FACTORS AFFECTING USE OF MOBILE GOVERNMENT SERVICES IN INDIA

By

LOVNEESH CHANANA

COLLEGE OF MANAGEMENT AND ECONOMIC STUDIES

Under the Guidance of

PROF. DEVENDRA KUMAR PUNIA

DEPARTMENT OF INFORMATION SYSTEMS MANAGEMENT

COLLEGE OF MANAGEMENT AND ECONOMIC STUDIES

Submitted

IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY

To

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

DEHRADUN

May 2014

ACKNOWLEDGEMENT

I take this opportunity to place on record the sincere appreciation and acknowledgement of the support received from persons and organizations during the course of this research work. Without the overwhelming support and participation by the individuals named below, this research work would not have been possible.

At the outset, I express my sincere thanks to the University of Petroleum and Energy Studies under the leadership of **Dr. S.J. Chopra, Chancellor and Dr. Parag Dewan, Vice Chancellor** for providing me the opportunity to pursue my degree and research at the University and Petroleum Studies. It has been a thought changing experience going through this journey of research after a relatively long career in industry.

I take this opportunity to express my sincere gratitude to **Dr. A. Sengupta, Head, College of Management and Economic Studies** for continuously supporting my efforts.

My special thanks are due to the Center for Continuing Education ably headed by **Wg. Cdr. P.K. Gupta, Head of CCE** and the team comprising of **Dr. Anjali Midha Sharan, Program Director for Part time PHD programme** and **Rakhi Ruhal**. They have been the biggest support to this effort through an effective facilitation of every bit of this work.

This work would not have been possible without the continuous guidance, inputs and support by **Prof. Devendra Kumar Punia, Department of Information Systems Management, UPES** and my guide for this research work. It has been an amazing experience working with him.

My sincere thanks are due to my external guide **Dr. K. Subramanian, Ex- Deputy Director General, National Informatics Center, Government of India** for his continuous inputs and guidance.

I am most grateful to the **FRC members** for their valuable inputs. More important than the inputs, was the constructive manner in which those were provided by the FRC. It was really a great experience to present my synopsis and abstract to get their inputs.

My sincere thanks are due to **Dr. K.K. Pandey, Assistant Dean Research, University of Petroleum and Energy Studies** for his valuable suggestions and inputs.

During the course of this research work, I received huge support from persons and organizations in academia and industry. I owe my sincere gratitude to **Dr. Rajat Agarwal, Assistant Professor, Department of Management Studies, Indian Institute of Technology, Roorkee** for his help and support. It is only because of his continuous inputs on research methodology that I have been able to come to terms with the word 'Research'.

My heartfelt gratitude is due to **all experts and participants from academia, Government, citizens and industry** who participated in different surveys and Delphi exercise. I am aware of the challenges in taking time out of everyone's busy schedule to participate in surveys and discussions. It has been a real heartening experience to see the support forthcoming from all experts which was the sole reason for the quick turnaround of survey results.

Last but not the least, like everyone, I am thankful to **my wife and two understanding children** who stood always by my side and kept their expectations of spending time with me aside to support this work on almost every weekend during the last three years or so. From connecting my laptop to taking printouts, both my children **Vatsal and**

Rohan have been real teachers of PPT (Patience, Perseverance and Tolerance) to me in this effort so far.

I am sure, given the limitation of space, it is not possible to acknowledge everyone. I place on record my sincere appreciation and thanks to everyone who helped me directly or indirectly.

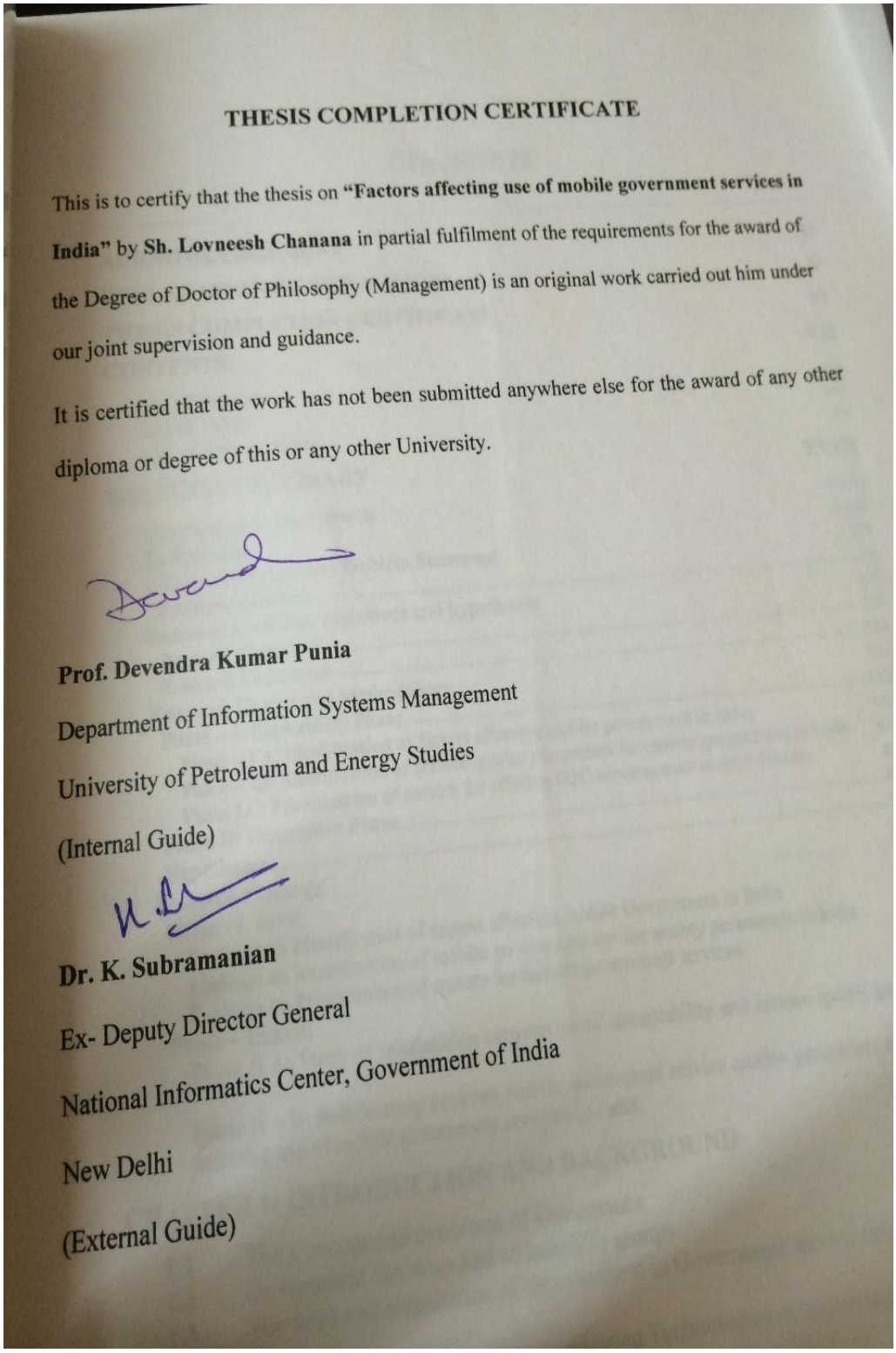
DECLARATION BY THE AUTHOR

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for award of any other degree or diploma of the University or any other Institute of higher learning, except where due acknowledgement has been made in the text.

(Lovneesh Chanana)

20-05-2014

THESIS COMPLETION CERTIFICATE



THESIS COMPLETION CERTIFICATE

This is to certify that the thesis on **"Factors affecting use of mobile government services in India"** by **Sh. Lovneesh Chanana** in partial fulfilment of the requirements for the award of the Degree of Doctor of Philosophy (Management) is an original work carried out him under our joint supervision and guidance.

It is certified that the work has not been submitted anywhere else for the award of any other diploma or degree of this or any other University.

Prof. Devendra Kumar Punia

Department of Information Systems Management

University of Petroleum and Energy Studies

(Internal Guide)

Dr. K. Subramanian

Ex- Deputy Director General

National Informatics Center, Government of India

New Delhi

(External Guide)

CONTENTS

List of Figures

List of Tables

List of Abbreviations

ANOVA	Analysis of Variance
ARC	Administrative Reforms Commission
CSC	Common Service Centres
C-DOT	Center for Development of Telematics
CAPAM	Commonwealth Association for Public Administration and Management
COAI	Cellular Operators Association of India
DARPG	Department of Administrative Reforms and Public Grievance
DEITY	Department of Electronics and Information Technology
DSC	Digital Signature Certificate
e-Biz	e-Business
EBSCO	Elton B Stephens Company
EDI	Electronic Data Interchange
eGov	Electronic Government
e-Government	Electronic Government
EGOSQ	E-governance service quality
e-mail	Electronic mail
mGov	Mobile Government
FRC	Faculty Research Committee
Fig	Figure
G2B	Government to Business
G2C	Government to Citizen
G2E	Government to Employees
G2G	Government to Government
Govt	Government
ICEG	International Conference on e-governance
ICT	Information and Communication Technologies
Infodev	Information for Development
IT	Information Technology
m-commerce	Mobile commerce

MMP	Mission Mode Project
MAIT	Manufacturers' Association for Information Technology
MCA21	Ministry of Corporate Affairs 21
MCIT	Ministry of Communications and Information Technology
m-Sewa	Mobile Sewa
mGov	Mobile Government
MSDG	Mobile service delivery gateway
NeGP	National e-Governance Plan
NGO	Non-Government organization
NSDG	National Service Delivery Gateway
PC	Personal Computer
PDA	Personal Digital Assistant
PhD	Doctor of Philosophy
PKI	Public Key Infrastructure
PPP	Public Private Partnership
SDC	State Data Center
SERVQUAL	Service quality
SITEQUAL	Site quality
SMS	Short Message Service
SPSS	Statistical package for social sciences
SWAN	State Wide Area Network
TEMA	Telecom Equipment Manufacturer Association
TRAI	Telecom Regulatory Authority of India
UPES	University of Petroleum and Energy Studies
UID	Unique Identification
UNDP	United Nations Development Program
UK	United Kingdom
UPES	University of Petroleum and Energy Studies
UT	Union Territory
www	World wide web
W3C	World wide Web consortium

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Introduction to the research

This research work titled “Factors affecting use of mobile government services in India” relates to delivery of Government services to citizens through the use of mobile phones and/or handheld devices. The study has identified the factors which may affect use of mobile government services in India and also the service quality parameters for mobile government services in India. The study has also identified the potential top priority sectors for mobile government applications in India. The research work has studied the relationship between factors affecting use of mobile government services and service quality parameters for mobile government services in India. The research work has also studied the relationship between service quality parameters and user acceptability of mobile government services.

This study has been done in two phases with the first phase being an exploratory study on identifying the factors affecting use of mobile government services, the sectors with potential of application of mobile government services, and also the mobile government service quality parameters in India. The second phase is a descriptive research studying the relationship between service quality parameters and factors affecting use of mobile government services in India. In addition, the second phase also covers the study of relationship between user acceptability of mobile government services and the service quality parameters.

