

# An Evaluation Framework to find Killer Applications in M-Government

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## Abstract

*Mobile Government is one of the new and important developments in e-government. The promise of m-government to provide greater access to government information is progressing in many developed and developing countries. Current Mobile Government does not exploit the full potential of available technology. Research shows there is a lack of a perfect killer application [2][1]. Firstly, this paper begins with an overview of e-gov and m-gov. In this context, this paper aims to present a framework to find killer applications in M-government to which researchers must pay attention and develop suitable way to perform according to different countries' contexts.*

**Keywords:** Mobile Government, Data protection, Killer Application, Framework

## Introduction

In the 21st century, communication and computing advances mean that many new business opportunities are appearing and promising us new services that could improve our lives. The citizens, visitors, business partners, employees are no longer physically moving to get some work done from the other side with these developments. Similarly, government is also advancing from the conventional state to e-government and present state of m-government. The vision of government is an order of magnitude improvement in its value to the citizen. This is becoming possible with the latest technological advances being implemented in both private and public sectors. However, these advances also present us with challenges, such as security, privacy, data-protection etc. As, the trend is moving from e-government to m-government due to

higher mobile penetration than PC or internet penetration [10], as well as governments and citizens around the world are experimenting with the new information technologies; but there lacks a framework to find Killer Applications [2]. In this paper, after recognizing the importance of Killer Application in m-government, we present a framework to evaluate possible applications to find killer applications in a particular country or context.

The paper begins with an overview of e-government, the predecessor of m-government, as well as m-government itself. Next, a brief overview of motivation, M-government requirements, challenges and benefits are presented. Section 4 describes the methodology. Lastly, the framework to find killer applications in m-government is presented. Finally, conclusion and the lessons drawn for m-government are discussed.

## Overview

### E-government

The proliferation of electronic commerce business models and technologies encouraged their application to the activities of government. E-government refers to the use of Information Communication Technology (ICT) to transform government operations so that government services are provided electronically any time [19] [22]. The rapid development of ICT in the governmental sector created e-Government with specific initiatives to create new dimensions of economic and social progress rendering its services to citizens, business and other government departments and employees. E-government may focus on:

- Internal activities (within government)
- External business relations, and

- External relations with consumers of services (with citizens and visitors to its jurisdiction).

The resulting benefits can include less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions. In general, the fundamental point is the following: E-government is about transforming government to be more citizen-centered. It involves in automation or computerization of existing paper-based procedures that will prompt new styles of leadership, new ways of debating and deciding strategies, new ways of transacting business, new ways of listening to citizens and communities, and new ways of organizing and delivering information [24].

### **M-government**

M-Government is not meant to be a replacement for e-government but a complement to e-government. M-government stands for the use of mobile wireless communication technology within the government administration and in its delivery of services and information to citizens and firms [23]. On the other hand, m-government should not be viewed as a new type of government, rather a new 'tool' for government. M-Government is a mix of complex strategies which is seen as a great method for improving efficiency of the traditional government tasks as it changes the working style of the government and enables the establishment of a favorable relationship between the government and the public. There are 1.7 billion of mobile phone users in the world presently [23], over a quarter of the world's population, which means the same number of potential users. Mobile technology allows developing countries to leapfrog in adopting new technologies. This is very important to the development in developing countries. M-government becomes a better option in developing countries where the internet penetration is low and mobile phone and mobile internet penetration is high according to 49 middle class and 36 low income countries [10]

From the employee's perspective, m-government provides a seamless environment for employees enabling them to communicate, go into a meeting to another office or on the road without the need to plug into a network interface, in addition to accessing their emails, calendars, maps and tasks. For example field workers, customs inspectors, immigration agents, medical, law enforcement and military personnel can all benefit from access to current data to make better and faster decisions [18].

From the citizen's perspective, m-government facilitates accessibility to government services and public information at anytime, anywhere; saving time, effort and money. Generally, computers do not travel with citizens, but information and public services can, as m-government provides for instant availability of services and information, helping frequent travelers and people on the move to access government. For example, the Malaysian Ministry of agriculture sends SMS to farmers' mobile phones alerting them to increased water level thus enabling them to take necessary steps to avoid any potential damage to their agricultural lands [20]; Citizens are also involved in the fight against crime and illegal drugs by using SMS [2]. We will see more applications in detail in Section 4.

