M-Government – A Framework to Investigate Killer Applications for Developing Countries: An Indian Case Study

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2008
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by

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A Thesis submitted to the faculty of Information and Communications University in partial fulfillment of the requirements for the degree of Master of Arts in the School of IT Business

Daejeon, Korea
Dec 18th, 2007
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We certify that this work has passed the scholastic standards requested by the Information and Communications University as a thesis for the degree of Master.

Dec. 18, 2007

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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 or a framework to find killer application. Without this framework, the developing countries will lose an opportunity to accelerate the development where the potential inherently lies in the technologies. In this context, this paper aims to present a framework to find killer applications in M-government which can be followed by any country. Also the framework is explained with the case-study of Indian subcontinent which can be viewed as reference.

The framework consists of three simple steps. The first step is to abridge the emerging m-government applications through a context-based integrative Schema. The second step is to
prioritize and weigh the CSF criteria of killer applications through AHP. The third step is to evaluate the short-listed applications with the weighted CSF criteria to find the mobile government killer applications.

Later, the framework is carried out exactly as stated to find the m-government killer applications for India.
Contents

Abstract

List of Figures

List of Tables

I. Introduction

II. Literature Review

  2.1 Overview of Government
      2.1.1 Conventional Government
      2.1.2 Electronic Government
      2.1.3 Mobile Government

  2.2 Details of Mobile Government
      2.2.1 M-government Motivation
      2.2.2 M-government Benefits
      2.2.3 M-government Challenges
      2.2.4 M-government Applications
      2.2.5 What is Killer Application?

III. A Context Based Integrative Schema
      3.1 M-Government Goals
      3.2 Macro-Schema Dimensions
      3.3 The Proposed Context-based Schema

IV. M-Government Critical Success Factors
      4.1 General Model for CSF Research
4.2 Criteria Affecting M-GOV with Mobile Access

V. Overview of AHP

5.1 Break the Decision Problem into Hierarchy

5.2 Matrix Data (Pair-wise Comparison)

5.3 Find Eigen values & Eigen vectors (Pair-wise Comparison)

5.4 Aggregation of Relative Weights (Decision-making)

VI. Indian Case Study (A Reference)

6.1 Application of Context-based Integrative Schema

6.1.1 Classification of Countries based on M-Gov Index

6.1.2 Evaluation of M-Gov Applications with Goals

6.2 Application of AHP on Indian M-Gov Goals and CSF Criteria

6.2.1 AHP (Analytic Hierarchy Process) Overview

6.2.1.1 Data Collection and Samples

6.2.1.2 Hierarchy Structure of CSF Criteria

6.2.1.3 Final Weights of Goals & Criteria

6.3 Finding M-Gov Killer Applications for Indian Case

6.3.1 Evaluation of M-Gov Applications with M-Gov Goals (weights)

6.3.2 Evaluation of Reduced Applications with M-Gov CSF (weights)

6.3.3 Final List of Killer Applications

6.4 How to apply for different countries?

VII. Conclusion

7.1 Summary

7.2 Implications & Limitations
List of Figures

Figure 1. Components of M-Government Readiness Index
Figure 2. An Analytical integrative M-Government Schema
Figure 3. Framework for the CSF research
Figure 4. The Decision Schema of the AHP
Figure 5. Normal Distribution of M-Gov Readiness Index (179 countries)
Figure 6. AHP Hierarchy Diagram (CSF Criteria)
List of Tables

Table 1. List of Emerging M-government Applications with Classification [Reference]
Table 2. Classification of M-Gov Goals (values)
Table 3. Summary of M-Government Success factors
Table 4. Normalized Matrix and Priority
Table 5. RI Based on Matrix Size
Table 6. Weights of M-Gov CSF Criteria using AHP (Indian Case)
Table 7. Weights of M-Gov Goals (values) using AHP (Indian Case)
Table 8. Possible M-Gov Applications (Indian Case)
Table 9. Result of Evaluation of Alternatives (Indian Case)
I. 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 the help of these developments. Similarly, government is also advancing from the conventional state to e-government and to the present state of mobile government. The vision of government is an order of magnitude improvement in its value of 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, trust 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]. So, the following questions can be raised,

1) What are M-government Killer Applications? How to find them?

2) Is there any framework or a case-study to follow to find m-government killer applications?

This paper has tried to answer for those questions through various literature reviews related to e-commerce, m-commerce, e-government, m-government, and Information systems.
A General Framework is suggested to explain the method to find the m-government killer applications. Then, the method is applied and experimented for the Indian subcontinent with the help of expert survey (AHP).

The next chapter begins with literature review of e-government, the predecessor of m-government as well as m-government itself. We also discuss the drivers, requirements, benefits and challenges of M-government besides the emerging Mobile government applications. The third chapter describes the context-based integrative Schema. Chapter 4 discusses the Mobile government critical success factors (CSF). In chapter 5, we present an overview of the Analytic Hierarchy Process (AHP) technique. In the next chapter, we discuss the Indian Case study by applying context-based Schema and then apply AHP technique to evaluate the goals and success factors and finally find killer applications for India. Chapter 7 provides summary, concluding remarks, implications and future directions.
II. Literature Review

2.1. Overview of Government

2.1.1. Conventional Government

Whilst a government is considered the dynamic mixture of goals, structures and functions by which a community is ruled [20], it is also defined as an organization that has the power to make and enforce laws for a certain territory. The legal system of India defines government as the structure set up by the constitution for regulating the society. Hence a government is an organization that has the power to enforce law for a certain territory implementing certain policies and strategies in order to achieve certain goals and functions.

2.1.2. Electronic 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 anytime [3][14]. The rapid development of ICT in the government sector created e-government with specific initiatives to create new dimensions of economic and social progress rendering its services to citizens, businesses and other government departments and employees. E-government may focus on –

- Internal activities (within government)
- External business relations (with suppliers, other businesses and other governments at the same or different levels), 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 transacting business, new ways of listening to citizens and communities, and new ways of organizing and delivering information [27].

2.1.3. Mobile Government

Mobile government is not meant to be a replacement for e-government but a complement to e-government. Mobile 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 [18]. On the other hand, mobile 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 mobile phone users in the world presently [17], 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 of developing countries. 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 applications, developing countries can bypass more costly and time-consuming investments in fixed-wire telecom infrastructures.” [6] {ILO Report, 2002}. Mobile government becomes a better option in developing countries where the internet penetration is low and mobile phone and mobile penetration is high. Total number of mobile phones has already surpassed the total number of fixed lines according to 49 middle income and 36 low income countries [6].

There will be many kinds of applications which can be classified into administrative, cultural & tourism, transportation, education, public health & welfare and general sectors [12][24][21]. Already some of these applications are being deployed in various countries like Korea, Canada, Denmark, Malaysia, Hong-Kong, Turkey [6][12][11].

From the employee’s perspective, mobile 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 [1].

From the citizen’s perspective, mobile 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, in Malaysia the citizen can use Short Message Service (SMS) to verify his voting information, such as state
and parliamentary constituencies, from wherever he is; the Ministry of agriculture sends SMS to farmers’ mobile phones alerting them to take necessary steps to avoid any potential damage to their agricultural lands [11]; the state government in California established a webpage for citizens in order to let them register if they desire receiving ‘cell notification services’ for traffic updates, energy alerts, lottery results and even papers from the Governor’s press room. Citizens are also involved in the fight against crime and illegal drugs by using SMS [24].

2.2. Details of Mobile Government

2.2.1. Motivation for M-government

According to [5], mobile government is inevitable. The major changes in the technological infrastructure and the advances in mobile telecommunication services influence the move from e-government to m-government. Here are some of the facts which motivate to move from e-government to m-government:
- Benefits to be gained from value added business models
- Citizens’ 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 and 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 mobile government is denser than population with e-government according to survey conducted [2].

2.2.2. Mobile Government Benefits

There are numerous benefits with the implementation and deployment of M-government in developing countries. Some of the benefits are listed below –

- Less corruption [2][5]
- Ability to reach rural and 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]

2.2.3. Mobile Government Challenges

Every progress has challenges. Implementing m-government will also bring a series of challenges. Some of the typical challenges for e-government are naturally shared by the m-government efforts. [5] states some of these challenges. Among them, we will visit those which are most relevant to m-government including infrastructure development, privacy and security, legal issues, mobile penetration rate and accessibility, compatibility.

**Infrastructure Development**: For m-government to flourish, the information technology infrastructure must be present. This infrastructure is both physical and ‘soft’. The physical infrastructure refers to the technology, equipment, and network required implementing m-government. Limitations of handsets such as display-size, low memory, low processing power or battery power are also to be taken care [4].

No less important are soft infrastructures such as institutional arrangements and
software that make m-government transactions possible. Even though m-government is in its initial stage, various software are available for m-government services. Packet Writer, Pocket Blue, and Pocket Rescue are a few examples of m-government software developed by Aether systems.

**Payment Infrastructures:** are also vital to the success of m-government. A very first obstacle for consumers to buy online is a feeling of mistrust in sending their credit card information over the mobile phone or the internet [2]. In developing countries, though, another problem precedes that: low credit card penetration. The number of persons with credit cards is too small in comparison to the number of potential users for m-government transactions.

**Privacy and Security:** are the most significant concerns citizens have about m-government. The general fear is that their mobile phone numbers will be traced, when they send their opinions and inquiries to the government. The government must overcome the mistrust, and assure mobile users that people’s privacy is protected and the information will not be sold to third parties [6][4].