Background

Electronic Government is rapidly becoming one of government’s critical means for the provision of seamless services for public agencies, businesses and citizens. The National e-governance plan (NeGP) of Government of India has identified 31 projects

as mission mode projects. In parallel, India has observed the exponential and speedy growth in the telecom subscription base. The overall tele-density in India has reached 75.23% in March 2014. The tele-density in urban areas stands at 146% and in rural areas at 43.96% (Source: Telecom Regulatory Authority of India). Such explosion of mobile penetration across the Indian states offer tremendous potential for offering and use of mobile based Government to citizen services. Mobile and handheld devices are emerging as an important medium of Government service delivery and therefore Mobile Government is fast growing in India. Mobile technology could well form the next wave of technology base for Government – citizen interface and interactions. "m-Government is a functional subset of all inclusive e-Government that utilizes the unique features of mobile and/or wireless technologies like cellular/mobile phones, laptops and PDAs (personal digital assistants) connected to wireless networks for provision of location based government services and information to officials and citizens/businesses at any time & any place (24/7 Operational Model)" [1].

The potential for mobile based governance in improving the delivery of citizen services highlighted above clearly calls for understanding the factors affecting use of mobile government services in India, the service quality parameters for mobile government services, the sectors and types of G2C services that can be offered through mobile devices and studying the relationship between factors and the service quality parameters.

Literature Review and Problem Statement

The following categories of literature have been reviewed for the purpose of this research:

- Electronic and mobile government frameworks including the legal, technology and user related issues related to mobile government
- Relationship between electronic government and mobile government
- Factors affecting electronic and mobile government
- Government to Citizen (G2C) services that can be offered over mobile services including the International and Indian case studies in mobile government
- Service quality parameters related to electronic and mobile government

The detailed literature review has been presented in Chapter – 2.

Problem Statement

A review of the literature suggests the following gaps w.r.t. mobile government in India:

- Researchers indicate that while mobile government is a concept in embryonic stage and management of mobile based governance process requires understanding of a wide variety of factors affecting the same. To date, it appears that we lack the research foundation for identification and analysis of factors affecting use of m-government services, specifically for Indian conditions.
- Researchers have indicated that not all services can be offered over mobile devices. Till date, it appears that the identification and prioritization of sectors and G2C services from the view point of offering over mobile devices in India has not been carried out in any research.

- Researchers have identified the 'electronic' service delivery quality parameters. However, there is very little research on 'mobile' service delivery quality parameters w.r.t. government service delivery. To date, it appears that service quality parameters have not been identified for mobile government services in India.

- The relationship between factors affecting the use of mobile government services and the service quality parameters of mobile government services in India has not been studied so far.

- The effect of service quality parameters on users' acceptability of mobile government services in India has not been studied so far.

The present research aims to seek answers to the above gaps.

Research questions, objectives and hypotheses

Research Questions

Based on the gaps in the literature, this study aims to seek answers to the following research questions:

a. What are the factors affecting use of mobile government services in India?
b. What are the service quality parameters for mobile government in India?
c. Which sectors/types of G2C services can be prioritized for offering over mobile devices?
d. What is the relationship between the factors affecting use of mobile government services and the mobile government service quality parameters?
e. What is the relationship between the mobile government service quality parameters and users' acceptability of mobile based G2C services?

Research Objectives

a. To explore and identify factors affecting use of mobile government services in India.
b. To identify and explore the mobile government service quality parameters in India.
c. To explore and identify sectors for the G2C services which can be prioritized for offering services over mobile devices.
d. To examine the relationship between the factors affecting use of mobile government in India and the service quality parameters of mobile Government services.
e. To examine between mobile government quality service parameters and user acceptance of mobile government services.

Research Design and Methodology

The research has been carried out in two phases:

a) Phase I : Exploratory research covering the following:
    i. The identification of factors affecting use of mobile Government services in India
    ii. The identification of service quality parameters for mobile government in India
    iii. The prioritization of sectors/identification of citizen services for offering over mobile devices.
b) Phase II: Descriptive research covering the following:

a. Study of relationship between mobile government service quality parameters (as identified at a (ii) above) and users' acceptability of mobile government services.
b. Study of relationship between factors affecting mobile government in India ((as identified at a (ii) above) and mobile government service quality parameters (as identified at a (ii) above).

Phase II of study has been conducted for sectors identified at a(iii) above.

Phase – I: Exploratory Phase

Phase – I A: Identification of factors affecting mobile government in India

This phase of study uses 'Experts' Survey' as a tool for the exploratory phase. The study uses an extension to the approach adopted by Shadi Al-Khamayseh, Elaine Lawrence and Agnieszka Zmijewska [2] in identifying success factors in Interactive mobile government. The study uses a Questionnaire/online based survey involving expert groups from researchers, academicians, government officials, telecom companies, IT companies, consultants and NGOs. The respondents have been asked to rank the factors based on their assessment of the factors' applicability to Indian conditions.

Phase – IB: Identification of service quality parameters for mobile government in India

This part of the exploratory study has been done with the same methodology as Phase-IA. A common questionnaire has been designed for experts' survey on factors as well as service quality parameters. For the purpose of service quality parameters, the Indian experts have been approached initially with the service quality parameters for e-government in India. The experts were presented with the initial set of 17 service quality parameters for e-government and requested to rank these as per their assessment of

importance of these service quality parameters with reference to mobile based service delivery in Indian conditions. The experts were also presented with the option of adding any other service quality parameter.

Phase I C: Prioritization of sectors for offering G2C services over mobile devices

As the research in this area is currently non-existent, Delphi method has been used to get a priority of sectors with the potential of offering G2C services over mobile devices.

Phase II: Descriptive Phase

The phase II is a descriptive research phase involving the study of the following:

- Phase IIA: Study of relationship between mobile government service quality parameters and user acceptability of mobile government services.
- Phase IIB: Study of relationship between factors affecting use of mobile government services in India and mobile government service quality parameters

This phase of study uses a questionnaire based survey of Government officials and citizens/users of government services. The respondents have been asked to rate the following:

i. The impact of mobile government service quality parameters on users' acceptability of services over mobile devices.
ii. The impact of factors affecting use of mobile government services on mobile government service quality parameters.

Hypotheses

Based on the findings of the exploratory phase, the following two sets of hypotheses have been formulated, one related to the impact of mobile government service quality parameters on users' acceptability and the other related to relationship between factors

affecting use of mobile government services in India and mobile government service quality parameters. The first set of hypotheses have been listed below:

a. Ho: There is no significant relationship between users' acceptability of mobile government services and privacy of information;

b. Ho: There is no significant relationship between users' acceptability of mobile government services and "getting things done in the expected time frame";

c. Ho: There is no significant relationship between users' acceptability of mobile government services and "ease of use of applications" ;

d. Ho: There is no significant relationship between users' acceptability of mobile government services and "getting things right the first time";

e. Ho: There is no significant relationship between users' acceptability of mobile government services and "financial security of online transactions";

f. Ho: There is no significant relationship between users' acceptability of mobile government services and "fast navigation through the applications without jams" ;

g. Ho: There is no significant relationship between users' acceptability of mobile government services and "getting updated information";

The next set of hypotheses related to factors affecting use of mobile government in India and the mobile government service quality parameters in India have been listed below:

1. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “privacy of information”;
2. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “getting things done in the expected time frame”;
3. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “ease of use of applications”;
4. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “getting things right the first time”;
5. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “financial security of online transactions”;
6. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “fast navigation through the applications without jams”;
7. Ho: There is no significant relationship between factors affecting use of mobile government services in India and “getting updated information”

Research Findings

Phase - I

Findings on Identification of factors affecting mobile Government in India

A total of 73 responses have been received from experts for this survey. The order of factors as ranked by respondents in terms of applicability to Indian conditions indicates that the following five factors are considered by experts to be most important in Indian conditions:

i. E-Government i.e. availability of e-government services as a pre-requisite for mobile government
ii. A strategy for mobile government
iii. Mobile government awareness
iv. Users' access to mobile services
v. Quality of mobile government services

Findings on Identification of mobile government service quality parameters in India

The following service quality parameters have been assigned an average ranking of less than 10 (out of 17) based on experts' perception of their importance in Indian conditions:

i. Privacy – protection of personal information
ii. Getting things done in the expected time frame
iii. Getting things done right the first time.
iv. Ease of use of applications
v. Fast navigation through applications without jams
vi. Getting 'updated' information through the application
vii. Financial security of online transactions

viii. Availability of mobile services at all days and at all times

ix. Getting ‘useful’ information through the application

x. A ‘wide’ range of services through applications

xi. Transparency in action on applications.

Findings on Prioritization of sectors for mobile government services

The list of top sectors as identified by experts in the Delphi group is given below:

- Health and family welfare
- Agriculture
- Rural development
- Social welfare
- Education
- Municipalities

Phase – II

Phase II A: Study of relationship between users’ acceptability and service quality parameters

A total of 257 responses were received for this survey. Respondents from the states of Delhi, Uttarakhand, Karnataka, Maharashtra and Punjab constitute the majority of responses. These states are in leadership or aspiring leaders category in the e-readiness assessment report of Government of India. [3]

The major findings from this phase include:

a. A significant relationship has been observed between all mobile government service quality parameters viz., financial security, privacy, ease of use, getting updated information, fast navigation through the

applications without jams and getting things right the first time and the users' acceptability of mobile government services.

b. While the service quality parameters have been found to be significantly related to the users' acceptability in an individual manner, a combined effect shows that 'updated information' is the most significant service quality parameter affecting the users' acceptability followed by financial security and privacy.

Phase II – B: Relationship between mobile government service quality parameters and factors affecting use of mobile government services in India:

a. There is a significant relationship between factors affecting use of mobile government services in India and service quality parameters of getting updated information and "ease of use of applications".

b. None of the factors has been found to have significant relationship with "privacy of Information".

c. The factors of users' awareness and access are found to have significant relationship with the service quality parameter on 'getting things done in the expected time frame'.

d. The factors on users' awareness and cost are found to have a significant relationship with the service quality parameter on 'ease of use of applications'.

e. The factor on cost is found to have a significant relationship with the service quality parameter on 'financial security of online transactions'.

f. The factor on strategy is found to have a significant relationship with the service quality parameter on "fast navigation through the applications without jams"

g. The factors on users' awareness and access are found to have a significant relationship with the service quality parameter on "getting updated information".

The inferences and implications have been discussed in Chapter – 5

This thesis document is organized as follows; Chapter – 1 provides and introduction and background to the research; Chapter – 2 highlights the review of literature on the research subject; Chapter – 3 provides an overview of the research design; Chapter – 4 details the data analysis; Chapter – 5 is a description of the major findings, conclusions and recommendations; Chapter – 6 lists the limitations and scope for future research. The chapters are followed by references, curriculum vitae of the researcher and the appendices.

