has it been advertised enough to doctors as something that can save them time and money. We see that entertainment and finance applications have made great strides towards the mobile phones of Indian people. Thus, m-Health solutions that are more centered on fun, entertaining experiences using game mechanics, and incorporate easy payment options will both increase positive health outcomes and drive consumer demand more than any amount of press or conference attention. While technology will play a key role in making m-Health a success in India, user centric design and awareness of improved health outcomes plus cost savings for doctors (and payers) will be the key drivers of growth.
The field of m-Health is at critical juncture with dozens of projects implemented and proven beneficial for the end user. Technological innovation will bring enhanced benefits particularly in the area of data collection, patient monitoring and remote diagnostic where application development is already proceeding at path-breaking speed. A lot of initiatives have been taken by the Government of India and state governments in the field of m-Health. Initiatives from private sector companies have provided lot of encouragement in this regard. Government should look for methods of providing these services at low prices. Also, the concept of telemedicine should be introduced in the district and rural hospitals, so that large number of rural people can benefit from it. Health needs in developing world are rapidly evolving including chronic diseases and communicable diseases. m-Health is placed well to address the challenges using currently available technologies. For example SMS in m-Health can be useful in increasing public health awareness of HIV/AIDS, thus, m-Health is coming in a big way and will rule the world in near future.

Although the implementation of online and mobile health technologies seem appealing and impressive, their proliferation into several fields of healthcare could take time due to issues like security breaches and difference in opinion amongst healthcare professionals. Nevertheless, this technology in future could contribute to improved patient care, increased healthcare efficiency and most importantly reduce healthcare costs overall.

**A Case Study on M-PESA, Kenya**

By far the most successful example of mobile money is M-Pesa. M-Pesa is a joint venture between Vodafone and Safaricom (the local mobile operator) with the backing of Citibank and Commercial Bank of Africa. **M-PESA** (‘M’ for mobile, ‘PESA’ is for money) is the product name of a mobile-phone based money transfer service whose initial concept and design was most assuredly developed by Sagentia, a technology and product company (later transferring to IBM in September 2009) for Vodafone. The development was initially sponsored by the UK-based Department for International Development (DFID) in 2003–2007. M-PESA is a mobile phone-based service for sending and storing money offered by Safaricom, Kenya’s largest mobile service provider. Safaricom customers can register for M-PESA by visiting one of more than 10,000 merchants who act as “agents” for account opening, handling of deposits and withdrawals into the customer’s virtual “wallet,” and customer support. Customers can then use an application on their mobile phone to check their balance, send money to other people, pay bills, and purchase mobile phone airtime. Customer funds are held in a special trust account at the Commercial Bank of Africa.

M-PESA allows users to make following basic types of transaction:

- Deposit and withdraw money.
- Transfers from person to person
- Transfers from individuals to businesses
- Pay Bills
- loan receipt or repayment
- Purchase airtime.

**Observation of Impact of M-PESA in Kenya:**

- Users began to make smaller, more frequent transfers.
- The income of rural recipients increased by up to 30 percent since they started using M-PESA.
- M-PESA empowers rural women by making it easier for them to solicit funds from their husbands and other contacts in the city.
- Urban migrants began to make home visits less frequently after adopting M-PESA.
- Users are integrating M-PESA into their savings portfolio. As a result, savings patterns are changing.

**Factors behind M-Pesa’s success:**

- **Large Market Share:** Market share of Safaricom in Kenya was in excess of 80% at the time of launch of the service. This large base could ring in the network effect which is reflected in the high consumer adoption.
• **Trust:** Safaricom selected the agents with a lot of care to ensure agents with high integrity are there on its network. Since the service involves money, it is important gain user trust. Safaricom communicated a lot with the users; if the server is slow, it would communicate that to the users so that there is no anxiety amongst the users. The survey conducted by Foundation for Sustainable Development (FSD) confirms the faith reposed by users in the M-Pesa service.

• **Relationship with the Regulator and other Banks:** Safaricom never had any confrontation with the regulators. It involved the central bank right from the very beginning. It always tries to accommodate concerns of the regulator and the banking industry. The Kenyan Government had voiced possibility of usage of service to launder money, and on 4th May 2009 ordered Central Bank to audit Safaricom’s M-Pesa service. Safaricom welcomed the Government’s decision and passed the audit due to complete transparent operations and proactive sharing of data with the regulator. The Central Bank declared the service safe and in line with Government’s objectives of financial inclusion.

• **Simple Communication:** At the start of the service, the communication was simple, “Send Money Home” targeting the migrant workers. The communication’s focus on what the single largest service (rather than all that M-Pesa) could do was a well articulated value proposition.

• **Pricing:** Safaricom kept the pricing of the product very transparent and lower than other alternatives. Free registration and no monthly fee helped the agents in persuading the potential user to subscribe to the service. This helped in building up the customer base initially that was important for agent and merchant recruitment.

• **Store Management:** Safaricom ensured consistent branding, training and constant supervision of the stores to deliver the right user experience. It worked tirelessly for proper liquidity management at the stores.

• **KYC:** M-Pesa was not positioned as a bank alternative and hence the “Know Your Customer” requirements were quite relaxed. The users were required to submit only the identity proof to get the service started. This limited KYC helped many Kenyans especially in the rural areas where the address proofs and other documents required by the banks are not available with most of the Kenyans. People who were not able to fulfill the documentation requirements of the bank saw M-Pesa a good alternative.