### **Drivers of M-government**

#### **Motivation**

According to [5], M-Gov is inevitable. The major changes in the technological infrastructure and the advances in mobile telecommunication services influence the move from e-gov to m-gov. Here are some of the facts which motivate to move from e-gov to m-gov:

- Benefits to be gained from value added business models
- Citizen's rising expectations for a better and convenient government services
- Current technological advances in the areas of wireless WWW and internet
- Increasing mobile infrastructure and mobile device penetration in the world [7][5] [10]
- Adoption of mobile internet applications by individuals and businesses [5]
- Creation of an open and transparent government as it is the real index of the effectiveness of gross government activity and progress [7]
- Evolution of mobile internet technologies, standards and protocols towards faster and more sophisticated applications [2][5]
- Wireless internet seems to be a better choice in developing countries as the mobile phones outnumber the total number of personal computers & fixed lines according to 49 middle income and 36 low income countries [10]
- Mobile technologies pave the way for governments to deliver better, quicker and on time information for its citizens. In addition, citizens' demands are increasing for better government services. [10]
- According to ILO, "acceleration of development can occur through the leapfrogging potentials inherent in

the technologies, where leapfrogging is defined as the ability to bypass earlier investments in the time or cost of development. Leapfrogging has first of all a technological foundation: through wireless application, developing countries can bypass more costly and time-consuming investments in fixed-wire telecom infrastructures.” [10]

- Example of Irish state where the population with access to m-gov is denser than population with e-gov according to survey done [2]

### **M-Government Requirements**

While technology only describes many possibilities, a government process consist of a set of requirements which are crucial for its fulfillment – like accessibility and security; looking at mobile government processes among other requirements such as data integrity and – security, privacy, cost and reliability can be added. There are users who have to accept the work. So, the requirements which are to be considered overall before implementing m-govt, these below requirements are to be fulfilled:

- User Readiness
- User Willingness
- User Requirements
- Integrated & flexible data communication and exchange mechanism
- Location Based Information
- Better mobile penetration than PC
- Move towards 3G services

### **M-Government Challenges**

Every progress has challenges. Implementing m-government will also bring a series of challenges. Some of the typical challenges for e-gov are naturally shared by the m-gov efforts. Some of the challenges most relevant for m-gov are as follows:

- Perfect Physical Infrastructure (technology, equipment, network) and software services should be available [4][5][6]
- Limitations in display size and low memory [4][5]
- Key question to be understood is that m-gov is needed for the targeted segment or not [6]
- Rapid advances in Usability (good for m-gov acceptance) [2][4]
- Technical challenges like handover, roaming, dropout, lack of technical standards and security issues [2]
- Compatibility of m-gov services with mobile network and terminal environment [4][5][6]

- Privacy and Security [4][6]
- Accessibility [4][5]
- Legal Issues [5]

### **M-Government Benefits**

Here, we list some of the benefits if m-gov service is applied fruitfully. The value of these benefits should outweigh the costs and challenges with a high margin.

The list constitutes –

- Less Corruption [2][5]
- Ability to reach rural & remote areas [2][5][13]
- Increased Transparency [2][5]
- Greater Convenience [2][5]
- Increased Productivity [2][5]
- Revenue Growth and/or Reduced Costs [2][4][5]
- Increased Citizen Participation [4][5]
- Reduced Redundancies & Errors [4][5]
- Speeding up the handling of works/services [4][5]
- Supporting mobility to citizens, businesses and internal operations of governments [5]
- Supporting law enforcement agents who are on patrol [5]
- Handles real time information concerning crimes, accidents, safety etc [5]

### **Research Methodology**

This paper represents the next stage in our study of the potential of m-government to provide efficient and effective applications from different countries. The focus of our initial literature review concentrated on existing applications for m-government in different countries from past journal and conference papers besides some projects, pilot-projects and case-studies performed by different government organizations. Next, we focused on to collect and develop different types of evaluation criteria using literature review and case studies.

We have used exploratory research for now as a legitimate methodology [15] to assist in establishing the theoretical foundation for further examination. For example, mobile payments for m-gov services [16] would be of vital importance if the delivery of such services is to be handled by mobile devices which currently face such technical challenges as handover, roaming, dropout, lack of tracking mechanisms and security issues. However, governments are recognizing that mobile devices are vital tools for emergency and law enforcement management as they promise to

enhance efficiency, effectiveness, responsiveness and accountability at all levels [17]. The recent emergencies caused by the Asian Tsunami in December 2004 and Hurricane Katrina in August, 2005 provide graphic examples of the failure of government agencies to communicate quickly and effectively with their threatened consequences. So, we present an evaluation framework to find some killer applications in m-gov and concentrate on these applications for better functioning of the government.

Later, in the evaluation framework, 7-likbert scale (where 7 is for excellent and 1 is to indicate the pooriness) should be used by the experts (government officials, politicians, and firms) to score each of the application with respect to each of the evaluation criteria. Then, based on some scenarios according to the country, the weights are to be associated for each of the evaluation criteria using AHP (a statistical tool). The scenarios possibly which effect the weights of each evaluation criteria may be as follows:

- Income levels of the prospective users
- Handset penetration of mobiles, PC
- Diffusion rate of mobile services
- Statistics of mobile companies (GSM, CDMA)
- Regulation policies
- Political scenarios
- Technological status and so on.