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

INTRODUCTION AND BACKGROUND

CHAPTER - 1

CHAPTER 1: INTRODUCTION AND BACKGROUND

Electronic Government involves the automation or computerization of existing paper based procedures that is prompting new styles of leadership, new ways of debating and deciding strategies, new methods of transacting business, new techniques for listening to citizens and communities and new strategies for organizing and delivering information. In the 21st century, mobility has become one of the most important technology and communication trends affecting all facets of modern life including mobile information systems, mobile payments, mobile commerce, mobile television and mobile government [4] Mobile Government refers to electronic government services capable of being delivered via mobile user interfaces, or in some instances, special mobile services such as location based services, provided by the Government[5].

This chapter is an attempt to set the context for the research work by providing the background on the concept of governance, public services, need for improved public services, use of ICT and the introduction to electronic and mobile government.

1.1 The Concept and evolution of Governance

The concept of "governance" is not new. It is as old as human civilization. For many thousands of centuries when people were hunter-gatherers and small scale farmers, humans lived in small, non-hierarchical and self-sufficient communities. The development of agriculture resulted in ever increasing population densities. As farming populations gathered in denser and larger communities, interactions between different groups increased and the social pressure rose until, in a striking parallel with star formation, new structures suddenly appeared, together with a new level of complexity.

About 5,000 years ago, the first small city-states appeared. States formed as the results of a positive feedback loop where population growth results in increased information exchange which results in innovation which results in increased resources which results in further population growth.

Simply put "governance" means: the process of decision-making and the process by which decisions are implemented (or not implemented). ‘Governance’ is the exercise of power or authority – political, economic, administrative or otherwise – to manage a country's resources and affairs. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. Recently the terms "governance" and "good governance" are being increasingly used in development literature. ‘Good governance’ means competent management of a country’s resources and affairs in a manner that is open, transparent, accountable, equitable and responsive to people’s needs.

According to supporters of government, the fundamental purpose of government is the maintenance of basic security and public order. The philosopher Thomas Hobbes figured that people were rational animals and thus saw submission to a government dominated by a sovereign as preferable to anarchy. According to Hobbes, people in a community create and submit to government for the purpose of establishing for themselves, safety and public order. The four major purposes of Government include maintaining social order; providing public services; providing national security; and making economic decisions.

An understanding of structure of Governments to perform the above functions is equally important e.g. The Government of India has three independent branches namely the executive, the legislature and the judiciary.

1.2 Government Services and stakeholder groups

Even though the traditional government performed well in the past, the modern government has demonstrated the need for better systems that would enable the governments to handle issues swiftly and satisfactorily. Although Government functioning encompasses a wide range of activities and actors, four distinct areas can be identified as shown below:

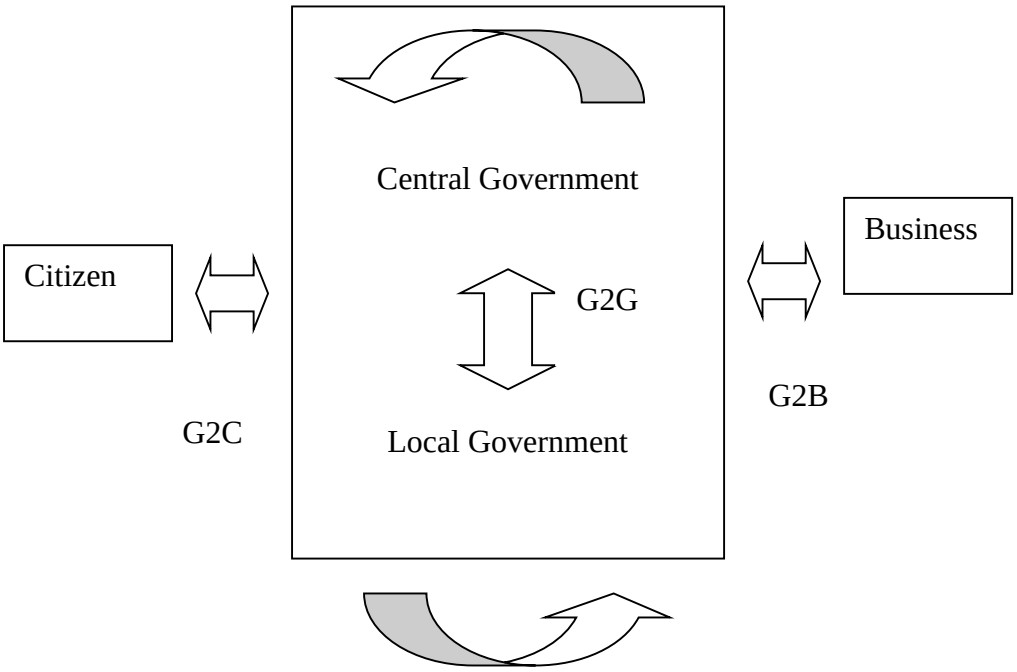


Figure 1.1 Categories of Government Services

These include Government to Government (G2G), Government to Business (G2B), Government to Citizen (G2C) and Government to Employee (G2E) sectors. The G2G sector represents the backbone of e-government and involves interactions amongst government actors. This involves both intra and inter-agency exchanges at the national level, as well as among national, provincial and local levels. The Government to

Business (G2B) sector includes the services and interactions with business, NGOs and civil society. The Government to citizen (G2C) services and transactions include functions like renewing licenses and certifications, paying taxes and applying for benefits. Government to Employee (G2E) interface covers the work guidelines, rules and regulations, salary structures, code of ethics for government employees.

Examples of G2C services offered by Government of India include providing information on seeds, fertilizers, cropping patterns, yields, technology, weather patterns, filing of tax returns, and enrolment of students in the education system etc.

1.3 The need and importance of improvement in Government service delivery in India

Despite a plethora of delivery mechanisms, most governments are increasingly perceived as unresponsive, with no covert accountability systems and mere lip service to transparency. It is by now an accepted fact that traditional government structures and systems are no longer adequate to meet the demands of rising citizen aspirations and challenges of complex global economies. The role of the government established and accepted earlier as the 'sole provider' is being questioned in every forum. The availability of constantly improving technological solutions coupled with innovative managerial tools have given rise to scope and options for improved administrative structures, efficient and effective public service delivery systems and the highest quality of governance. Governments and governance the world over are undergoing a 'paradigm shift' in their traditional roles and structures of inflexible control and procedure orientation, towards result orientation, flexibility, facilitation and a citizen-centric approach.

There are no institutionalized standards for the delivery of public services (The Department of Administrative Reforms and Public Grievances, Government of India has recently released 'Sevottam' as a process quality and maturity framework for service delivery process). Therefore, there always appears to be an unending struggle between the governmental systems, its capability to deliver and the actual needs of the citizens. Going by the typical definition of democracy, i.e. 'a government of the people, for the people and by the people', democratic India certainly seems to have fulfilled the tenets of 'a government by the people'. Though having recognized the need to govern 'for the people', and place the common requirements and aspirations 'of the people' on the highest priority for service delivery, progressive governments have found that the governing process itself comes in the way of their attempts to establish a positive relationship with its citizens. For the citizens, the procedures for availing government services are so lengthy and the number of officials and their attitudes so complicated that the citizen remains a dissatisfied and frustrated customer. The earlier governments performed well in the past but now with the dawning of the information age and the emerging knowledge regime, the citizen is no longer satisfied with services which can be delivered only by frequent visits to government offices, or standing for hours in long queues, or after time-consuming lengthy processes or with the evil but necessary associations with touts and middle men. The citizens want fast and efficient systems available at a single window which do not require them to know the faces and names of the bureaucratic structures, and which give them a 'nice feeling' about interacting with the government.

1.4 Role of Information and Communication Technologies in improving governance – the concept of electronic governance

The advent of internet technology has made it possible for the Government to become e-enabled and transform into a Government online. It offers an outstanding opportunity to react to demands of the citizens and business by offering new methods of service delivery to meet their expectations. Some common challenges/demands that are addressed by an e-government are:

- Citizens get online access to information which is otherwise difficult as citizens may have to visit government offices, stand in the queue for long hours to get the information. There is more transparency in the government systems.
- There can be a check on corruption.
- Citizens will find it easier to access government departments and lodge their complaints with them.
- The Government will be able to respond faster and be more efficient.

The term e-government and e-governance are often loosely used, but they are different in the finer sense. An e-government is a technology led administration where citizen can avail of Government services like getting a copy of the land records, filing of tax returns etc. while e-governance has two definite connotations – the application of electronic means in the interaction between government and citizens as well as in internal government operations to simplify and improve all the aspects including democratisation, governmental and business aspects of governance.

E-Government, also known as eGov, digital government, online government or in a certain context transformational government, refers to government's use of information technology to exchange information and services with citizens, businesses, and other arms of government [6]. E-Government could be described as the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationship through technology, the internet and new media.

Electronic Government is rapidly becoming one of government's critical means for the provision of seamless services for public agencies, businesses and citizens [7]. Globally governments have set very ambitious goals and are running costly programs for delivering public services electronically [8].

The IT industry and especially the software and services industry are growing very rapidly in India and worldwide. The traditional drivers for this growth are the banking, finance, securities and insurance sectors, followed by manufacturing and retail sectors. However, recently e-Government is emerging as the leading driver for growth in this sector. E-Government sector has been witnessing above average growth in India for the past three years. India's expenditure on IT in Public sector will be the fastest growing in Asia. India's expenditure on IT in public sector is forecast to grow to US$2.9 billion with a growth rate of 19.6%. India is playing catch up where the public sector is concerned but it is making the key technology investments that are needed to help maintain the high rates of economic growth and to increase the speed and efficiency with which government services are delivered. India is among the lowest ranking countries in Asia for per-capita spending on IT in the public sector, bust based on the

growth rates, India is making the investments needed to increase the efficiency and capability of government services. (Mohan Datar, 2008) [9].

The National e-governance program (NeGP) of Government of India has identified 31 projects as mission mode projects.

Figure 1.2 : Thirty One Mission Mode Projects of National e-Governance Plan of India

The figure above shows the National e-governance plan of India. The plan primarily comprises of four major areas:

a. *State Mission Mode Projects* – Implemented at the state Government level (shown in the outermost circle above) viz., Commercial taxes, employment exchanges, agriculture, property registration, treasuries, panchayats, education, police, municipalities, e-district, public distribution system, road transport, land records and health.

b. *Central Mission Mode Projects* – Implemented at the Central Government level – shown in second circle from outside viz., MCA21, Income tax, passport, immigration and visa, pensions, banking, insurance, posts, e-office, excise and customs and Unique ID.

c. Integrated Mission Mode Projects – Implemented at both central and state level viz., Common service centers, e-Biz, EDI, e-courts, National service delivery gateway and India portal.

d. Components – SWANs, SDCs, CSCs, e-governance standards, capacity building and assessment.

1.5 Evolution of mobile telecom in India

The postal and telecom sectors had a slow and uneasy start in India. In 1850, the first experimental electric telegraph Line was started between Kolkata and Diamond Harbor. In 1851, it was opened for the British East India Company.