Although encryption of SMS messages is relatively safe, mobile phone numbers and mobile devices are relatively easy to be hacked. Wireless networks are vulnerable because they use public airwaves to send signals. Because of interception in all traffic on the internet, there is a big chance for outsiders to attack on wireless networks to steal important information and tamper with documents and files. Therefore in the planning stage of the m-government project, privacy and security issues should be considered so that developers will be able to select appropriate mobile devices.
Accessibility: The success of mobile government will depend on largely the number of its users: the citizens. But socio-economic factors such as income, education level, gender, age, handicap, language differences and regional discrepancies will affect the citizens’ attitude towards mobile government [5]. In order to increase citizen participation and provide citizen-oriented services, government needs to offer easy access to m-government information in alternative forms, possibly, using video and voice communications.

Legal Issues: Many countries around the world have not yet adopted the Law of Fair Information Practices [2], which spells out the rights of data subjects (citizens) and the responsibilities of the data holders (government). In some cases the law does not recognize mobile documents and transactions [5]. There is no clear legal status for government’s online publications, no regulations and laws for online fillings, online signings, and online taxable transactions.

Compatibility: One of the technical difficulties might arise from compatibility of the mobile systems with the existing e-government systems. This may get even more serious in the cases of government offices having legacy systems which may not be easy to integrate both in terms of functionalities and data administration. [6][5][4]

2.2.4. List of Emerging M-Gov Applications

This stage in our study represents efficient and potential emerging applications from
different countries. These applications listed below are gathered from different past journal
and conference papers besides some projects, pilot-projects and case-studies.

There are many kinds of applications which can be classified into administrative,
cultural & tourism, transportation, education, public health & welfare and other general
sectors [9][2][29]

The list of all the emerging applications gathered using literature review is presented
below in Table 1.

Table 1. List of Emerging M-gov Applications with Classification [References, Countries]

<table>
<thead>
<tr>
<th>M-Gov Applications</th>
<th>References (countries if available)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Administrative Services</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 Express citizens’ opinion to the gov’t officials</td>
<td>[2][4][5]</td>
</tr>
<tr>
<td>1.2 Mobile Voting</td>
<td></td>
</tr>
<tr>
<td>1.3 Monitor the representatives under close control</td>
<td>[2][4][5]</td>
</tr>
<tr>
<td>1.4 Birth &amp; Death Statistics</td>
<td>[4][7]</td>
</tr>
<tr>
<td>1.5 DCB statements for water, electricity, property tax, grievance status, building approval status</td>
<td>[7]</td>
</tr>
<tr>
<td>1.6 Feedback of a service directly from public</td>
<td>[2][4][5]</td>
</tr>
<tr>
<td>1.7 Distribution of funds among officials</td>
<td>[2][4][5]</td>
</tr>
<tr>
<td>1.8 Election dates, Receiving election forms &amp; funds</td>
<td>[2][5]</td>
</tr>
<tr>
<td>1.9 Notification of Pay dates, Holiday information</td>
<td>[2]</td>
</tr>
<tr>
<td>1.10 Tax Management system</td>
<td>Korea [6][1][2][4][13]</td>
</tr>
<tr>
<td>1.11 Matching Job Profiles &amp; sending messages via SMS</td>
<td>Sweden [1]</td>
</tr>
<tr>
<td>1.12 Customer Compliant Services</td>
<td>[2]</td>
</tr>
<tr>
<td>1.13 Fight against Crime &amp; Illegal drugs</td>
<td>Malaysia, US [2][5]</td>
</tr>
<tr>
<td>1.14 Field Inspections</td>
<td>[13]</td>
</tr>
<tr>
<td>1.15 Registration of property or lands</td>
<td>[7]</td>
</tr>
<tr>
<td><strong>2. Cultural &amp; Tourism</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Tourist Information</td>
<td>[6][2][4]</td>
</tr>
<tr>
<td>2.2 Traffic &amp; Transport systems</td>
<td>[4][2][5][13][9]</td>
</tr>
<tr>
<td>2.3 Max &amp; Min Speed, and other transport Info</td>
<td>[5][11]</td>
</tr>
<tr>
<td>2.4 Weather Info</td>
<td>[2][4][5][13]</td>
</tr>
<tr>
<td>2.5 Navigation Assistance</td>
<td>[13]</td>
</tr>
<tr>
<td>2.6 Promotion of city events</td>
<td>[9]</td>
</tr>
<tr>
<td><strong>3. Transportation</strong></td>
<td></td>
</tr>
<tr>
<td>3.1 Road Safety</td>
<td>[2][5]</td>
</tr>
<tr>
<td>3.2 Optimize transportation</td>
<td>[2][5]</td>
</tr>
<tr>
<td>3.3 Regional, National and global policies &amp; resources</td>
<td>[3][2][5]</td>
</tr>
<tr>
<td>3.4 Transportation eligibility based on time &amp; distance</td>
<td>[5][7][2]</td>
</tr>
<tr>
<td>3.5 Eligibility for nationals &amp; foreigners</td>
<td>[2][5]</td>
</tr>
</tbody>
</table>
### 3.6 Vehicle capacities
3.7 Toll fee b/w cities in a nation for diff. vehicles
3.8 Road maps, flight routes, stop locations for delivery, distribution & maintenance
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] |
| Korea, US | 2[7][3][5] |
| Korea, US | 2[5] |
| Malaysia | 9[13][2] |
| Malaysia | 4[5][13][9] |

### 4. Public Health & Welfare
4.1 Fighting bushfires
4.2 Medical Emergencies
4.3 Rescuing flood victims
4.4 Access to patient records
4.5 Finding patient’s HMO and PCP
4.6 Access to lab test results
4.7 Requests for urgent blood donations
4.8 Vaccinations dates & centers (Bird flu, malaria)
4.9 Access to latest drug reference databases
4.10 Sending patients’ data for second opinion
4.11 Electronic billing for in-home health care workers
4.12 Hurricane & Tsunami warnings
4.13 Locating Emergency callers
4.14 Radioactivity Detection
4.15 Bio-terrorism alerts
4.16 Accident & safety Alert issues
4.17 Fight against crime & illegal drugs

| Korea | 1[2][5] |
| Korea | 2[4][5] |
| Korea | 2 |
| Korea | 5 |
| Korea | 5 |
| Korea | 5 |
| Korea | 5 |
| Korea | 5 |
| Malaysia | 2[3][5] |

### 5. Other General Issues
5.1 Public Hearing Calendar
5.2 Policy Status Info, Guidelines, Standards
5.3 National Police Agency
5.4 Parking lot Mgt
5.5 Inspection system at National Fisheries (NFPIS)
5.6 Urgent Notifications (Energy alerts, lottery results, licenses)
5.7 Stolen vehicle tracking

| Korea | 2 |
| Korea, Germany | 5[1][2] |
| Korea, Denmark, Sweden, US | 6[1][4][5] |
| Korea | 1[2][5] |
| Korea | 6 |
| Korea, Malaysia | 6[2][4][5] |
| Korea | 13 |

### 2.2.5. What is Killer Application?

Looking for the killer application that will make the m-government useful for you? Will you be happy if you find it? This study looks at a procedure/schema to find possible killer applications according to different countries’ contexts that could be put
in place with the technology of today or the near future.

“The term ‘Killer Application’ comes from the moment when the application is so wonderful people see it and say, ‘Man, is that a killer!’” [38]

Here in this study, we are focusing on the mobile government application which is a killer application focused on both political and economic situation of that particular country. The application should be frequently used to provide usefulness to the citizens, businesses and mainly government.

By literature review, we have found that the ‘e-mail’ is the killer application for internet, ‘SMS (short message service)’ for the mobile phones, ‘Internet banking’ for E-Commerce, etc. But in case of m-government, it may not have the characteristics of the above killer applications as this domain is focused on the government and welfare of the citizens rather than from investment point of view.

The applications may not be killer from investment & profit point of view like in e-commerce, internet; but it promises welfare of citizens and smooth run of the government.

### III. Context-based Integrative Schema

The recent advances in the Mobile technology have propelled the development of related applications in mobile communications and transactions, including mobile commerce and mobile government (m-government). There has been a proliferation of
m-government initiatives worldwide undertaken under different forms of government, socioeconomic settings, and technological conditions. Nonetheless, the relationship between an m-government initiative and its context has not received adequate attention in the m-government literature. This section provides an organizing Schema that maps the core values (goals) of m-government to two fundamental factors; namely, the degree of m-government readiness and the level of democratization. The framework addresses the importance of the relationship between the contexts of an m-government initiative in influencing the goals of this initiative. From a practical viewpoint, the Schema provides a roadmap for policy makers to formulate policy goals of m-government initiatives commensurate with their respective environments.

3.1. M-Government Goals

Here, we present below a systematic treatment of goals (values) of m-government. These goals are classified into individual, societal, organizational, or political (see table 2). This classification helps to better understand the goals of m-government and formulate strategies for m-government initiatives. For instance, four types of strategies may be proposed based on this classification: individually focused (increasing accessibility of government services to individuals), society focused (better utilization of society’s scarce resources), organizationally focused (empowering organizational members), and politically focused (enhancing governmental accountability). The classification provides a heuristic device for better organization of
m-government goals [31][32].