• **Dedicated Customer Care Line:** In Kenya, not everyone can read, so sometimes people make mistakes and send money to the wrong person, so Safaricom established back office support to assist people get the money back where possible. M-PESA has its own dedicated call centre with its own number. Safaricom ensures that a very high quality of customer care is maintained. The strong back office support has helped the company in not only building trust but also attracted the users who are afraid of technology.

![Figure 3. M-Pesa Transaction System](image)

Rapid adoption and frequent use of M-PESA engendered a variety of positive outcomes, as well as unintended consequences. Specific design elements of the M-PESA system shape these impacts. Most important, by allowing money to flow electronically rather than physically, M-PESA lessens, and in some cases eliminates, many of the spatial and temporal barriers to money transfer. This releases money flows in Kenya and allows such flows to penetrate rural areas where cash is difficult to access. Also, as M-PESA reached a critical mass of users, network effects began to develop. Despite being touted as a financial inclusion service, M-Pesa user households are twice more likely to have a bank account than non-user households. It is young, male, urban migrants who are driving the uptake of services – customer adoption. Hence, the adoption is not uniform across social strata. Also the service availability is not uniform across the country. The service availability is dependant on the network availability which is strong in the south-west corner of the country. There are only 2000 towers of Safaricom which are not sufficient to cover the entire country.

Originally, M-PESA intended just to design and test a platform that would allow customers to receive money and repay small loans using their handsets. This service can be further used to pay school fees, or for sending pocket money to students in rural areas. This service provides opportunities for employment of large number of agents, as it grows further.

**Conclusion:** M-Governance is part of a broader phenomenon of mobile-enabled development, taking electronic services and making them available using devices such as mobile phones. M-Governance has the potential to help
make public information and governance services available “anytime, anywhere” to citizens and officials and provides the much needed last-mile-connectivity in developing countries. Mobile / wireless technologies are the key to reach the citizens at the bottom of the pyramid and making the public services delivery inclusive. Mobility only enlarges the scope of e-Governance rather than substitute it.

There is a need to fast pace the deployment of state of the art e-Governance services and it is possible to leapfrog only by learning about the best practice models in other countries. The applications of m-government differ from country to country. In Turkey m-government applications are mostly confined to G2G whereas in Philippines and Estonia, m-government applications are utilized for both G2C and C2G. We see that in developed countries, most of the m-government applications are highly interactive, on the other hand, in developing countries the interactions are mostly one way i.e. G2C or C2G. This pattern seems quite reasonable, based on the current mobile phone infrastructure (GSM) in developing countries.

In India, Government can start implementing m-government in three different phases. Firstly, applications should be developed to reach citizens in time of crisis such as earthquakes, fire, floods, disease outbreaks etc. These types of services are mainly government to citizen (G2C) and the flow of information is one way. Secondly, more interactive m-government applications can be developed to allow citizens’ participation in government activities. This will encourage citizens’ participation and enhance democracy and brings accountability. Thirdly, highly interactive m-government applications can be developed. These applications range from simple transactions such as payment of taxes, bills and inquiries to mobile identification cards where a citizens’ mobile phone functions not only as device for making calls but also an identification card, payment wallet, driving license and health insurance card.

The mobiles have the ability to push information rather than the user needing to pull information. The Unique Identification (UID) project is a perfect example for the use of mobile technologies, where the services can be targeted to a specific set of citizens such as those eligible for Mahatma Gandhi National Rural Employment Guarantee Scheme (MG-NREGS) or Below Poverty Line (BPL) benefits. In fact, with a combination of International Mobile Equipment Identity (IMEI) number, phone number, and voice biometric authentication, mobile device itself can be used as an identification device.

It is equally important for the policy makers in India to keep in mind various organizational issues in planning and implementing an m-government application. It should be amply supported by top government authorities and should have the required political will and support, as it might face resistance within the government. The government agencies related to the newly planned m-government application should be highly involved in the planning and implementation phases of the new service.

Successful m-government applications rely on effective backend to support them. Necessary considerations and infrastructure should be made available to support all the m-government applications. It might be the case that creating many independent m-government applications may create an island of information where there is no integration between one m-government service and another at the initial stage, but need arises for integration later on. Therefore, m-government projects should be planned strategically and carefully, to reduce the chances of such islands of information dilemma. Minimizing the cost and complexity is another challenge involved with mobilizing applications. Also, protecting privacy and providing security for the data and interactions should be one of the important focuses of the application.

Language is another aspect, where due consideration needs to be given if M-Governance has to reach every segment and remote areas. Localization of content is important, i.e. data needs to be provided in regional languages. Developing an m-government application does not necessary means that it will be used by all citizens. The success of mobile governance would largely depend on our ability to focus on reaching the maximum number of mobile users. Thus, the M-Government application must serve a specific purpose. Awareness should be made to the citizens about these applications and citizens need to be educated on the use of these applications and services. For this, the benefits of these services should be highlighted.

Also, there is no existing M-Governance policy in India, because of which it’s not a wise option to utilize M-Governance services in India. We also do not have a dedicated legal framework for m-governance in India. This may create problems in cases of mobile banking, m-governance, m-commerce, etc. Although there is information
technology act 2000 (IT Act 2000) as the cyber law of India, yet it is far from perfect for even e-governance purposes and is not at all applicable to m-governance environment.

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