- 1881 - a license was granted to the Oriental Telephone Company Limited of England for opening telephone exchanges at Kolkata, Mumbai, Chennai (Madras) and Ahmadabad.

- 1902 - First wireless telegraph station established between Sagar Islands and Sandheads.
- 1907 - First Central Battery of telephones introduced in Kanpur
- 1913- First Automatic Exchange installed in Shimla.
- 1927 - Radio-telegraph system between the UK and India, with beam stations at Khadki and Daund established
- 1933 - Radiotelephone system inaugurated between the UK and India.
- 1960 - First subscriber trunk dialing route commissioned between Kanpur and Lucknow.
- 1976 - First digital microwave junction introduced.
- 1979 - First optical fibre system for local junction commissioned at Pune.
- 1980 - First satellite earth station for domestic communications established at Secunderabad, Andhra Pradesh
- 1983 - First analog Stored Program Control exchange for trunk lines commissioned at Mumbai.
- 1984 - C-DOT established for indigenous development and production of digital exchanges.
- 1985 - First mobile telephone service started on non-commercial basis in Delhi.

1.6 Current state of mobile telecom in India

In parallel, India has observed the exponential and speedy growth in the telecom subscription base. Key performance indicators for mobile growth in India as on March 2014 have been summarized below (Source Telecom Industry Performance Indicators – March, TRAI):

- The overall tele-density in India has reached 75.23% in March 2014. The tele-density in urban areas stands at 146% and in rural areas at 43.96%.

With a view to bridging the urban-rural divide and improving the economic strength of rural India, the government has brought inclusive growth for all sections of society onto the main platform. Telecommunications is a critical lynchpin in this endeavor and is likely to be a successful part of this agenda. The government is strongly promoting this effort through various large-sized budgetary allocations and the telecommunications industry also has a clear agenda of rural expansion.

1.7 Mobile Government

There is no need to re-emphasize just how appropriate information and communication technology (ICT) systems (here computers and internet) are for the capture, processing, storage, organization and presentation of data and information. ICT, as seen in many developed countries, facilitates a freer flow of information between government and citizens and opens up for opportunities for citizens to participate more directly in influencing decisions that affect them. But how about mobile phones as the new interface between government and citizens? Can slow government processes be combined with mobile phones that are ever-changing, quick and direct in their usage? Why mobile phones? Is it not just another hype that often accompanies the latest

technical breakthroughs? What is the rationale to use mobile phones for good governance:

- **Access**: Penetration rate is ever increasing and even more have access through shared usage and ownership. Related to access is that mobile phones add the dimension 'anywhere and anytime': due to their mobility and that mobile phones are switched on most of the time, which opens up for new possibilities.
- **Reach:** Again, due to its mobility and network infrastructure, mobiles can reach areas where there is no other ICT infrastructure (like internet, fixed lines).
- **Adoption**: As mobile phones more and more become an integral part of people's lives, m-commerce and m-government will be the normal way of doing things. Further, there is an increasing public demand for mobility and easy access to services.
- **Interaction**: Mobile phones make it possible for real-time, two-way dialogue as opposed to radio, brochures, posters, public speeches etc.
- **Costs**: The relatively lower cost of mobile phone technology versus internet technology has lowered the entry barriers for poor people. Affordability is still a concern though somebody needs to pay for the infrastructure, communication and services.
- **Efficiency**: Due to high access, its reach, good adoption and real-time interaction mobile phones offer efficient solutions to government's communication challenges.
- **No other option?** In developing regions with poor infrastructure, going mobile may be the only viable option.

"mGovernment is a functional subset of all inclusive e- Government that utilizes the unique features of mobile and/or wireless technologies like cellular/mobile phones, laptops and PDAs (personal digital assistants) connected to wireless networks for provision of location based government services and information to officials and citizens/businesses at any time & any place (24/7 Operational Model)" [1]

Mobile government (m-Government) refers to the use of ICTs by government institutions with the help of mobile technologies to deliver electronic services to the public. M-Government can also be defined as "use of mobile and wireless communication technology within the government administration and in its delivery of services and information to citizens and firms" [10].

1.7.1 M-Government initiatives in India

According to an estimate approximately 50%–60% of government services in India can be delivered via mobile channel [11]. Caroll (2005:85) in her study of Australian mobile phone users has reported that "Unless the services and applications of m-government meet citizens' needs, they will not achieve long-term, persistent use." After studying m-government in Beijing [12], Song (2005) goes a step further and suggests that local government should pay attention to the new mobile technologies and theirs impact on organizations, and face up to the challenges and opportunities it offers to transcend the traditional e-government model, a model which pays undue attention to online Internet portals. [13]

Three types of benefits from mobile phones have been noted: (i) incremental benefits, (ii) transformational benefits, and (iii) production benefits. Many citizens, however, are not aware of these services, which require publicity. Due to limitations placed on them,

mobile devices can never be substitutes for computers. As such m-government is not a substitute of e-government but it can complement e-government a great deal.

Figure 1.3 Mobile Sewa website of Ministry of Communications and Information Technology, Government of India

Some of the initial initiatives by Indian Government towards transitioning to mobile government, as evidenced by literature survey are listed below:

- Central Board of Direct Taxes, Government of India has launched SMS based services for challan status enquiry:
- Indian Railways is offering mobile based railway ticket booking and enquiry facilities.
- One of the state Governments viz., Government of Kerala has launched Dr. SMS project to provide comprehensive information on health-related resources via the short message service (SMS).

The potential for mobile technology in improving the delivery of citizen services highlighted above clearly calls for understanding the factors affecting use of mobile government services in India, the service quality parameters for mobile government services, the sectors and types of G2C services that can be offered through mobile phones and studying the relationship between factors and the service quality parameters and also that between user acceptability of mobile government services and service quality parameters. This research is aimed at studying these.

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

LITERATURE REVIEW

CHAPTER - 2

CHAPTER – 2: LITERATURE REVIEW

This chapter highlights the literature reviewed under the following broad categories:

i. Electronic and mobile Government frameworks including the legal, technology and user related issues related to mobile government

ii. Factors affecting electronic and mobile government

iii. Government to Citizen (G2C) services that can be offered over mobile services including the international and Indian experiences in mobile government

iv. Service quality parameters related to mobile services and mobile government

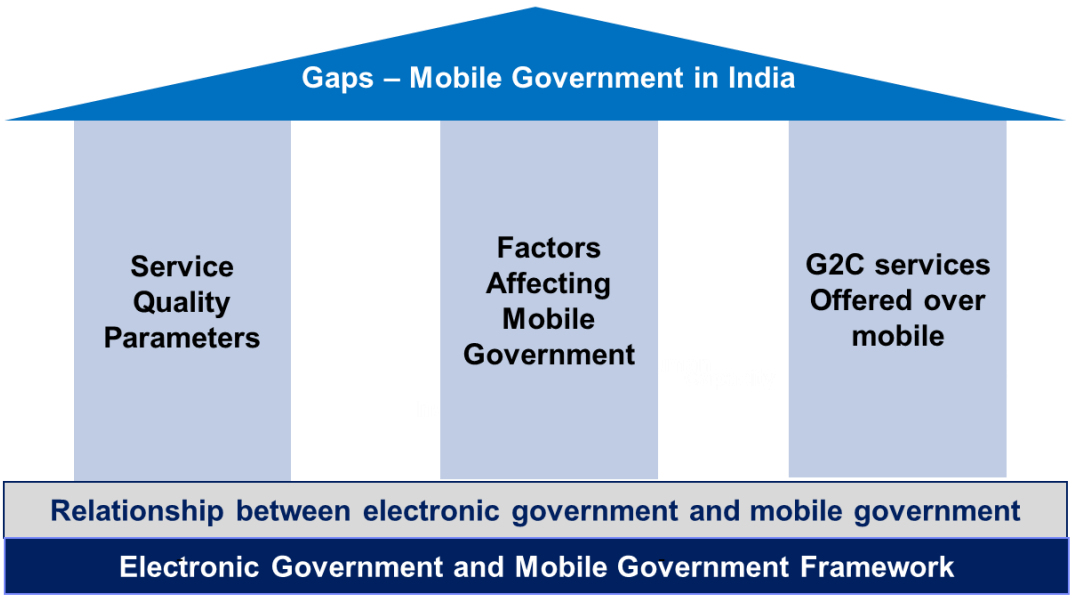


Figure 2 Categories of Literature Review

2.1 Electronic and Mobile Government frameworks

2.1.1 E-Governance Frameworks

Framework is defined as a structure for supporting or enclosing something else, especially a skeletal support used as the basis for something being constructed. Tania

Gessi, Devindra Ramnarine and John Wilkins (2006) [14] present a framework for mapping of confluence of four elements integral to managing e-transitions. First, the framework sees e-leadership as the key to making strategic use of ICTs in e-governance initiatives and to assuring local commitment and ownership. Second, it emphasizes good business practice based upon private sector tools for innovation. Third, it focuses on and creates popular pressure for reform through strategic gap analysis. And fourth, it features multi-stakeholder partnerships based on mutual trust and interdependence to build capacity.

The framework is about enabling change and redesigning roles and processes to achieve better governance. This means empowering citizens who access services and public servants who deliver services. It responds to good governance principles and practices, public sector reform and ICT innovations. ICTs crosscut citizens' needs for better service and promote improved transparency, accountability and shared decision making. Deploying a set of interrelated planning tools facilitates strategic responses to intractable problems. The framework also recognizes the need for strong monitoring and evaluation, with a feedback loop for corrective action. The combined use of these tools in the public sector increases the chances of successful strategic change management.

Charru Malhotra, V. M. Chariar, L.K. Das, and P. V. Ilavarasan (2008) [15] present an inclusive framework for e-governance for rural development in India.

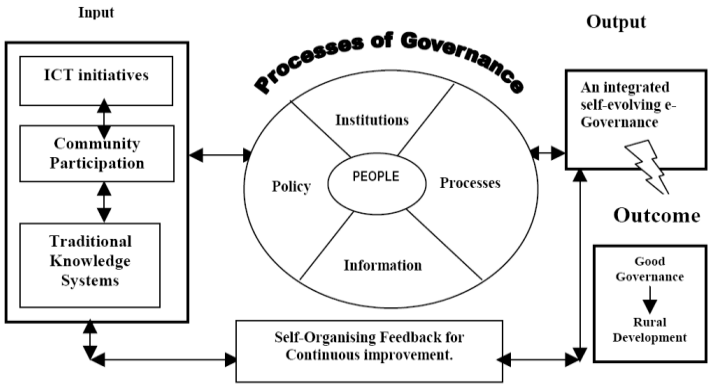


Figure 3 Framework for e-governance for rural development in India

2.1.2 M-government framework

Carroll (2006) [12] suggests an m-government using concepts in the innovation, information systems, e-commerce and mobility literature in order to facilitate analysis of the influences on the implementation and likely uptake of m-Government. The framework represents two sets of forces influencing m-government.