### Table 2: Classification of M-government Goals (values)

<table>
<thead>
<tr>
<th>Goals (values)</th>
<th>Individual</th>
<th>Societal</th>
<th>Organizational</th>
<th>Political</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency/economy</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accountability</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Equity</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Empowerment/ Participation</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transparency</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Availability of services</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Democratic Responsiveness</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Integrity</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personalization</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

#### 3.2. Macro-Schema Dimensions

The m-government readiness index is a weighted average (composite) measure based on a number of sub indices: m-government Web site assessment index, telecommunication infrastructure index, economic index and human capital index [33].
The Web site assessment sub index is based upon the level of sophistication of a
government online presence and the online offerings of citizen services. There are five
stages of e-government presence in ascending order of sophistication: emerging,
enhanced, interactive, transactional, and networked [33]. The telecommunications
infrastructure sub index is an indicator of a country’s ICT infrastructural capacity. It is
a weighted average measure of six lower level primary indices. These indices are
Mobile Network Readiness Index, Internet users/1000 persons, telephone lines/1000
persons, online population, mobile phones/1000 persons, and TV’s/1000 persons.
Mobile Network Readiness Index constitutes ICT environment, Actual usage of latest
ICT available, and Readiness of 3 stakeholders: Individuals, Businesses, and
Government. The economic index is calculated based on the status of nominal GDP,
the government’s national debt, inflation and interest payments. The human capital
index relies on the UNDP “education index” which is a composite of the adult literacy
rate and the combined primary, secondary, and tertiary gross enrollment ratio, with
two-third weight given to adult literacy and one-third to gross enrollment ratio. Figure1
below summarizes the components of the m-government readiness index. It should be
noted that the m-government readiness index is to some extent an indirect reflection of
a country’s level of economic development. In other words, a highly developed ICT
infrastructure requires a fairly high level of economic development. For example, all
countries high on this index are developed countries, such as the United States, United
Kingdom, France, Korea, Japan and Finland. On the other hand, most countries low on
The democratization index is a measure of political development and also a composite of five subcomponents: political process, civil society, independent media, governance, and public administration. Countries high on this index generally have democratic form of government whereas those low on the index generally have authoritarian form of government.

The advantage of using these macro-dimensions is that they represent a summary of multiple important sub-dimensions. By using aggregate dimensions, the framework in fact indirectly takes into account all the subcomponents represented by such aggregates. Another advantage of using aggregate dimensions is that the

Figure 1: Components of the M-government Readiness Index

the ICT infrastructure index are developing countries.
framework becomes less complex.

3.3. The Proposed Context-based Schema

Generally speaking, m-government initiatives embrace political values as well as efficiency-related values. The latter are arguably common to all initiatives, as resource scarcity is, in all probability, a common denominator in all countries and government systems. For instance, efficiency in government is an important value whether a government is democratic or not and whether the country is rich or poor. The political goals of an m-government initiative are the function of the government’s democratization level. The question of which subset among those goals, to include in a specific m-government initiative, depends on the level of m-government readiness.

Thus, the schema proposed in this paper is predicated on the above distinction that efficiency-related values are common among m-government initiatives while political goals of an m-government initiative are contingent on two major dimensions: democratization and m-government readiness. One would expect that countries high on democratization are likely to pay more attention to political values in their m-government initiatives than those low on democratization. By the same token, countries with high m-government readiness have greater capacity to achieve both political values and efficiency-related values than those with low m-government readiness. Thus, a more rational approach to political goal setting for an m-government initiative needs to take into account levels of both of these dimensions. Assuming three
levels (high, medium and low) for m-government readiness index and two levels for democratization index, six possible combinations are discernable and can be represented by 6 quadrants in a two-dimensional space (see Figure 2 below). Each quadrant characterizes the set of dominant goals of an m-government initiative and, consequently, suggests a unique strategic disposition (accessible, informational, transactional, semi-consultational, consultational, or participational) of the initiative.

**Figure 2: An Analytical integrative m-government Schema**

<table>
<thead>
<tr>
<th>High Democracy</th>
<th>Low Democracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low M-GOV Readiness</td>
<td>High M-GOV Readiness</td>
</tr>
<tr>
<td>Transparent Public Accountability</td>
<td>Transparent Public Accountability</td>
</tr>
<tr>
<td>Transparency Democratic Responsiveness Integrity</td>
<td>Transparency Democratic Responsiveness</td>
</tr>
<tr>
<td>Personalization Mobility Equity</td>
<td>Efficiency/economy Effectiveness/Service Quality</td>
</tr>
<tr>
<td>Access to Information on the government</td>
<td>Access Availability of Services</td>
</tr>
<tr>
<td>Efficiency/economy Effectiveness/Service Quality Availability of Services</td>
<td>Integrity Personalization</td>
</tr>
</tbody>
</table>

3.3.1 Accessible Disposition

This disposition is suggested by the first quadrant which is delineated by low levels of democratization and m-government readiness. The realistically achievable m-
government goal here is to provide ready and efficient access to government information. Countries in this quadrant (e.g., Sub-Saharan African countries) are likely to be characterized by extreme scarcity of resources which dictates a paramount focus on efficiency. Thus, the strategic disposition of m-government initiatives undertaken by countries in this quadrant should be only Accessible.

3.3.2 Informational Disposition

This disposition is suggested by the second quadrant which resembles by medium levels of m-government readiness and low levels of democratization. The overriding and realistically achievable m-government goals here are to provide ready and efficient access to government information and to enquire whether the services are available at a point of time or not (informational efficiency). Countries in this quadrant are likely to be characterized by some developing countries with authoritarian government type. Political goals (e.g., democratic responsiveness, public accountability, transparency etc.) are virtually a luxury for countries in this quadrant. A principal concern here is that m-government may be used as an instrument of control and manipulation. For example, in a dictatorship the government may provide such information that will serve its hidden goal of maintaining or enhancing its grip on its population. Thus, the strategic disposition of m-government initiatives undertaken by countries in this quadrant should be informational and mainly emphasizes access to government information.
3.3.3 Transactional Disposition

This disposition results from the third quadrant which is represented by high m-government readiness and low democratization levels. Three values are likely to be dominant in this quadrant: transactional efficiency, effectiveness/quality of service, mobility and integrity in the delivery of services. In contrast to the countries in the first and second quadrants, countries in this quadrant (e.g., Malaysia and Singapore) seek to provide not only efficient access to information but also efficient and effective delivery of public services and integrity in the provision of those services. Here the focus is on the efficiency, effectiveness, mobility and integrity in public service delivery. The emphasis may be a response to the possibly high expectation of citizens in an environment of high m-government readiness – an environment characterized by high literacy and diffusion of computer and Internet usage in the society (see Figure 1: M-government Index). Focus on effective service delivery may be a pragmatic policy option in an environment where a higher democratization level is not viable for one reason or another. Thus, the strategic disposition of m-government initiatives undertaken by countries in this quadrant should be transactional and hence mainly emphasizes the aforementioned dominant goals.

3.3.4 Semi-Consultational Disposition

The fourth quadrant resembles a combination of high level of democratization and
low level of m-government readiness which suggests a semi-consultational disposition. M-government political values are more likely to be paramount, though the limited m-government infrastructure here poses a real constraint on the realization of these values. Only Transparency and Public Accountability are possible values that do not require much emphasis on m-government readiness. Thus, the strategic disposition of m-government initiatives undertaken by countries in this quadrant should be semi-consultational.

3.3.5 Consultational Disposition

The fifth quadrant represents a combination of a high level of democratization and a medium level of m-government readiness which suggests a consultational disposition. M-government political values are more likely to be paramount, though the limited m-government infrastructure here poses a real constraint on the realization of these values. Nonetheless, democratic values (e.g., transparency and integrity) that do not require policy dialogue between the government and the citizens are still achievable under this context. In contrast, values such as democratic participation and responsiveness presume citizen-government dialogue or interactivity, values which may not be fully supportable by the technological and educational levels in this quadrant. Thus, the strategic disposition of m-government initiatives undertaken by countries in this quadrant must be consultational.
3.3.6 Participational Disposition

The sixth quadrant is high on both democratization and m-government readiness indices, suggesting a participational disposition. What sets this quadrant apart from the preceding five quadrants is that it represents a setting in which the realization of all the goals (both political and efficiency related) of m-government is feasible. Although political goals are paramount here, efficiency-related goals are also important, especially in the context of prolonged economic stagnation and concomitant chronic fiscal deficits. In addition, public accountability, personalization, mobility, which is expectedly the outcome of high democratization, dictates not only the efficient and effective use of public resources but also integrity in the use of this aspect of public trust. A high level of m-government readiness allows a higher level of Web-enabled citizen participation in public policy discourse or dialogue in the broadest sense in comparison to the previous dispositions.

IV. M-Gov Critical Success Factors (CSF)

4.1. General Model for Critical Success Factors

The starting point of the CSF research was a paper of [35] who analyzed some
critical factors in context of management information systems. The concept itself can be defined as follows: A success factor which has a sustainable and positive effect on the success of the company/government. By using these factors a competitive advantage could be realized.

Because, however, there are many different potential success factors, the academic research in this field is only interested in the most critical ones. These factors are called CSF and can be classified in three groups [36]: The first group is the subset of the so-called endogenous CSF which can be directly controlled. The second class contains the so-called exogenous CSF which is not directly manageable. The third group is the class of moderator variables that have the task to mediate between the ‘real’ success factors and the success values. Consider all these groups a CSF, a very general model for the casual relationship within the CSF research was defined as illustrated in figure below.