After finding the weights of each of these evaluation criteria, the scores of each application with respect to the weights and scores of 7-likbert scale, the individual score of each application for each criterion is calculated (suppose for application x under evaluation criterion y of weight 0.3, the likbert score is 6; then, individual score of  $xy = 1.8$ ). Then, finally the total score of the application is calculated by adding the individual evaluation criteria score. Then, the highest few (two or three) have to be considered as the possible killer applications in the country.

Now, the list of *all the applications* reviewed using literature review are presented below in Table 1.

Table 1. Classification of M-gov Applications [Ref]

M-Gov Applications	References (countries if available)
<i>1. Administrative Services</i>	
1.1 Express citizens' opinion to the gov't officials	[2][4][5]
1.2 Mobile Voting	U.K, Czech Republic, Malaysia [2][5]
1.3 Monitor the	

representatives under close control	[2][4][5]
1.4 Birth & Death Statistics	[4][7]
1.5 DCB statements for water, electricity, property tax, grievance status, building approval status	[7]
1.6 Feedback of a service directly from public	[2][4][5]
1.7 Distribution of funds among officials	[2][4][5]
1.8 Election dates, Receiving election forms & funds	[2][5]
1.9 Notification of Pay dates, Holiday information	[2]
1.10 Tax Management system	Korea [6][1][2][4][13]
1.11 Matching Job Profiles & sending messages via SMS	Sweden [1]
1.12 Customer Compliant Services	[2]
1.13 Fight against Crime & Illegal drugs	Malaysia, US [2][5]
1.14 Field Inspections	[13]
1.15 Registration of property or lands	[7]
<i>2. Cultural &amp; Tourism</i>	
2.1 Tourist Information	[6][2][4]
2.2 Traffic & Transport systems	[4][2][5][13][9]
2.3 Max & Min Speed, and other transport Info	[5][11]
2.4 Weather Info	[2][4][5][13]
2.5 Navigation Assistance	[13]
2.6 Promotion of city events	[9]
<i>3. Transportation</i>	
3.1 Road Safety	[2][5]
3.2 Optimize transportation	[2][5]
3.3 Regional, National and global policies & resources	[3][2][5]
3.4 Transportation eligibility based on time & distance	[5][7][2]
3.5 Eligibility for nationals & foreigners	[2][5]
3.6 Vehicle capacities	[2][5]
3.7 Toll fee b/w cities in a nation for diff. vehicles	[2][7][3][5]
3.8 Road maps, flight routes, stop locations for delivery, distribution & maintenance	[2][5]

3.9 Speed limits, Street names, Hundred block addresses & Hazardous conditions 3.10 Traffic announcements, strikes & emergencies 3.11 Train, Bus, Flight delays	Korea, US[3][2][5] [9][13][2] [4][5][13][9]
4. Education 4.1 Class Schedule Updates 4.2 Campus Events 4.3 Office hours 4.4 Availability of campus resources 4.5 Exam Results 4.6 Status of child (late, missed) periodically 4.7 Consulting attendances 4.8 Open universities or distance education (more useful)	Europe [2][5][9] [2][5][9] [2][5][9][13] [2][5][9][11][13] [2][5][13][9] [2][5][1][9] [2][5][13][9] [9][13]
5. Public Health & Welfare 5.1 Fighting bushfires 5.2 Medical Emergencies 5.3 Rescuing flood victims 5.4 Access to patient records 5.5 Finding patient's HMO and PCP 5.6 Access to lab test results 5.7 Requests for urgent blood donations 5.8 Vaccinations dates & centers (Bird flu, malaria) 5.9 Access to latest drug reference databases 5.10 Sending patients' data for second opinion 5.11 Electronic billing for in-home health care workers 5.12 Hurricane & Tsunami warnings 5.13 Locating Emergency callers 5.14 Radioactivity Detection 5.15 Bioterrorism alerts 5.16 Accident & safety Alert issues 5.17 Fight against crime & illegal drugs	[1][2][5] [2][4][5] [2] [5] [5] [5] [5] [5] [2] [5] [5] [5] [5] [2][5] [2][5][13] [2] [2] [5] Malaysia [2][3][5]

6. Other General Issues 6.1 Public Hearing Calendar 6.2 Policy Status Info, Guidelines, Standards 6.3 National Police Agency 6.4 Parking lot Mgt 6.5 Inspection system at National Fisheries (NFPIS) 6.6 Urgent Notifications (Energy alerts, lottery results, licenses) 6.7 Stolen vehicle tracking	[2] [5][1][2] Korea, Germany, US [6][1][4][5] Korea, Denmark, Sweden, US [1][2][5] Korea [6] Korea, Malaysia, US [6][2][4][5] [13]
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Similarly, the *evaluation criteria* are collected in different angles through literature review of journals and projects. The list of these criteria is classified as follows:

- Technological Criteria
  - Openness [4][9]
  - Scalability [4][10]
  - Interoperability [2][4][9][10]
  - Interactivity [2][6][4][9]
- Handset-related
  - Screen size & Display [4][5][7][13]
  - Battery power management [2] [4][13]
  - Processing power [2][4][7][13]
  - Ease of use [2][4][7]
  - Storage & retrieval [7][13]
- Application- related
  - Small Duration Tasks [2][4]
  - Less intense & complex tasks [2][4]
  - Clear Input & Output mechanisms and adequate screen size influenced usage [2]
  - Reliability [2][4][7]
  - Urgency [4]
  - Validity, accuracy, frequency, sufficiency, timeliness, message content and cost [7][2][9]
  - Effect of failure
- System
  - Number of people required [2][5][7]
  - Equipment & Facilities [2][4][7]
  - Response time [7]
  - Frequency of breakdowns [5][7]
  - Inputs, outputs, number of forms [7]

- Number of operations, number of storages, sizes and quality of data bank sizes and quality of model bank [7]
  - Scope of business components that are related by the MIS [7][13][3]
  - User satisfaction [2][4][7]
  - Error rates, persistent problem areas, ease of maintenance & modification, unplanned-for impact on performance [7]
  - Savings, cost [7][13][3]
- Social
- Security & Privacy [2][4][13]
  - Seamless connectivity of Internet & public sector services [2][4]
  - Trust in eTransactions & mTransactions [2]
  - Pricing [2][5][7]

methodology of AHP and Likbert scale explained above in Section 5, here we show the table of how the evaluation table looks like for the applications from 'Cultural & Tourism' Sector:

In the below table 2, the hypothetical weights of all the criteria are given 0.2 ; where as practically, these weights as well as the weights of each of the components (Evaluation 1 to 4 are also calculated for the Technological criteria) are to be calculated by applying AHP on the survey done in that particular country where the framework is applied. The guidelines of giving weights are mentioned in the methodology section. Then, the likbert scale scores and the weights are multiplied and added horizontally for each of the application of the 'Cultural & Tourism' Sector.

Similarly, calculations for all the sector applications mentioned in the methodology section (or more according to the country) should be done. Then, the highest few are to be considered as possible killer applications in that country to go for M-gov service.

(Below is the Table 2).

### The proposed Framework

Now that we have seen the applications, the evaluation criteria from different angles along with the

Table 2: An Example of Evaluation of one Sector 'Cultural & Tourism'

Applications	Technological (wt = 0.2)	Handset related (wt = 0.2)	Application related criteria (wt = 0.2)	System (wt = 0.2)	Social (wt = 0.2)
<i>Cultural &amp; Tourism Sector</i>	<i>Eval 1-4</i>	<i>Eval 5-9</i>	<i>Eval 10-16</i>	<i>Eval 17-26</i>	<i>Eval 27-30</i>
1. Tourist Information					
2. Traffic & Transport					
3. Max. & Min. Speed					
4. Weather Info					
5. Navigation Assistance					
6. Promotion of city events					

Mobile technologies are developing at a faster rate than any other technological advancement. The value of the government lies in the citizen satisfaction which can be achieved with the help of e-government and m-government with its way of delivering better, quicker and on time information to its citizens. [10] has already shown that mobile technologies do more good to developing countries than the developed countries. It allows the developing countries to bypass building all the heavy infrastructures, the costs and time association for e-gov. The major problem of investigating Killer Application can be solved using the criteria described in this paper. It helps in evaluating the different possible applications of different sectors under different classifications such as technical, social,

### Conclusion

The paper discusses regarding:

- Importance of M-government as a complement to e-government.
- The challenges, requirements and benefits of M-government
- A framework to find possible killer applications using all-round criteria

handset-related, personal, infrastructural by analyzing the countries' social, political, economical environments besides citizens' and firms' readiness. We are implementing the evaluation model described in this paper for the Indian subcontinent by performing expert survey, finding weights using AHP and finally to find the killer applications as future work of this paper.

Governments in developing countries can start implementing m-government in three different phases. Firstly, applications should be developed to reach citizens in time of crisis such as earthquakes, floods, etc. Secondly, more interactive m-government applications can be developed to allow citizens' participation in government activities. This is possible with 3G and 4G technologies. Lastly, highly interactive m-government applications can be developed such as m-wallet, payment mechanisms.

This paper also has the limitation such as the limited literature review of journals, case studies & projects. It lacks a perfect methodology to support the framework of evaluating in the real-context sense. This paper also has a lot of future research to be done. As mentioned above, we are implementing the concept in India. Also, we are developing a knowledge management model to support the applications filtered after the evaluation is done.

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