The drivers that 'push' the use of mobile technologies in government are pictured on the left-hand side of the framework. These drivers are interrelated and mutually reinforcing: introduction of m-government services depends upon co-operation between the key players to provide the necessary infrastructure, identify potential business models and then devise programs and applications that utilize the capabilities of available technology.

Successful m-government, however, depends on more than merely developing and disseminating services (m-government provision). It also depends on individuals 'pulling' these services into their normal practices – so that some or all of their interactions with government use mobile technologies (m-government acceptance). These individuals may be internal to government (employees), have external business relations with government (employees of business partners or private providers) or be

consumers of government services (citizens and visitors). The users are pictured on the right-hand side of the framework.

It is essential that the needs of the key stakeholders on both sides of the framework– those providing and those using the services–are satisfied in order to achieve long-term success for m-government.

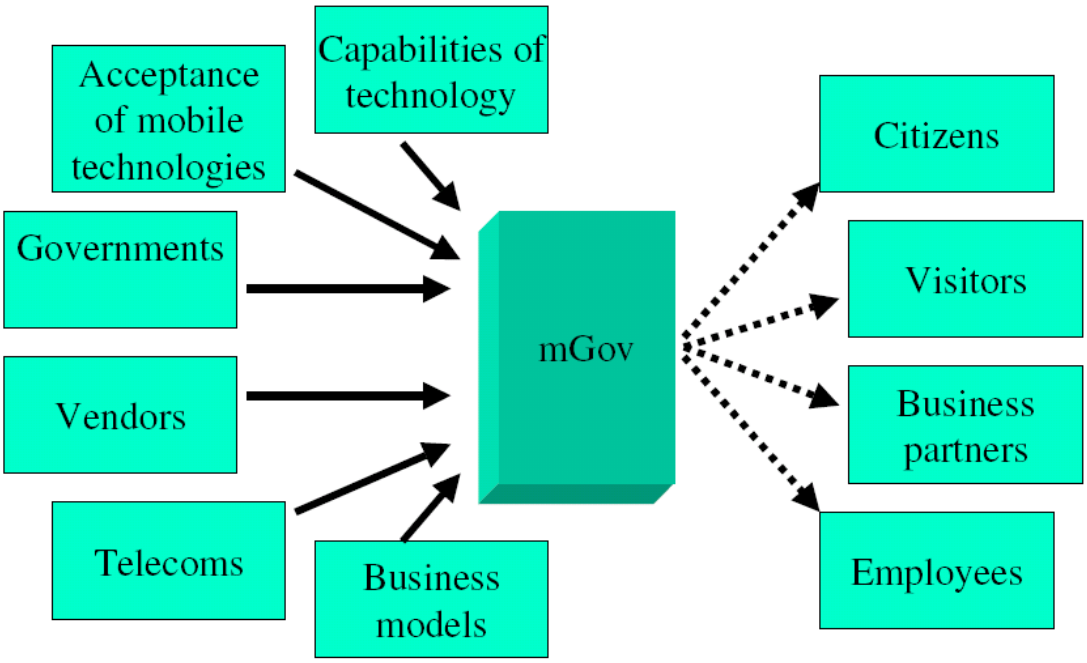


Figure 4 M-Government Framework

Diatha Krishna Sundar Shashank Garg (2005) [16] define a mobile governance framework for urban local bodies in India. The broad framework for mobile-governance involves the citizen by giving the freedom and flexibility of accessing and interacting with the urban local body in multiple convenient and personalized ways. The framework discussed to creating e-chains to enable e-governance through embedded technologies is adopted and modified in the m-governance context for urban local bodies (ULBs). These requirements are addressed through a flexible architecture of multi-mode delivery in the proposed framework given in figure below.

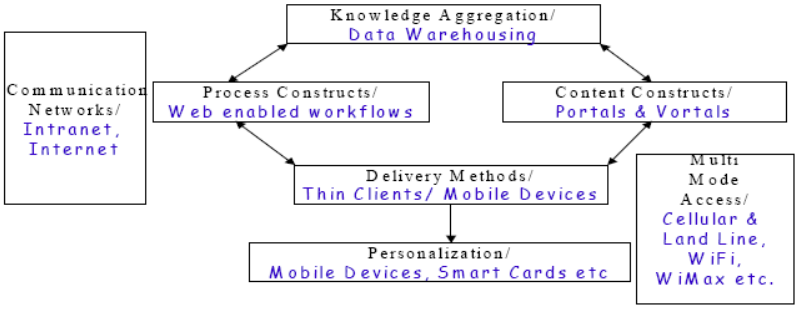


Figure 5 Mobile governance framework for urban local bodies in India

2.1.3 Relationship between mobile and electronic governance

Defined simply, m-government is public service delivery including transactions on mobile devices like mobile phones, pagers and personal digital assistants (PDAs). Kushchu and Kuscu (2003) [17] define it as "the strategy and its implementation involving the utilization of all kinds of wireless and mobile technology, services, applications and devices for improving benefits to the parties involved in e-government including citizens, businesses and all government units." M-government is an integral part, a sub-set, of e-government (D.C. Mishra (2010) [18].

Some call it as an extension of e-government, while others call it an evolution of egovernment. D.C. Mishra (2010) [18] suggests that M-government is of two types: (a) Web-based, and (b) Non-Web. Again it can be classified as (a) Voice, and (b) Non-voice. Apart from the convenience of carriage (small size of mobile phone) and mobility (anywhere e-government), an important feature of m-government is that it can be independent of web, which is a very attractive feature due to low Internet penetration in developing countries. The momentum to m-government is provided by the mobile phones and e-government can make use of SMS. Also, official portals can be accessed through mobile phone browsers.

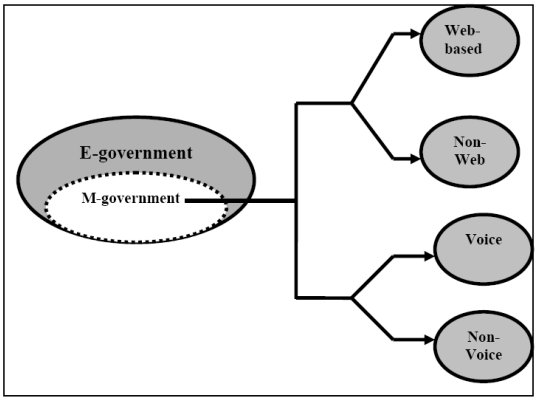


Figure 6 e-Government and Mobile Government

M.Ntaliani, Costopoulou and S. Karestos (2008) [7] suggest that like e-government, m-government operates on four different levels represented by following interactions:

- mGovernment to government (mG2G) referring to inter-agency relationships and the interaction between government agencies.
- mGovernment to business (mG2B) describing the interaction of government with businesses.
- mGovernment to employee (mG2E) concerning the interaction between government and its employees.
- mGovernment to citizen (mG2C), which refers to the interaction between government and citizen.

2.1.4 Legal and Technology issues in electronic and mobile government

2.1.4.1 Legal Issues in e-government:

The legal and regulatory issues in e-governance could address one or more of the following:

- Legality of conducting business electronic transactions.
- Legality of electronic documents exchanging.
- Legality of sharing of application data across organizational boundaries.

- Liability assignment for Internet transactions.
- Legality of electronic payments.
- Legality of notifications, management, physical services delivery and contracts.
- Verifying identifications, electronic signatures and authentication procedures.
- Establishment of cyber security response system

Laws designed for the paper world can hinder implementation of e-Government; conversely, legal reforms can facilitate the development of e-Government. At the least, countries implementing e-Government strategies should examine their legal framework to ensure that there are no barriers to putting information and services online. Beyond that, there are a number of reforms that governments may take to facilitate the implementation of e-Government.

Corien Prins (2007) [19] compares two methods of bringing in required regulatory environment for e-governance. A first method is policy driven, relying on political targets, technical standards and institutional incentives. Another method is to use formal legislation and legally enforceable rights (for citizens) and duties (for departments) in steering the way in which e-government is implemented and used. A glance at the different country reports shows that both lines are used. In the UK, as described by national reporter Schafer, e-government initiatives are in general policy driven, with a clear primacy of the political over the legal. Rather than using formal legislation, policy documents with targets are published, and positions are created which have responsibility for these targets. Here, the 'best' departments are publicly praised, while the 'weakest' are exposed and encouraged to follow in the future the lead of 'beacon departments'. In Germany, the success of e-government initiatives is expressly linked to legislative arrangements for legal certainty: administrative procedure statutes and some other specific statutes were amended to allow for electronic interaction. Illustrative for the role which is given to law in stimulating e-government progress is

the Danish example. Here, an authorization rule was included in the Public Administration Act, whose sole purpose was to promote electronic communication between citizens/companies, on the one hand, and public authorities, on the other.

The 11th report of the Administrative Reforms Commission in India provides for a legal framework for e-governance in India. The Commission has recommended that India's National e-Governance Program may be enshrined in a legal framework keeping in consideration the mammoth dimension of the task, the level of required coordination between the Union and State Governments and the diverse and complex field situations in which it is being implemented.

2.1.4.2 Technology issues in e-government

Dr. Sita Vanka, Mr. K. Sriram Dr. Ashok Agarwal (2007) [20] highlight the key technology related issues for e-governance in India. The key factors are security, interoperability and scalable architecture.

Lack of well-defined and understandable enterprise architecture for the Government is a road block in the success of e-Governance initiatives in the country. There is a lack of awareness of enterprise architecture concepts and its advantages. Standards based architectures are a must for Integration and interoperability of various citizen services, within and across the state and the central Government. Listed below are typical issues followed by recommendation of a standards based enterprise architecture to resolve and avoid such issues. The aim is to approach for enterprise architecture for the government that is citizen centric, open, standards based, interoperable, transparent, flexible, secure, result oriented and dynamic.

Architectural Issues: Most of e-Government projects face one or more of the following issues:

- Integration and Interoperability Issues
- Lack of Knowledge Sharing
- Security Issues
- Lack of Standards

To overcome these issues, there is a need for a standard based enterprise architecture framework with appropriate knowledge and awareness amongst the key stakeholders. Enterprise architecture for the Government that is citizen centric, open, standards based, interoperable, transparent, flexible, secure and result oriented and dynamic is the need of the hour.

2.1.4.3 Legal issues on m-government

Michael Knopp (2007) [21] highlights that the legal requirements for a mobilized administration must be identified and legal rules must be established. Some of these legal requirements include:

- *Mobile signatures:* The possibility to produce documents on-site or to fill in an electronic form on-site is a constitutive requirement for the activity of mobile administrative field staff. The authenticity and integrity of the document must be ensured for a subsequent usability, if these documents shall be taken on file immediately.
- *Electronic storage of records and filing:* In order to be able to give account for its activity, storing, filing and organization of records are crucial points for the interior organization of the administration and indeed for the capability of any administration. Furthermore ensuring the access to previous procedures, all

records have to be archived electronically. The legal preconditions increasingly exist. European guidelines already some effect in some areas.