![Figure 3: Framework for the CSF Research [36]](image-url)
4.2. Criteria Affecting M-Gov with Mobile Access

For at least the last half-decade we have seen the emerging power of the Internet as a channel for electronic government (“e-government”). Today, the mobile internet is rapidly emerging, and the transaction paradigm in e-government is shifting to mobile government (“m-government”). M-government, like e-government, represents an immense opportunity for government. Success in m-government will go to those countries that start to implement early, and to those that focus on creating compelling value to citizens.

The term m-government covers an emerging set of applications and services that people can access from their web-enabled mobile devices using the “wireless web”. M-government inherits many attributes from m-commerce and e-government, and we have employed some e-commerce, m-commerce & e-government characteristics [37].

In the mobile internet environment, people can use a mobile application with a wireless connection anywhere and at anytime. Mobility of devices and applications
raises the issue of the appropriateness of their use under certain circumstances [38], that is, mobility is a strategic consideration for m-government to utilize in aiming for success. We extracted the major aspects of m-commerce, e-government from [38][39]. These are listed in table below, and consist of six m-government success factors: System Quality, Content Quality, Trust, Support, Mobility, Personalization and alternatives for decision making are shown below. More detailed information on these categories can be found in references [37][38][4][7][9] and [13].

Table 3: Summary of the Success Factors

<table>
<thead>
<tr>
<th>Factors</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Quality</td>
<td>Response Time, 24-hr availability, Page loading speed, visual appearance</td>
</tr>
<tr>
<td>Content Quality</td>
<td>Up-to-datedness, Understandability, Timeliness, Preciseness</td>
</tr>
<tr>
<td>Trust</td>
<td>Security, Privacy</td>
</tr>
<tr>
<td>Support</td>
<td>Tracking order status, Account maintenance, Payment alternatives, FAQs</td>
</tr>
<tr>
<td>Mobility</td>
<td>Device, Application</td>
</tr>
<tr>
<td>Personalization</td>
<td>Location, Time, Individual preferences</td>
</tr>
</tbody>
</table>

A. System Quality
This is the principal criterion for judging whether site performance is sufficiently smooth and seamless in m-government. Earlier MIS works investigated the reliability of the system, response time, and so on. Recent works focusing on e-government have suggested additional variables: response time, 24-hr availability, page loading speed, visual appearance. Since these considerations also apply to e-government, these criteria and their components are equally applicable to an m-government system.

B. Content Quality

Content Quality is very important in attracting citizens to m-government. Content quality includes the attributes of the application that are presented directly on mobile devices. Information systems’ literature has emphasized the importance of information quality as one of the determinants of user satisfaction, and has identified a number of attributes: up-to-datedness, understandability, timeliness, and preciseness.

C. Trust

Trust is another significant challenge in the m-government environment. Citizens are concerned about the level of security when providing sensitive information through mobile. Also, they expect that personal information will be protected from external access. There are two alternatives – Security and Privacy. There are potential benefits in storing data, including personal and financial information, on mobile devices for use in m-government applications.

D. Support

If m-government applications/services provide citizen satisfaction, citizens will return
to the service after their initial experience. Support is a citizen-oriented criterion and includes the following components: tracking order status, account maintenance, payment alternatives, FAQs etc.

E. Mobility

The citizen can employ mobile services and transactions from anywhere, at anytime; m-government must support this citizen mobility. Mobility of device and application raises the issue of their suitability for the user under some circumstances.

F. Personalization

Personalization is defined as the customization of products and services to the context of the user. The importance of personalization, and therefore context, in m-government is widely recognized as a critical success factor. The notion of context used here follows context-aware computing, i.e., the use of context to provide task-relevant information and services to a citizen. Since mobile devices have particular limitations, e.g., low battery capacity, and small memory and screen size, personalization is needed to increase their usability.

A review of the literature reveals a tendency to concentrate on context components such as location, time, activity, role and personal preferences. While the component roles of activity and mission are relatively difficult to model, we select location, time, and individual preferences as parameters that can be precisely measured. These alternatives are the current parameters for personalization in m-government.
V. A Brief Overview of AHP (Analytical Hierarchy Process)

The Analytic Hierarchy Process is an MCDM (Multiple Criteria Decision Making) technique to assist the solution of complex criteria problems. This has been found to be an effective approach that can settle complex decisions; it has been used by numerous researchers in various fields to handle both tangible and intangible factors and sub-factors. As the AHP approach is a subjective methodology, information and the priority weights of elements may be obtained from a decision-maker using a direct questioning or by a questionnaire method. [25] Summarized the AHP procedure in terms of four steps: 5.1 through 5.4. This system has been retained, but the use of some terms has been changed.

5.1. Break the Decision Problem into a Hierarchy of Interrelated Problems

The top level contains the macro dimension objective, such as selecting the best alternative. The lower levels contain attributes that contribute to the quality of this decision. The next lower levels consider these attributes in increased detail. The bottom level of the hierarchy contains decision alternatives or the selection of choices. Figure illustrates the standard decision schema for an AHP decision model.

Figure 4: The Decision Schema of the AHP
5.2. Derive the Matrix Data for Pair-wise Comparison of Decision Elements

Once the hierarchy has been structured, the next step is to determine the priorities of elements at each level. The matrix data express judgments in pair-wise comparisons, using a nine-point scale. The meaning of each scale measurement is explained in Table. The pair-wise comparisons are estimated in terms of the extent to which element A is more important than element B etc. Even-numbered digits, 2, 4, 6, 8, represent compromise between odd-numbered values, and reciprocals apply to inverse comparisons.

[23] Suggested the construction of a matrix where each off-diagonal element is determined by comparing the relative importance of two factors using the type of scale shown in Table. For instance, if A is moderately more important than B, then A is assigned an importance rating three times that of B, and B is consequently 1/3 as important as A.
The elements in the next hierarchical level are arranged in the form of a matrix and pair-wise judgmental values are assigned that satisfy the decision element of the present level for which the comparison matrix is built. Similarly, elements in the next level down are subjected to pair-wise comparisons for a particular decision element in the previous level and values are assigned.

Table 4: Normalized Matrix and Priority

<table>
<thead>
<tr>
<th>Preference weights</th>
<th>Definition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equally preferred</td>
<td>Two activities contribute equally to the objective.</td>
</tr>
<tr>
<td>3</td>
<td>Moderately preferred</td>
<td>Experience and judgment slightly favor one activity over another.</td>
</tr>
<tr>
<td>5</td>
<td>Strongly preferred</td>
<td>Experience and judgment strongly favor one activity over another.</td>
</tr>
<tr>
<td>7</td>
<td>Very strongly preferred</td>
<td>An activity is strongly favored over another and its dominance demonstrated in practice.</td>
</tr>
<tr>
<td>9</td>
<td>Extremely preferred</td>
<td>The evidence favoring one activity over another is of the highest degree possible of affirmation.</td>
</tr>
<tr>
<td>2, 4, 6, 8</td>
<td>Intermediate values</td>
<td>Used to represent compromise between the preferences listed above.</td>
</tr>
<tr>
<td>Reciprocals</td>
<td>Reciprocals for inverse comparison</td>
<td></td>
</tr>
</tbody>
</table>

5.3. Find the Eigen values and Eigenvectors of the Pair-wise Comparison Matrices to Estimate the Relative Weights of the Decision Elements

The pair-wise comparison values produce a ratio scale of weights of relative importance (with each value multiplied by a constant). AHP assumes that the evaluator
does not know the actual weights, represented by vector W. Therefore the observed pair-wise relative weight matrix, A, contains inconsistencies. The matrix A has rank 1.

\[ A.W = n.W \]

where \( n \) is the eigenvalue and \( W \) is the eigenvector of A.

\[ A^* . W^* = Z_{\text{max}} . W^* \]

Where \( A^* \) is the observed pair-wise comparison matrix, \( Z_{\text{max}} \) is the largest eigenvalue of A, and \( W^* \) is the estimated \( W \). The estimated value of \( n \) is \( Z_{\text{max}} \); the closer the computed \( W_{\text{max}} \) is to \( n \), the more consistent the values of \( A^* \). As a result, the value of \( Z_{\text{max}} \) is an important validating parameter in AHP. It is used in evaluating the consistency ratio (CR) [38] of the estimated vector, calculated as follows:

1) The eigenvector (the relative weights) and \( Z_{\text{max}} \) for each matrix is calculated.

2) The consistency index (CI) is computed using the formula \( CI = (Z_{\text{max}} - n) / (n - 1) \).

3) CR is calculated using the formula \( CR = CI / RI \).

RI is a known random consistency index called the average index of randomly generated weights, (ACI) in [25], obtained from a large number of simulation runs. It varies depending upon the order of the matrix.

Table shows the value of the random consistency (RI) for matrices of order 1 to 10 obtained by approximating random indices using a simple size of 500 [38].

A CR value of 0.10 or less is considered acceptable, otherwise the values of matrix \( A^* \) must be reassessed to resolve inconsistencies in pair-wise comparisons. The acceptable CR ranges are 0.52 for a 3 by 3 matrix, 0.89 for a 4 by 4 matrix,
and 1.0 for 5 by 5 matrices or larger. An acceptable consistency level ensures decision maker reliability in determining the priorities of a set of criteria.

### Table 5: RI Based on Matrix Size

<table>
<thead>
<tr>
<th>Size of Matrix (n)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI</td>
<td>0</td>
<td>0</td>
<td>0.9</td>
<td>1.11</td>
<td>1.25</td>
<td>1.35</td>
<td>1.40</td>
<td>1.45</td>
<td>1.49</td>
<td></td>
</tr>
</tbody>
</table>

5.4. Aggregate the Relative Weights of the Decision Elements to Obtain a Rating for Decision Alternatives

In this step, we collect the relative weights through the hierarchy by weighting relative values. Then we sum the totals for each decision alternative and normalize the results of total 1. This weighted value represents the priority level.