- *Legal caused format discontinuities:* The extensive mobile access to all the data concerning a case is a basic requirement for the Mobilized Administration. A record that is only partially available by electronic means doesn't deliver complete information on-site. Therefore it is not useful. Such vacancies of records can emerge due to legal exceptions of electronic form.

2.1.4.4 Technology issues in m-government

Swaran Lata , Somnath Chandra , Prashant Verma (2010) [22] highlight the technology issues related to mobile governance in India. There are 22 official recognized Indian languages. The Indian language scripts are mainly stems from ancient Brahmi script and perso-arabic family. The syllable formation possibilities are infinite due to large set of consonant, vowel, vowel signs. Many Conjunct formed are drastically of different look from their consonant counterpart. The conjuncts formation can be either liner or vertical.

- Large linguistic diversity with 22 officially recognized languages and 12 scripts.
- One-language many scripts ; Many languages – one script
- Specificity for each language and script is unique in nature and cannot be easily replicated , even if they share common characteristics
- Difference in perceptions of usage among various stakeholders, e.g. state governments , academia and industry
- Some of the languages have coverage across different nations across SAARC countries.
- Involves interdisciplinary research in advanced and sophisticated computer processing involving artificial intelligence and Machine Learning in one hand; linguistic knowledge for incorporating human communication techniques on the other hand.

They also highlight the technical issues on mobile web:

- *Availability on handsets:* Not all handsets have browsing capabilities. Even if today most of devices sold integrate a browser, this is not the case for handsets from previous generations, which largely have no browser, or a browser not compatible with current standards.
- *Access to all handset features:* Web browsers offer for the content author, a kind of abstraction layer that ensure that the content or applications will work on all standard-compliant browsers. However, Web technologies, and particularly mobile web technologies are still evolving technologies. As of today, these technologies do not yet allow a service designer to access and use all the components of the handsets in his application. For instance, there is no standardized APIs to access and use e.g. the GPS, or the camera of the phone from the browser.
- *Usability of web browser:* mobile browsers available on phones today reproduce exactly the interface of desktop browsers in order to help users coming from the desktop world. For first time users, such interfaces on phones, plus the issue of computer literacy are barriers for accessing services, and require heavy training.
- *Web and low-reading skills:* Web technology itself is not a barrier, there are no guidelines or methodologies to develop web content and applications accessible to people with low-reading skills.
- *Web support of lesser-known languages:* The web architecture has been developed to support all languages, many of these languages are not available yet on the Web.

- *Awareness on mobile web technologies:* While there are now tools, standards and guidelines on how to write web content and applications for mobile, very few people are aware of this work, and don't know how to deliver services that are usable on mobiles.
- *Support of disconnected mode:* Web technologies still support poorly the disconnected and the off-line modes. While browsers have some very limited caching capabilities which allow a user to access some previously-read web pages when not in range of a network, there is no real support of these modes that would allow the completion of tasks such as form filling, and access a long list of web pages previously load.
- Support and implementation of standards and specifications. Not all mobile browsers implement all of the W3C and other related standard bodies specifications in the same way, or don't implement all features.

2.2 Factors affecting mobile Government

Al-khamayseh & Lawrence, (2006) [23] have identified eighteen fully interactive M-Government success factors which are depicted in figure below:

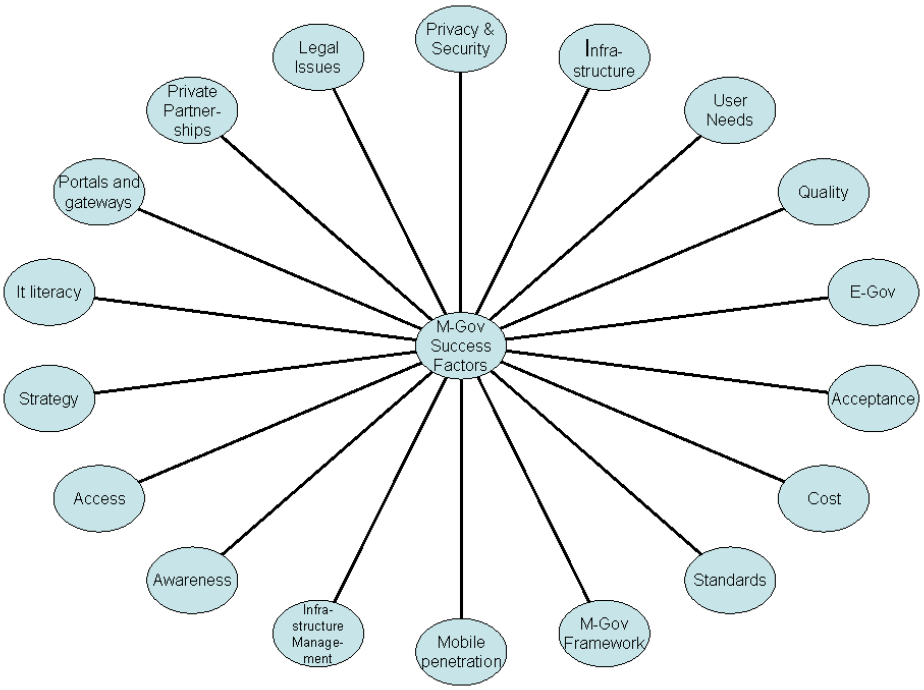


Figure 7 Mobile Government success factors

As a part of their research, they conducted a survey of experts on a stratified purposive sampling. The order of the above factors as ranked by the experts is given below:

a) Privacy and security
b) Infrastructure
c) User needs and preferences
d) Quality and user friendly applications
e) E-government
f) Acceptance
g) Cost
h) Standards and data exchange products
i) Coherent m-government framework
j) High mobile penetration
k) Infrastructure management
l) M-Government Awareness
m) Access
n) Strategy

o) IT literacy
p) M-Government portal and exclusive gateway
q) Partnership with private sector
r) Legal Issues: Liberalization of telecommunications sector

Jennie Carroll (2006) [12] adopted a different approach to the research on success factors for mobile government. According to her, there are many difficulties in investigating the likely success of yet-to-be implemented services. Conventional requirements elicitation techniques such as asking whether participants want, or think they would use, a particular service are inadequate. This is because people's espoused theories are often very different to their theories in action and so what people believe they need or do frequently diverges from what they are observed to do. Typically, current use is investigated and used as the starting point for predicting or envisioning future use through designer introspection, future workshops or scenarios. Mobile technologies add to the difficulties, notably because of the influence of context on use and the likelihood of adhoc user behaviours. An alternative approach, taken in this research, is to examine current practices and to derive general lessons about the use of mobile technologies in the provision of public sector services. Such an approach is useful in defining a possibility space to focus future research (employing acting out, scenarios or prototypes, for example). Thus, implications for mGovernment were induced from the findings. The following six lessons were derived from:

a) The mobile phone was the technology of choice.
b) The use practices around mobile technologies are diverse.
c) The participants wanted to control the traffic on their devices and limit incoming information to meet their local, real time needs.
d) Current m-government initiatives focus on one-way government to citizen interaction.

e) As more channels are added for interaction with the governments, trust must be built so that all channels are perceived to be trustworthy.

f) There are significant advantages of using personalized technologies for providing government services.

Tarek El-Kiki and Elaine Lawrence (2007) [4] carried an expert's opinion survey on barriers to m-government and opinion to overcome those. A web based survey was conducted to extract opinions. Analysis of responses identified three major areas of suggestions: organizational, technical and social. The suggestions were compared to the findings from literature survey and are shown below:

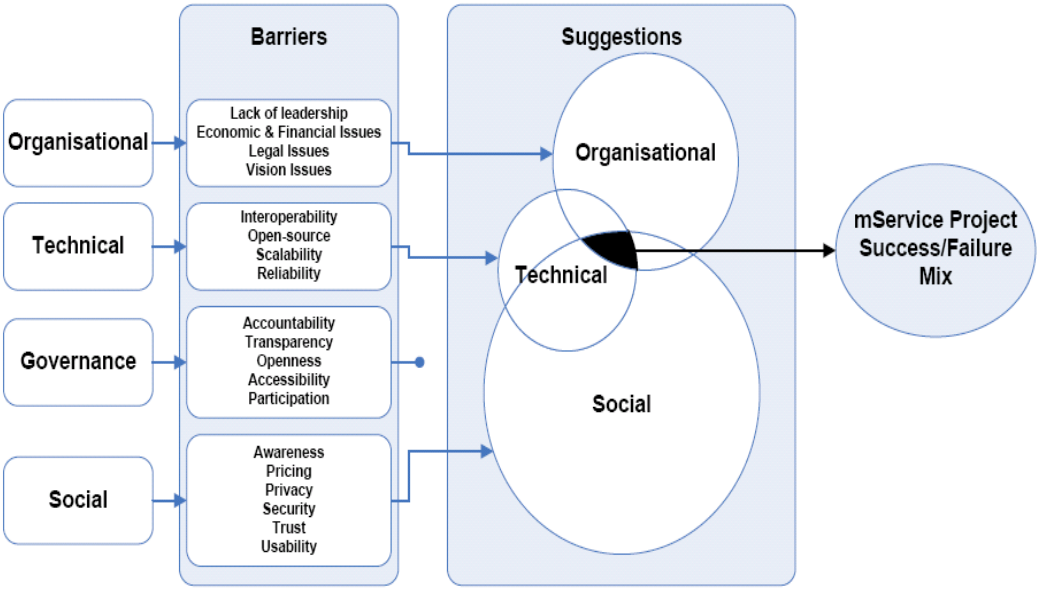


Figure 8 Barriers to mobile government

Geoffrey A Sandy and Stuart McMillan (2005) [24] reviewed the available literature and identified six factors critical to m-government success. These have been tabulated below:

Success Factor	Reference
Cost	Heeks & Lallana (2004), Welch & Wong (2001)
Business Re-engineering	Kushchu & Borucki (2003), Reola & Pohjanpalo (2002)
Education	Zálešák (2003), West (2002), Huta (2002)
Acceptance	Heeks & Lallana (2004), Aust Bureau of Statistics (2003), Valdez (2002)
Security	Heeks & Lallana (2004), Zálešák (2003), Okenfeld (2002)
Access	Huta (2002), Liff (2000), McClure (2000),

Table 2.1 Factors critical to m-government success

The Success Factors Model postulates a service delivery where the level of M-government sophistication positively correlates with the level of service delivery functionality. Five levels of functionality in electronic service delivery (mobile and web presence) have been identified. They are:

- Initial – provides basic wireless access with brochure ware, non-interactive responses such as set answers to interrogation from citizens
- Enhanced – delivers updated information such as weather forecasts, traffic conditions, policy changes, or periodically enhanced material
- Interactive – allows formal interactions between citizens and government service providers. Providing a more sophisticated level of access enabling users to directly access information based on their specific interests or needs. Users can search specialized databases; download forms and applications or submit them from mobile devices or wireless connection; make appointments with officials etc.
- Transactional or mature interface – provides a single entity interaction for mobile and wireless users. Regardless of department or agency, a mobile wireless request is actioned through a single government interface with disregard for time and place. It will provide non-critical transactions with payment.
- Fully-interactive – offers a secure mobile wireless transaction for payment, ordering and billing of services. Agency independent, it offers the users 7/24, anywhere access from a mobile wireless device with secure identification and authorization.

2.3 G2C services over mobile devices

Dimitris Gouscos, Dimitris Drossos and Giannis F Marias (2005) [25] have identified indicative initiatives and applications throughout the world that could be integrated in the mobile government sector. These are shown below:

Service	Description	Source
M-transportation	SMS notifications: The driver receives an estimation for the total time duration of his transport. The notification could be time or event based	NTUA (2005)
M-payment	Drivers in London can pay tolls with SMS text messages	Bradford (2003)
M-learning	Pupils are taught the history of hip-hop and must also analyse and relate to hip-hop lyrics and their meaning. They must also compose their own lyrics and make their own rap on the PDA	Crossroads Copenhagen (2005)
M-voting	Norwich City Council and Ipswich Borough Council are providing new means for voting through the use of text messaging using mobile phones	BBC (2003)
M-tourism	Using a handheld device with the CRUMPET system integrated, tourists can check out an array of information such as the nearest Italian restaurant in their locality or the times of public transport in another city using a digital map of that city	CRUMPET (2003)
M-health	Use of mobile applications in emergency management so as to improve the safety and security of both the public and the emergency workers themselves	XMOTION (2003)
M-weather	On demand localised forecast for the next six hours for any UK postcode, town or city	MetOffice (2005)
M-policing	The Philippines National Police – the country's unified police force – introduced a text messaging system in 2002 enabling the public to report wrongdoings by police officers as well as by criminals	Alampay (2003)
M-welfare	The Hong Kong government sent a blanket text message to 6m mobile phones in a bid to scotch a spoof internet story spreading fears about Asia's mystery bug	Guardian Unlimited (2003)
M-emergency	The Italian Ministry of Foreign Affairs, during the aftermath of the Asian Quake, sent an SMS to Italians located in the struck area. The message was: "Answer indicating your identity, health status, and place where you are". The Italian Government obtained the list of people located in struck area from phone companies, that provided the information based on the international roaming services	mGovLab.org (2005)

Table 2.2 G2C services over mobile devices

They observe that these applications are still in the embryonic stage and mainly focus on SMS notifications and e-mail.

Ronan de Kervenoael, D. Selcen O. Aykac, Enes Eryarsoy and Nihat Kasap (2008) [26] have analysed the e-government services in Turkey with a four stage model of services:

E-government Services for individuals	Current Status	E-government services for enterprises	Current Status
Income Tax Declaration	4/4	Social contribution for employees	4/4
Job Searches by labor Offices	1/3	Corporation tax: declaration, notification	4/4
Social security benefits	1/4	VAT: declaration, notification	4/4
Personal documents	3/3	Registration of a new company	2/4
Car registration	3/4	Submission of data to statistical offices	0/3
Application for building/planning permission	1/4	Customs declarations	3/4
Declaration to the police	3/3	Environment-related permits	2/4
Public libraries	3/3	Public procurement	3/4
Certificates (birth, marriage)	1/3		
Enrolment in higher education/university	1/4		
Announcement of moving (change of address)	1/3		
Health related services	1/4		
Stage 1 Information: online information about public services Stage 2 Interaction: downloading of forms Stage 3 Two way interaction: processing of forms, including authentication Stage 4 Transaction: full case handling, decision and delivery (payment)			

Table 2.3 Four stage model of e-government services

2.4 Service Quality Parameters

The literature review on service quality parameters is presented in five sections. The first section covers the basic understanding of service quality measurement; the next section covers the literature review on e-service quality measurement; the next section covers the literature review on e-governance service quality measurement; the next section covers the literature review of the relationship between electronic governance and mobile governance; and the final section covers the literature review of mobile service quality.

2.4.1 Measures of Service Quality Parameters

A review of literature on traditional (non-internet based) service quality suggests that researchers have proposed to determine the service quality by the difference between expected and perceived performance levels of services (Parsauraman etal. 1988, 1991, 2005) [27], [28], [29]. Persuraman et al conducted studies in different industries to develop and subsequently refine the service quality instrument (SERVQUAL). The five dimensions of SERVQUAL are given below:

- Tangibles: The appearance of physical facilities
- Reliability: The dependability and accuracy of promised services
- Responsiveness: The willingness to help customer and provide prompt services
- Assurance: The ability to convey trust and confidence
- Empathy: Care and individualized attention to customers.

Cronin and Taylor (1992) [30] suggested that SERVPERF scale based on performance perceptions provides a better measure for service quality as compared to measures based on gap between expectation and perception.

2.4.2 Measures of e-Service Quality Parameters

Li, Hongxiu et al. (2009) [31] suggest that SERVQUAL is considered problematic and may not be appropriate for e-service (services offered electronically or through electronic modes) quality evaluation. They suggest that the reason for the same is that e-service is different from traditional service from three aspects: the absence of sales staff, the absence of traditional tangible element, and self-service of customer.

Most of the literature on e-service quality is based on studies conducted in the domains of retail, online shopping and website quality. Various researchers have identified several dimensions of e-service quality.

Dabholkar (1996) [32] conducted a research work on the dimensions of eservice quality focusing on website design, and he argues that 7 dimensions of e-service quality can be illustrated as the basic parameters in the judgement of eservice quality, including website design, reliability, delivery, ease of use, enjoyment and control. Kyanama and Black (2000) [33] have given E-QUAL identifying (a) responsiveness (b) Content and Purpose (c) accessibility (d) navigation (e) design and presentation (f) background and (g) personalization and customization as the dimensions of service quality measurements. Zeithaml (2001) [34] gives (a) reliability (b) responsiveness (c) access (d) flexibility (e) ease of navigation (f) efficiency (g) assurance/trust (h) security/privacy (i) price knowledge (j) site aesthetics and (k) customization/personalization as the measures of service quality for e-services. Liljander et al (2001) [35] also identifies (a) user interface (b) responsiveness (c) reliability (d) customization and (e) assurance as service quality parameters. Zeithaml, Parsuraman and Malhotra (2005) [36] have given e-SQUAL measures as (a) tangibility (b) reliability (c) responsiveness (d) integration of communication (e) assurance (f) quality of information and (g) empathy. A few researchers have proposed measurement instrumentation for measuring website quality (Yoo and Donthu, 2001) [37]. Substantial researches providing a generalized scale developed using a variety of industries; also, comparative studies to find the best approach (discrepancy/gap, or, perception based) to measure e-service quality are nonexistent (Agrawal, 2007). There is a predominance of perception based measurement approaches only.

2.4.3 Measures of e-governance service quality parameters

Agrawal, Shah and Wadhwa (2007) [38] have identified the following seven categories of e-service quality and performance as EGOSQ:

- Information: including accuracy, reliability, comprehensiveness, usefulness, timeliness, ease of retrieval and use, ease to comprehend and extent of updation.
- Interaction: including friendly and courteous interaction, availability of online contact options, empathetically, timely response, promptness, willingness, knowledge and concern.
- Integration: including customizable features, range of services, ease of use of all features, personalization, payment options and confirmations.
- Accessibility: including availability, fast navigation without jams, impressive interface, ease of navigation, quick response, quick loading of web pages, stability of websites.
- Emotional engagement: including opportunities to contact with other users, fun and enjoyment while using e-services
- Active service recovery: including Government accepting responsibility and taking control in the event of service failure, concern shown in case of failure, ability to raise concern and complaint handling procedure
- Assurance: including getting things done right the first time, financial security of online transactions, protection of personal information and privacy, getting things done in the expected time frame and transparency.

They have provided a pool of 26 items under these seven dimensions as measures of EGOSQ.

2.4.4 Measures of m-government service quality parameters

Chae et. Al [39] provided connection quality, content quality, interaction quality and contextual quality as dimensions of m-service quality. However, Emmanouil Stiakakis and Christos K. Georgiadis (2011) [40] suggest that these only focus on information quality rather than service quality.

Seth et al [41] categorized the quality of mobile service parameters into technical and managerial. Technical parameters include the network performance of cellular mobile communication network and managerial parameters comprise functional as well as internal quality parameters.

Lu et al [42] proposed the three dimensions of mobile service quality as interaction quality, environment quality and outcome quality.

Emmanouil Stiakakis and Christos K. Georgiadis (2011) [40] therefore suggest the following parameters of mobile service quality:

- Interaction quality – Expertise, Problem solving, Information, Security/privacy and Customization/personalization
- Environment quality – equipment, design and context
- Outcome quality – reliability, tangibles and valence

2.5 Gaps in Literature Review

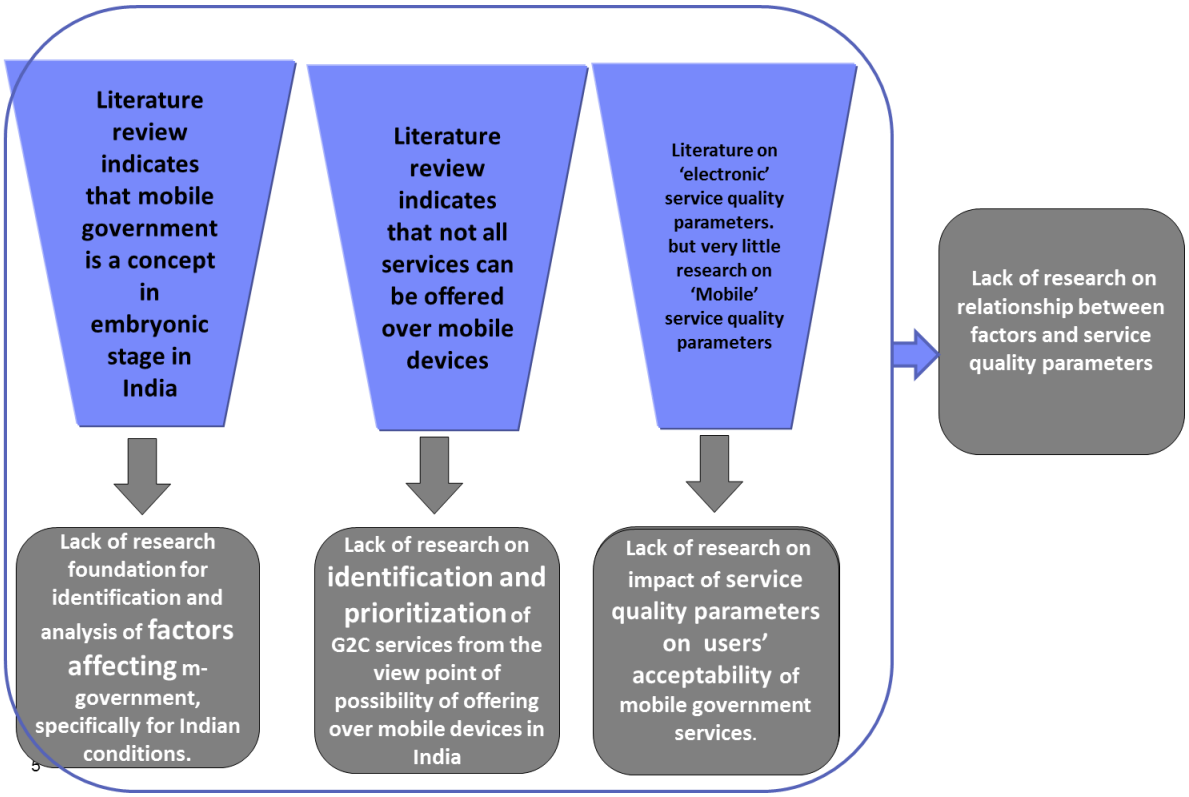


Figure 9 Gaps in Literature Review

A review of the literature suggests the following gaps w.r.t. mobile government in India:

- Researchers indicate that while mobile government is a concept in embryonic stage and management of mobile based governance process requires understanding of a wide variety of factors affecting the same. To date, it appears that we lack the research foundation for identification and analysis of factors affecting m-government, specifically for Indian conditions.