VI. INDIAN CASE-STUDY (*A Reference*)
6.1. Application of Context-based Integrative Schema

6.1.1. Classification of Countries based on Macro-dimensions

The Schema presented above underscores the importance of context of m-government initiatives. The goals or values the initiatives seek to achieve are not independent of the settings in which those initiatives are undertaken. The fact that national m-government initiatives differ in terms of goals they are designed to achieve is a reflection of the influence of the varied contexts of those initiatives. Among the myriad of contextual factors influencing the goals of m-government initiatives, technical and political factors appear to be most important. The level of m-government readiness, the technical or infrastructural factor, indicates the degree of computer and internet penetration in the society and, concomitantly, the feasibility of using these digital technologies to realize public policy goals. Thus, a low level of m-government readiness may substantially constrain what a government can seek to achieve.

The political environment in which m-government initiatives are undertaken is of paramount importance. The primacy of politics here stems from the view that politics represents the authoritative allocation of values or goals for the society. Such values comprise public accountability, citizen participation, efficiency, effectiveness, economy, and democratic responsiveness, integrity in public service, service quality, security, public health, and public safety. These values are likely to receive differing
degrees of emphasis as public policy goals. In a setting where a high level of democratization exists, one would expect a greater emphasis on democratic values: political accountability, democratic responsiveness, transparency and integrity in public service, citizen participation, etc. On the other hand, such values are unlikely to be emphasized in an environment of low level of democratization. From this perspective, the level of democratization appears to be an important contextual factor influencing the relative emphasis on democracy-related values.

Thus, in a context of a high level of democratization and a high level of m-government readiness, one would expect democracy-related values to be dominant values in m-government initiatives, as are such issues as privacy, security, and confidentiality. Such issues are important in this context inasmuch as they are related to personal freedoms which are likely to be important in an environment of high democratization. In such an environment, the mode of interactions between government and citizens should be interactive. Both government and citizens engage in policy dialogue. Citizens are not passive recipients of government proposals or actions in this context. They actively seek to influence government policy outputs. In this environment also, resource scarcity-related values (efficiency, effectiveness and economy) are likely to be important values under conditions of fiscal stress. Under such conditions, m-government initiatives should be expected to emphasize both democracy-related as well as resource scarcity-related values.

An environment of high democratization and low m-government readiness is
likely to constrain the interactions between government and citizens in m-government initiatives. Although democracy-related values are likely to be dominant in such initiatives, low m-government infrastructural capacity will render broad-based active citizen participation infeasible. Accordingly, policy dialogue between citizens and government are likely to be limited.

In contexts characterized by low levels of democracy, resource-related values are likely to be dominant. In such environments, low levels of m-government readiness will limit m-government initiatives to providing information to citizens and businesses. Therefore, the interactions are principally one-way (G2C). On the other hand, high levels of m-government readiness enable governments not only to provide information but also to make it possible for citizens and businesses to conduct transactions through mobile with their government. Consequently, interactions are mainly G2C and G2B.

In summary, the simultaneous interaction of these two dimensions provides an integrated perspective that identifies strategies for m-government initiatives.

To further illustrate the applicability of our Schema, we present here a case about India which falls under the fifth quadrant characterized by a high level of democratization and a medium level of m-government readiness Index [33].

We have collected the M-Government Readiness Indexes’ for 179 countries from the report [33] and plotted the index using Normal distribution with the help of SPSS in order to find the limits for the quadrants.

The figure below shows the approximate normal distribution of M-
Government Readiness Indexes of 179 countries.

Figure 5: Normal Distribution of M-Gov Index of 179 countries

After applying the Normal Distribution formulae,

The following limits are calculated for M-Gov Readiness Index –

Very low – 0 ~ 0.2500 (26 countries)
Low – 0.2500 ~ 0.4217 (66 countries)
Medium – 0.4217 ~ 0.5500 (51 countries)
High – 0.5500 ~ 1.0 (36 countries)
In terms of this Schema described in 3rd section, India falls under 5th quadrant i.e., consultational disposition, which is characterized by a high level of democratization and a medium level of m-government readiness. India is a full-fledged democracy. However, it scores 0.43 on the United Nations m-government readiness Index [33]. This is just above the world average which stands at 0.4217 and less than 0.55. The goals according to Consultational Disposition are Transparency, Accountability, Democratic Responsiveness and Integrity.

6.1.2. Evaluation of M-Gov Applications with Goals/Values

As we presented above a systematic treatment of the goals/values of m-government and classified into –

Individually Focused – Increasing Accessibility of government services to individuals

Society Focused – Better Utilization of society’s scarce resources

Organizationally Focused – Empowering organizational members

Politically Focused – Enhancing governmental accountability.

The M-government applications should be evaluated based on focus of the application in terms of goals. Some applications can only satiate only some goals and the focus of the goals are limited as described in section 3.1. For the purpose of analyzing whether a particular m-government application is suitable, it is convenient to start by identifying those elements that define m-government action and constitute the essence in public administration tasks. So, the applications are
evaluated based on the goals in terms of four dimensions posed by [34] i.e., *Service, Time, Distance* and *Interaction*.

Let us go through some simple *examples* to understand how to carry-out with the evaluation of M-gov applications and Goals:

First of all, there is the idea of *service*. Let us take the goal *Efficiency* here. In this case, if the m-gov application provides ‘low cost access to information & knowledge’ then the goal of efficiency in the dimension of service is satisfied. In case of goal *Effectiveness* in the dimension of *service*, if the m-gov application provides ‘improved quality of the legislation or enhances the communication capacity’, the goal for that application is satisfied.

With respect to goal ‘Effectiveness’ and dimension ‘Time’, if the m-gov application provides ‘Information on a 7days & 24hours basis’ or ‘Enhances support to citizen/business activities’, the goal is satisfied by that application.

With respect to goal ‘Effectiveness’ and dimension of ‘distance’, if the application ‘standardizes activities performed by disperse agencies’ or ‘frequent & better communication’, the goal is satisfied by that application.

With respect to goal ‘Efficiency’ and dimension of ‘Interaction’, if the application ‘Reduces communication costs’, the goal is achieved by that application.

In summary, all the applications are evaluated with each goal in all the four dimensions ‘service, time, distance & interaction’. If the application satisfies in any or subset or all the dimensions, the application with respect to that goal is marked ‘Y’ else
it’s marked ‘N’.

This kind of assessment [34] of m-government applications is helpful in encouraging or rejecting a particular application by any country with their goals to be achieved.

6.2. Application of AHP on Goals & CSF

AHP (Analytical Hierarchy Process) is a decision-making process in which a problem is first broken down to a hierarchy of inter-related decision elements and then uses the pair-wise comparisons of the user to give the order in which factors affect a decision, consistency of the respondent, and (depending on the particular problem) a prioritized list of the decisions to be made [26]. There are several advantages including ease of use and over-specification of judgment, built-in consistency tests, use of appropriate measurement scales, and applicability in the elicitation of utility functions.

The AHP model was formulated and data were collected to assess the professional judgment of customers or decision-making executives using the “1-9 Saaty Scale” for pair-wise comparisons. The criteria and decision alternatives that are applied in this evaluation were already described above in Section 4. While we have included decision criteria that are identified in the literature, decision-makers wishing to use AHP must identify criteria appropriate to their own particular situation.

The results of this application provide good analytical penetration regarding
m-government success factors in the market.

6.2.1 Data Collection and samples

For collecting data, we first explained the AHP methodology and discussed M-Gov CSF Criteria and M-Gov goals/values with experts. Then we have submitted AHP questionnaires to nearly 30 experts (professors, CEOs, researcher scientists, IT-Managers related to e-government & m-government). We received the responses from only 11 experts (3 professors, 5 research scientists and 3 IT-Managers). The survey data were collected for 12 days from Nov 30, 2007. The judgment of the importance of one factor over another should be made subjectively and converted to numerical value using a scale of 1-9 [24]. Consistency rate which indicates the logical response of questionnaire is satisfied less than 0.1 for only 7 responses(goals) and 5 responses (CSF criteria) [23][24]. We used Expert Choice 2000, which is an application program of AHP model, to apply AHP technique to our hierarchy structure.

6.2.2. Hierarchy Structure of CSF Criteria

In this step, we build a decision hierarchy by breaking a general problem into individual criteria. The success factors described in section 4 are shown in figure below in the form of an AHP hierarchical diagram. The top of the hierarchy is the overall objective, the decision alternatives are at the bottom. The middle nodes are the relevant attributes (CSF criteria) of the decision problem.
6.2.3. Pair-wise comparison

Next, we gather rational data for the decision criteria, using the AHP relational scale suggested by [23].

The results of this stage are presented as pair-wise comparison matrices of the decision elements indicating the global objective and criteria.

6.2.3.1 Weights of CSF Criteria
The weights of CSF criteria to find M-government killer Applications is shown in Table 5.

<table>
<thead>
<tr>
<th>CSF Criteria</th>
<th>Sub-Criteria</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Quality</td>
<td>Response Time</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>24-hr Availability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Page-loading Speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visual Appearance</td>
<td></td>
</tr>
<tr>
<td>Content-Quality</td>
<td>Up-to-datedness</td>
<td>0.275</td>
</tr>
<tr>
<td></td>
<td>Understandability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timeliness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preciseness</td>
<td></td>
</tr>
<tr>
<td>Trust</td>
<td>Security</td>
<td>0.326</td>
</tr>
<tr>
<td></td>
<td>Privacy</td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>Tracking Order status</td>
<td>0.129</td>
</tr>
<tr>
<td></td>
<td>Account Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Payment Alternatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAQs</td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td>Device</td>
<td>0.189</td>
</tr>
<tr>
<td></td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>Personalization</td>
<td>Location</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Individual Preferences</td>
<td></td>
</tr>
</tbody>
</table>

6.2.3.2. Weights of M-Gov Goals

In this step, we want to find the weights of the goals for India (Transparency, Accountability, Democratic Responsiveness & Integrity) which fall under consultational disposition. In order to reduce the total number of applications, we have already evaluated the M-Gov applications based on goals/values in all the dimensions mentioned in section 6.1.2. But in order to have effective application reduction, we
conducted AHP pair-wise comparison with some of the Indian experts.

The results are indicated in the table below.

**Table 7: Weights of M-Gov Goals/Values using AHP (Indian Case)**

<table>
<thead>
<tr>
<th>M-Government Goals/Values</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency</td>
<td>0.285</td>
</tr>
<tr>
<td>Accountability</td>
<td>0.287</td>
</tr>
<tr>
<td>Democratic Responsiveness</td>
<td>0.128</td>
</tr>
<tr>
<td>Integrity</td>
<td>0.300</td>
</tr>
</tbody>
</table>

6.3 Finding M-Government Killer Applications for India

6.3.1 Evaluation of M-Gov applications with M-Gov goals of India

As we applied the context-based integrative schema to India, according to consulational disposition, we have the goals (*transparency*, *accountability*, *responsiveness* and *Integrity*) which suit to the context of India.

The M-Gov applications are evaluated with respect to the goals with respect to all the four dimensions (*service*, *time*, *distance* and *interaction*). As we also found the relative weights of the goals using AHP presented in table above, the m-gov applications are evaluated and short-listed based on the context of India and with the help of the weights of goals.

Now, the table below shows the short-listed applications suitable to Indian context.

**Table 8: Possible M-Gov Applications (Indian Case)**
<table>
<thead>
<tr>
<th>Category</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>App1 – Express Citizens opinions directly to gov’t officials</td>
</tr>
<tr>
<td></td>
<td>App2 – Mobile Voting</td>
</tr>
<tr>
<td></td>
<td>App3 – Birth &amp; Death Statistics</td>
</tr>
<tr>
<td></td>
<td>App4 – Distribution of Funds among Officials</td>
</tr>
<tr>
<td></td>
<td>App5 – Tax Management System</td>
</tr>
<tr>
<td></td>
<td>App6 – Registration of land/property</td>
</tr>
<tr>
<td>Cultural &amp; Tourism</td>
<td>App7 – Promotion of City events</td>
</tr>
<tr>
<td>Transportation</td>
<td>App8 – Regional, National Global Policies &amp; Resource availability</td>
</tr>
<tr>
<td></td>
<td>App9 – Eligibility of Nationals/foreigners for a particular location</td>
</tr>
<tr>
<td>Public Health &amp;</td>
<td>App10 – Vaccination dates &amp; centers (flu, malaria etc)</td>
</tr>
<tr>
<td>Welfare</td>
<td>App11 – Hurricane &amp; Tsunami warnings</td>
</tr>
<tr>
<td></td>
<td>App12 – Radioactivity Detection</td>
</tr>
<tr>
<td></td>
<td>App13 – Rescuing Flood Victims</td>
</tr>
<tr>
<td>General</td>
<td>App 14 – Public Hearing Notification Calendar</td>
</tr>
</tbody>
</table>

6.3.2 Evaluation of Reduced M-Gov Applications with CSF Criteria
For finding killer applications in any country, one should find the CSF criteria of killer applications and determine the weights of CSF criteria and then evaluate each of the possible application (alternative). It is the evaluation of alternatives in a decision making process. In this section, we investigate the evaluation of alternatives for Killer Applications based on the CSF criteria weights and the evaluation scores given to the applications by experts.

By applying Schema and M-Gov goals/values evaluation to the list of applications (~50), we got the possible m-government applications (14) for India. By applying AHP to the CSF criteria, we got the weights. In the table below –

The reduced M-Gov applications are rows and the CSF criteria with weights are the columns. Now, all the applications are evaluated by experts with respect to each criterion (column-wise) based on 7-likbert scale (7 = excellent, 1 = poor). Now, each application has a 7-likbert score with respect to each criterion. Then, the average scores of each application with respect to each criterion are calculated. They are the values in the table.

Now, follow these two steps –

1) For each application, multiply the average score (1~7) with the weight of the criterion.
2) Now, add all the multiplied values row-wise to get the overall score of each application.

After calculating the final scores of all the 14 applications, the table is arranged in descending order.

The M-government Killer Applications for India are the applications with scores above the average of the whole 14 applications.

The average score of the 14 applications is 4.45.
So, the applications above the average are highlighted in the table below.

Table 9: Result of evaluation of Alternatives Table (Indian Case)

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>System-Quality</th>
<th>Content-Quality</th>
<th>Trust</th>
<th>Support</th>
<th>Mobility</th>
<th>Personalization</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-Government Applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hurricane &amp; Tsunami warnings</td>
<td>5.75</td>
<td>6</td>
<td>5.75</td>
<td>6</td>
<td>5.5</td>
<td>3.5</td>
<td>5.712</td>
</tr>
<tr>
<td>Vaccination dates &amp; centers (flu, malaria, etc)</td>
<td>5.25</td>
<td>5.75</td>
<td>6</td>
<td>6.5</td>
<td>4</td>
<td>4.75</td>
<td>5.534</td>
</tr>
<tr>
<td>Rescuing Flood Victims (location based on Mobile)</td>
<td>4.75</td>
<td>5</td>
<td>5</td>
<td>5.25</td>
<td>5</td>
<td>3.5</td>
<td>4.955</td>
</tr>
<tr>
<td>Promotion of City Events</td>
<td>5.25</td>
<td>5.25</td>
<td>5.25</td>
<td>4.75</td>
<td>4.25</td>
<td>3.25</td>
<td>4.905</td>
</tr>
<tr>
<td>Mobile Voting</td>
<td>4.75</td>
<td>5.5</td>
<td>3</td>
<td>5.75</td>
<td>5.5</td>
<td>6.25</td>
<td>4.726</td>
</tr>
<tr>
<td>Radioactivity Detection</td>
<td>4.5</td>
<td>5.25</td>
<td>4.25</td>
<td>4.5</td>
<td>4.5</td>
<td>3.5</td>
<td>4.579</td>
</tr>
<tr>
<td>Regional, National Global Policies &amp; Resource availability</td>
<td>4</td>
<td>5</td>
<td>4.25</td>
<td>5.25</td>
<td>4</td>
<td>3.75</td>
<td>4.506</td>
</tr>
<tr>
<td>Birth &amp; Death Statistics</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5.25</td>
<td>3.75</td>
<td>4.5</td>
<td>4.412</td>
</tr>
<tr>
<td>Express Citizens opinions directly to Government Applications (feedback)</td>
<td>4</td>
<td>5.25</td>
<td>3.5</td>
<td>4.25</td>
<td>4.5</td>
<td>4.25</td>
<td>4.319</td>
</tr>
<tr>
<td>Tax Management System</td>
<td>4.25</td>
<td>5.25</td>
<td>3.25</td>
<td>4.5</td>
<td>3.75</td>
<td>5.25</td>
<td>4.183</td>
</tr>
<tr>
<td>Public Hearing Calendar Notifications (court-hearings)</td>
<td>3</td>
<td>4.25</td>
<td>4.75</td>
<td>4.5</td>
<td>3</td>
<td>3.25</td>
<td>4.119</td>
</tr>
<tr>
<td>Registration of land/property</td>
<td>4</td>
<td>4.75</td>
<td>3</td>
<td>4.33</td>
<td>4</td>
<td>4.25</td>
<td>3.934</td>
</tr>
<tr>
<td>Eligibility for nationals/foreigners for a particular location</td>
<td>3.25</td>
<td>3.75</td>
<td>4</td>
<td>3</td>
<td>3.25</td>
<td>2.75</td>
<td>3.579</td>
</tr>
<tr>
<td>Distribution of Funds among Officials</td>
<td>2.5</td>
<td>3</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2.82</td>
</tr>
</tbody>
</table>

6.3.3 Final List of M-Gov Killer Applications
The applications are shortened based on the contextual Schema, where the applications should satiate the goals defined by the technical, economical, democratic and cultural constraints. Later, the CSF criteria are found based on the literature review of e-commerce, m-commerce, MIS, e-government and applied AHP technique to find the weights (priority and preference) of the criteria. Later the reduced applications are evaluated with respect to criteria to find the most probable future killer applications for India.

The same procedure can be carried out for the developing countries as well as other countries. This Indian case is just used as a reference to show-case the implementation steps.

So, the final M-Gov Killer Applications for India are listed below –

1) Hurricane & Tsunami warnings
2) Vaccination dates & centers (flu, malaria etc)
3) Rescuing Flood victims (location based on mobile)
4) Promotion of city events
5) Mobile voting
6) Radioactivity Detection
7) Regional, national global policies & Resource availability.

6.4 How to apply for different countries?

Here, in this paper, we have listed the emerging m-government applications. Then, based on the contextual integrative schema, we have assigned goals based on the countries’ contexts i.e., Democratization Index and M-government Readiness Index. If you want to find
the future mobile government killer applications, you have to find/calculate the above indexes of your country. Based on the quadrant your country falls and its goals, you should try to abridge the emerging number of m-government applications into a handful number by finding the applications satisfying the goals of that quadrant. Based on the experts opinions (AHP), find the weights of the goals and find the limited (suggested 10–15) m-government applications. Now, you have short number of m-government applications which satisfy the goals of m-government in your country.

Now, we have also listed the critical success factors of m-government through broad literature review of e-commerce, m-commerce, e-government. So, you can add/delete any of the CSF based on the countries’ requirements. Based on the AHP procedure we mentioned in detail, try to find the weights of the CSF criteria.

We have limited short number of applications and CSF criteria with weights. Then, conduct an extensive evaluation to maximum number of experts designated in mobile domain, government employees, politicians, end-users, etc. The evaluation should be done for all applications with respect to each criteria (column-wise) based on 7-likert scale (7 – important, 1 – least important). The evaluators should think about ‘How important is that criteria (wt) for that application. Based on the responses of the evaluation result, the average of all the responses for each application are to be calculated.

Now, we have the table with short-listed applications, CSF criteria with weights and the value for each application with respect to each criterion (average value). Now calculate the total score of each application by multiplying the score with the CSF weight and adding row-wise in order to find the final score for that application. Follow the same way for all the applications. Now, find the average score of the final scores of all short-listed applications.
Then, Pick the applications which score above the average score.

Please follow any other better way of sorting the best applications out of short-listed applications and their scores. The picked applications can be grouped in order to give the preference by experts’ choice. Now, we have the final list of m-government killer applications suitable for your countries’ contexts.

VII. Conclusions
5.1 Summary

Mobile or wireless communications has penetrated many developing countries in the recent past and is still evolving at a rapid pace. Recent survey [10] suggests that total number of mobile phones has already surpassed the total number of fixed lines, internet, and PC according to 49 middle-income and 36 low-income countries. Research suggests that M-government is inevitable and also analyzed that it is a better option in developing countries as the mobile technology allows developing countries to leapfrog in adopting new technologies. This is very important to the development of developing countries as “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 time or cost of development [ILO].”

In order to avail this opportunity of leapfrogging by developing countries, m-government should be made possible. ‘What applications are to be implemented first?’ has become major question in the research. But the research lacks to figure-out the killer application and also lacks a framework to find killer application.

In this study, firstly we showed a general framework to find M-government killer applications which can be followed by any developing/developed country. Then, in order to provide an example of the framework, we showed it with a case-study of Indian subcontinent.

This study has gathered all the M-government applications from literature review of different journals, conferences, projects, pilot-projects and case-studies. Then based on the framework, the total list of M-government applications is short-listed using the context-based goals of the framework. The applications are evaluated based on the goals (with dimensions)
and their weights (AHP)

Then, the CSF criteria are found through literature review using a general framework to find the critical success factors of any service. The criteria are prioritized & given weights by experts (professors, scientists, researchers). Using the weights of CSF criteria and the short-listed applications, the evaluation of alternatives is done. Finally, the killer applications of M-government are found for India.

5.2 Implications & Limitations

For any country to develop mobile government, they need to find the killer applications to implement in first place. So, the general framework developed in this study can be followed with Indian case-study as a reference.

Implications to the Firms

The final M-government killer applications for the country (India) when investigated (already found in this study) can be implemented by mobile firms (in India) with perfect collaboration with the public administration. This will improve the value of the government from citizens’ point of view. Overall productivity of the available information will increase to citizens & government. The firms implementing m-government also have innumerable benefits such as using the same infrastructure which is being already used in their ordinary business. The firms will improve their public-relations with authorities/government officials which is time-saving as well as cost-saving. In the near future, new application fields may arise for local businesses in establishing public-private partnership co-operations and taking over
intermediary functions. The employees within companies need sufficient know-how to interact with government using mobile.

The limitation in this case for the firm is regarding the fact that governments might know information about a company more quickly which may cause some unwanted issues.

**Implications to citizens**

The implication to citizens is that the technologies used by Government to implement m-government will enforce trust in technologies by citizens. Once the m-government applications become familiar in the future, the citizens doing business with government through the mobile will become a must, which is a good signal regarding the development of the country. Other major implication is that citizen participation will increase rapidly. Example such as the elderly people/physically challenged people can use the mobile to perform a public service.

The killer applications found above are mostly related to ‘disaster recovery’ or political applications. The applications are not very difficult for the citizens to perform or follow when given some guided support and training. It will help both citizens as well as the government. Government can collaborate with the mobile value-chain players in order to implement the above or some of the 7 killer applications. The mobile value-chain finds new business models with the help of the implementation of m-government applications. The strategies can be developed with perfect cooperation among the value-chain players.

The Government gets new face value with the implementation of m-government as it uses the latest mobile technologies which make an impact on the people as well as other countries. The trust on Government should be taken care of as citizens do not allow any kind
of security or privacy breaches. This implementation by government makes citizens/businesses trust in the technologies/software used in here.

Although the study provides meaningful implications, there are a few limitations. First, the criteria hierarchy does not maintain independence with other criteria perfectly. Second, samples for analyzing goals & CSF criteria and the evaluation of alternatives are biased to mobile experts & government scientists that it would be occurred a lack of objectivity. Also, the sample size of experts is less. Accordingly, further study is needed to find a model to sustain these mobile government applications for long time. Future research should focus on developing the mobile interface to make the applications more interactive.

References


[28] TRAI., “Performance Indicators of Indian Telecom Services”, Telecom Regulation Authority of India, 2006, pp.1-37


September/October, 1961, pp. 111-121.


Appendix 1: AHP Questionnaire

I – Introduction and Instructions

“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 [ovum].

We are conducting survey to find the killer applications in M-government. We need to find the weights of the ‘goals’ to reduce the total emerging m-government applications into a handful number. Also, we need to investigate the weights for the criteria to perform evaluation of the reduced m-government applications. We are conducting AHP methodology to find the weights for ‘goals’ and ‘criteria’.

This survey has two parts: AHP scoring for ‘Criteria’ & AHP Scoring for ‘Goals’. Here are some of the guidelines to help you finish this survey successfully, viz.,

1. This is a survey conducted to support my research but not used for any business purpose.
2. The guidelines required to score AHP Questionnaire are also provided.
3. The information regarding the ‘Goals’ as well as ‘Criteria’ are provided to help you.
4. Part II is ‘AHP Survey Guidelines’.
5. The Part III is AHP survey of ‘Criteria’.
6. The Part IV is AHP survey of ‘Goals’.
7. The Part V is the ‘Information related to Criteria and Goals’ to help you score easily.
8. Your valuable scores are highly appreciated.

Thank you for spending your precious time
We kindly request you to forward the survey to other experts in your organization.
II – AHP Survey Guidelines

We are conducting this part of survey to find the preferences of the different criteria such that we can find the weights of different criteria based on your opinions.

AHP Method Basis
- 1 point: If both the criteria are equally important
- 3 point (less important) ~ 9 point (more important)

Prioritize the given Criteria according to your opinion
System Quality (  )
Content Quality (  )

Example of AHP Survey

<table>
<thead>
<tr>
<th>System Quality</th>
<th>9</th>
<th>7</th>
<th>5</th>
<th>3</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- If both the criteria ‘System Quality’ and ‘Content Quality’ are equally important, please check score 1
- If ‘System Quality’ is more important than ‘Content Quality’, check the scores on the left which indicate the importance of ‘System Quality’ over ‘Content Quality’.
- If ‘Content Quality’ is more important than ‘System Quality’, check the scores on the right which indicate the importance of ‘Content Quality’ over ‘System Quality’.

If priority of ‘Content Quality’ is 1 and ‘System Quality’ is 2. Then, the extent to which ‘Content Quality’ is preferred than ‘System Quality’ is measured through above example of AHP Questionnaire and helps to assign weights to the criteria.

Some Implications from Questionnaire
If ‘System Quality’ > ‘Content Quality’ & ‘Content Quality’ > ‘Trust’, then ‘System Quality’ > ‘Trust’
⇒ Accepted.
If ‘System Quality’ > ‘Content Quality’ & ‘Content Quality’ > ‘Trust’, then ‘System Quality’ < ‘Trust’
⇒ Rejected.
### III– AHP Survey

**GOAL – To FIND the Weights of the Criteria.**

Prioritize the criteria below:
- ‘System Quality’ ( ),
- ‘Content Quality’ ( ),
- ‘Trust’ ( ),
- ‘Support’ ( ),
- ‘Mobility’ ( ),
- ‘Personalization’ ( )

Preferences of the alternatives based on the priority above:

| ‘System Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Content Quality’ | 9 7 5 3 1 3 5 7 9 |
| ‘System Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Trust’ | 9 7 5 3 1 3 5 7 9 |
| ‘System Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Support’ | 9 7 5 3 1 3 5 7 9 |
| ‘System Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Mobility’ | 9 7 5 3 1 3 5 7 9 |
| ‘System Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Personalization’ | 9 7 5 3 1 3 5 7 9 |

| ‘Content Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Trust’ | 9 7 5 3 1 3 5 7 9 |
| ‘Content Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Support’ | 9 7 5 3 1 3 5 7 9 |
| ‘Content Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Mobility’ | 9 7 5 3 1 3 5 7 9 |
| ‘Content Quality’ | 9 7 5 3 1 3 5 7 9 | ‘Personalization’ | 9 7 5 3 1 3 5 7 9 |

| ‘Trust’ | 9 7 5 3 1 3 5 7 9 | ‘Support’ | 9 7 5 3 1 3 5 7 9 |
| ‘Trust’ | 9 7 5 3 1 3 5 7 9 | ‘Mobility’ | 9 7 5 3 1 3 5 7 9 |
| ‘Trust’ | 9 7 5 3 1 3 5 7 9 | ‘Personalization’ | 9 7 5 3 1 3 5 7 9 |

| ‘Support’ | 9 7 5 3 1 3 5 7 9 | ‘Mobility’ | 9 7 5 3 1 3 5 7 9 |
| ‘Support’ | 9 7 5 3 1 3 5 7 9 | ‘Personalization’ | 9 7 5 3 1 3 5 7 9 |

| ‘Mobility’ | 9 7 5 3 1 3 5 7 9 | ‘Personalization’ | 9 7 5 3 1 3 5 7 9 |
IV– AHP Survey

GOAL – To FIND the weights of GOALS

Prioritize the Goals below:
‘Transparency’ ( ),
‘Public Accountability’ ( ),
‘Democratic Responsiveness’ ( ),
‘Integrity’ ( )

Preferences of the alternatives based on the priority above

| ‘Transparency’ | 9 7 5 3 1 3 5 7 9 | ‘Public Accountability’ |
| ‘Transparency’ | 9 7 5 3 1 3 5 7 9 | ‘Democratic Responsiveness’ |
| ‘Transparency’ | 9 7 5 3 1 3 5 7 9 | ‘Integrity’ |
| ‘Public Accountability’ | 9 7 5 3 1 3 5 7 9 | ‘Democratic Responsiveness’ |
| ‘Public Accountability’ | 9 7 5 3 1 3 5 7 9 | ‘Integrity’ |
| ‘Integrity’ | 9 7 5 3 1 3 5 7 9 | ‘Democratic Responsiveness’ |
V – Information

5.1 Information Related to Criteria

There are many terms used; so we would like to give brief explanation of the criteria in the form of sub-criteria. Consider all the sub-criteria and give your score for the main criterion.
Sub-Criteria are in italic format.

1. System Quality
This is the principal criterion for judging whether site performance is sufficiently smooth and seamless in m-government. Earlier studies investigated Response time, 24-hour availability, page-loading speed, visual appearance are the critical components which are applicable to m-government.

2. Content-Quality
Content Quality is very important in attracting citizens to m-government. Content Quality includes the attributes of the applications (content) that are presented directly on mobile devices. Information systems' literature has emphasized the importance of information quality as one of the determinants of citizen satisfaction, and has identified a number of attributes: up-to-datedness, understandability, timeliness and preciseness.

3. Trust
Trust is another significant challenge in the mobile environment (M-Gov). Citizens are concerned about the level of security when providing sensitive information. Also, they expect that personal information will be protected from external access. There are two alternatives – security and privacy. There are potential benefits in storing data, including personal and financial information, on mobile devices for use in m-government applications.

4. Support
If m-government applications provide customer satisfaction, citizens will return to the application after their initial experience. Support is a citizen-oriented criterion and includes the following components: tracking order status, account maintenance, payment alternatives, FAQs, etc.

5. Mobility
The citizen can employ mobile applications and transactions from anywhere, at anytime; m-government must support this citizen mobility. Mobility of device and application raises the issue of their suitability for the citizen under some circumstances.

6. Personalization
Personalization is defined as the customization of products and services to the context of the citizen. The importance of personalization, and therefore context, in m-government is widely recognized as a critical success factor. The notion of context used here follows context-aware computing, i.e., the use of context to provide task-relevant information and services to a citizen. Its significance is conveyed in a quote from Miller-Veerse, “Personalization will be absolutely crucial in the mobile environment, where additional click required from the citizen reduces the transaction probability by 50%”. Since mobile devices have particular limitations, e.g., low battery capacity, and small memory and screen size, personalization is needed to increase their usability. A review of the literature reveals a tendency to concentrate on context components such as location, time, activity, role and personal preferences. While the component roles of activity and mission are relatively difficult to model, we select location, time and individual preferences as parameters that can be precisely measured. These alternatives are the current parameters for
personalization in m-government.

5.2 Information Related to Goals

M-Government Applications aim to achieve some goals/values. The values encompass efficiency, effectiveness, public accountability, transparency, integrity, democratic responsiveness, citizen participation, and many more. These goals are classified based on the countries’ macro dimensions such as M-Government readiness Index (x-axis) and Democratization Index (y-axis), which by indexes itself are composite measures based on number of sub indices. So, based on that framework, the goals (Transparency, Accountability, Democratic Responsiveness, and Integrity) are suitable for the Indian context. Now, we are trying to find the weights of the goals such that the applications high on these weights can be implemented in the future for higher social welfare-ness.

Thank You
Appendix 2: Evaluation of Alternatives Questionnaire

**I – Introduction and Instructions**

“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 [ovum].

We are conducting survey to find the killer applications in M-government. We need to conduct expert survey to find the researchers’ opinion on most important applications in the future of INDIA to support our research. We also listed the different evaluation criteria. For each criterion, you have to give a score with respect to each application.

Here are some of the *guidelines* to help you finish this survey successfully, viz.,

1. This is a survey conducted to support my research but not used for any business purpose.
2. In the first survey, Based on 7-likbert scale (1~7; 1 is worse & 7 for excellent), you have to score the table for all the applications (1st column) according to the evaluation criteria in the first row.
3. The information regarding the evaluation criteria is also provided.
4. The score you insert should reflect the importance of that particular criterion for that application.
5. In order to score the table, Look at the application and check the information of the criteria from ‘CSF criteria information’ and mark score (1~7) with respect to your opinion.
6. The Evaluation should be done column-wise. That is, for each evaluation criterion, mark the scores for all the applications first. (Please don’t give scores row-wise)
7. Please don’t bother the box which show ‘Wt =’. It is not concerned with your scoring.
8. Your valuable scores are highly appreciated.

Thank you for spending your precious time
We kindly request you to forward the survey to other experts in your organization.
Refer the ‘CSF criteria information’ to score the applications under each Criterion.

Table 1: An Evaluation Table of Applications

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>System-Quality</th>
<th>Content-Quality</th>
<th>Trust</th>
<th>Support</th>
<th>Mobility</th>
<th>Personalization</th>
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<td><strong>M-Government Applications</strong></td>
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<td>Express Citizens opinions directly</td>
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<td>To Government Officials (feedback)</td>
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<td>Mobile Voting</td>
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<td>Birth &amp; Death Statistics</td>
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<td>Distribution of Funds among Officials</td>
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<td>Tax Management System</td>
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<td>Registration of land/property</td>
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<td>Promotion of City Events</td>
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<td>Regional, National Global Policies &amp; Resource availability</td>
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<td>Eligibility for nationals/foreigners for a particular location</td>
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<td>Vaccination dates &amp; centers (flu, malaria, etc)</td>
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<td>Hurricane &amp; Tsunami warnings</td>
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<td>Radioactivity Detection</td>
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<td>Public Hearing Calendar Notifications (court-hearings)</td>
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<td>Rescuing Flood Victims (location based on Mobile)</td>
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III – CSF (criteria) Information

There are many terms used; so we would like to give brief explanation of the criteria in the form of sub-criteria. Consider all the sub-criteria and give your score for the main criterion. Sub-Criteria are in italic format.

1. System Quality
This is the principal criterion for judging whether site performance is sufficiently smooth and seamless in m-government. Earlier studies investigated Response time, 24-hour availability, page-loading speed, visual appearance are the critical components which are applicable to m-government.

2. Content-Quality
Content Quality is very important in attracting citizens to m-government. Content Quality includes the attributes of the applications (content) that are presented directly on mobile devices. Information systems’ literature has emphasized the importance of information quality as one of the determinants of citizen satisfaction, and has identified a number of attributes: up-to-datedness, understandability, timeliness and preciseness.

3. Trust
Trust is another significant challenge in the mobile environment (M-Gov). Citizens are concerned about the level of security when providing sensitive information. Also, they expect that personal information will be protected from external access. There are two alternatives – security and privacy. There are potential benefits in storing data, including personal and financial information, on mobile devices for use in m-government applications.

4. Support
If m-government applications provide customer satisfaction, citizens will return to the application after their initial experience. Support is a citizen-oriented criterion and includes the following components: tracking order status, account maintenance, payment alternatives, FAQs, etc.

5. Mobility
The citizen can employ mobile applications and transactions from anywhere, at anytime; m-government must support this citizen mobility. Mobility of device and application raises the issue of their suitability for the citizen under some circumstances.

6. Personalization
Personalization is defined as the customization of products and services to the context of the citizen. The importance of personalization, and therefore context, in m-government is widely recognized as a critical success factor. The notion of context used here follows context-aware computing, i.e., the use of context to provide task-relevant information and services to a citizen. Its significance is conveyed in a quote from Miller-Veerse, “Personalization will be absolutely crucial in the mobile environment, where additional click required from the citizen reduces the transaction probability by 50%”. Since mobile devices have particular limitations, e.g., low battery capacity, and small memory and screen size, personalization is needed to increase their usability.

A review of the literature reveals a tendency to concentrate on context components such as location, time, activity, role and personal preferences. While the component roles of activity and mission are relatively difficult to model, we select location, time and individual preferences as parameters that can be precisely measured. These alternatives are the current parameters for personalization in m-government.