- Researchers have indicated that not all services can be offered over mobile devices. Till date, it appears that the identification and prioritization of sectors and G2C services from the view point of possibility of offering over mobile devices in India has not been carried out in any research.

- Researchers have identified the 'electronic' service delivery quality parameters. However, there is very little research on 'mobile' service delivery quality parameters. To date, it appears that service quality parameters have not been identified for mobile government services in India.

- The relationship between factors and the service quality parameters affecting mobile government services in India has not been studied so far.

- The effect of service quality parameters on user acceptability of mobile government services has not been studied in India so far.

The present research aims to focus on the above gaps.

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

RESEARCH DESIGN

CHAPTER - 3

CHAPTER 3: RESEARCH DESIGN

3.1 Problem Statement

As highlighted in section 2.5, the following are the literature gaps:

- Researchers indicate that while mobile government is a concept in embryonic stage and management of mobile based governance process requires understanding of a wide variety of factors affecting the same. To date, it appears that we lack the research foundation for identification and analysis of factors affecting m-government, specifically for Indian conditions.
- Researchers have indicated that not all services can be offered over mobile devices. Till date, it appears that the identification and prioritization of G2C services from the view point of possibility of offering over mobile devices in India has not been carried out in any research.
- Researchers have identified the 'electronic' service delivery quality parameters. However, there is very little research on 'mobile' service delivery quality parameters. To date, it appears that service quality parameters have not been identified for mobile government services in India.
- The relationship between factors and the service quality parameters affecting mobile government services in India has not been studied so far.

The present research aims to carry forward the work in the above areas

3.2 Research Objectives

The following are the objectives of this research:

- To explore and identify factors affecting use of mobile government services in India.

- To identify sectors/ Government to citizen (G2C) services which can be prioritized for offering over mobile devices.
- To identify the mobile government service quality parameters in India.
- To examine the relationship between the factors affecting use of mobile government services in India and the service quality parameters of mobile government services.
- To examine the relationship between mobile government quality service parameters and user acceptability of mobile government services.

3.3 Research Questions

The following research questions form the basis of this study:

a) What are the factors affecting use of mobile government services in India?
b) Is there a difference between factors affecting use of mobile government services as identified globally vis-à-vis those affecting use of mobile government services in India?
c) What types of G2C services can be prioritized for offering over mobile devices?
d) What are the mobile government service quality parameters in India?
e) What is the relationship between the factors affecting use of mobile government services and the mobile government service quality parameters?
f) What is the relationship between the mobile government service quality parameters and user acceptability of mobile based G2C services?

3.4 Hypotheses:

At the start of the study, the following two hypotheses were formulated:

- There is no significant relationship between user acceptability of mobile based government services and service quality parameters.
- There is no significant relationship between factors affecting mobile government and mobile government service quality parameters.

However, as explained in the later sections, at the end of exploratory phase, top seven service quality parameters have been identified. Accordingly the following specific research questions were defined:

a. Is there a significant relationship between users' acceptability and 'privacy of information' i.e. do the users see privacy as an important quality parameter related to acceptability of mobile government services?
b. Is there a significant relationship between users' acceptability and 'getting things done in the expected time frame' i.e. do the users see 'getting things done in the expected time frame' as an important quality parameter related to acceptability of mobile government services?
c. Is there a significant relationship between users' acceptability and 'ease of use of applications' i.e. do the users see 'ease of use of applications; as an important quality parameter related to acceptability of mobile government services?
d. Is there a significant relationship between users' acceptability and 'getting things right the first time' i.e. do the users see 'getting things done right the first time' as an important quality parameter related to acceptability of mobile government services?
e. Is there a significant relationship between users' acceptability and 'financial security of online transactions' i.e. do the users see 'financial security of online transactions' as an important quality parameter related to acceptability of mobile government services?
f. Is there a significant relationship between users' acceptability and 'fast navigation through the applications without jams' i.e. do the users see 'fast

navigation through the applications with jams' as an important quality parameter related to acceptability of mobile government services?

g. Is there a significant relationship between users' acceptability and 'getting updated information' i.e. do the users see 'getting updated information' as an important quality parameter related to acceptability of mobile government services?

Based on the above research questions, following seven hypotheses have been formulated:

1. Ho: There is no significant relationship between users' acceptability of mobile government services and privacy of information.
2. Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting things done in the expected time frame'.
3. Ho: There is no significant relationship between users' acceptability of mobile government services and 'ease of use of applications'
4. Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting things right the first time'
5. Ho: There is no significant relationship between users' acceptability of mobile government services and 'financial security of online transactions'
6. Ho: There is no significant relationship between users' acceptability of mobile government services and 'fast navigation through the applications without jams'
7. Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting updated information'

Also, based on the factors and service quality parameters identified in Phase – I (as explained later in Chapter 4), the following additional research questions have been formulated:

a. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘privacy of information’ i.e. do the factors affecting use of mobile government services significantly affect the service quality parameter on ‘privacy of information’?
b. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘getting things done in the expected time frame’ i.e. do the factors affecting use of mobile government services significantly affect the service quality parameter on ‘getting things done in the expected time frame’?
c. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘ease of use of applications’ i.e. do the factors affecting use of mobile government services significantly affect the service quality parameter on ‘ease of use of applications’?
d. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘getting updated information’ i.e. do the factors affecting use of mobile government services significantly affect the service quality parameter on ‘getting updated information’?
e. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘fast navigation through the applications without jams’ i.e. do the factors affecting use of mobile government services significantly affect the service quality parameter on ‘fast navigation through the applications with jams’?

f. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘financial security of online transactions’ i.e. do the factors affecting use of mobile government services significantly affect the service quality parameter on ‘financial security of online transactions’?

g. Is there a significant relationship between factors affecting use of mobile government services and the service quality parameter on ‘getting things right the first time’ i.e. do the factors affecting use of mobile government significantly services affect the service quality parameter on ‘getting things right the first time?

Based on the above research questions, following seven hypotheses have been additionally formulated:

1. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘privacy of information’
2. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘getting things done in the expected time frame’
3. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘ease of use of applications’
4. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘getting things right the first time’
5. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘financial security of online transactions’
6. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘fast navigation through the applications without jams’

7. Ho: There is no significant relationship between factors affecting use of mobile government services and “getting updated information”

3.5 Research Design and Methodology

The research work has been designed to be completed in two phases as given below:

1. Phase I : Exploratory research covering the following:
   A. The identification of factors affecting use of mobile Government services in India
   B. The identification of service quality parameters for mobile government in India
   C. The prioritization of sectors/identification of citizen services for offering over mobile devices in India.
2. Phase II: Descriptive research covering the following:
   A. Study of relationship between mobile government service quality parameters (as identified at 1 (B) above) and users’ acceptability of mobile government services.
   B. Study of relationship between factors affecting use of mobile government services in India ((as identified at 1 (A) above) and mobile government service quality parameters (as identified 1(B) above).

Phase II study has been conducted for sectors identified at 1(C) above.

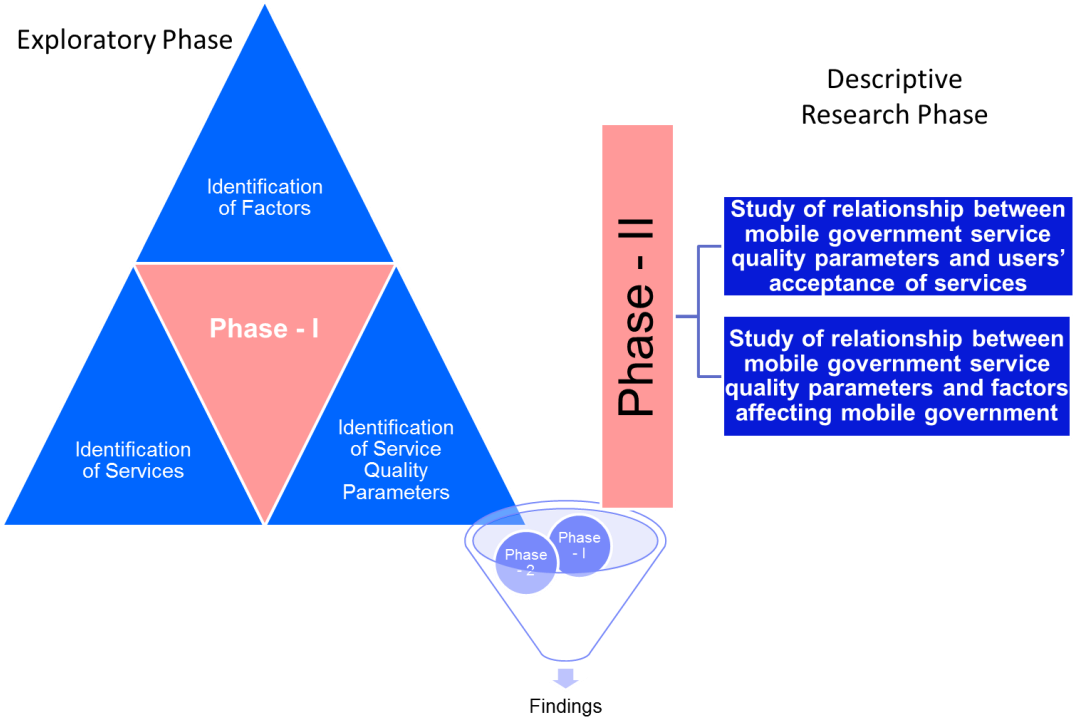


Figure 10 Research Design

3.6 Phase – I: Exploratory Phase

3.6.1 Phase – I A: Identification of factors affecting mobile government in India

Identification of factors affecting mobile government in India: This study uses 'Experts' Survey' for this exploratory research .The study uses an extension to the approach adopted by Shadi Al-Khamayseh, Elaine Lawrence and Agnieszka Zmijewska (2008)[2] in identifying success factors in Interactive mobile government. As a part of their study, they conducted an extensive review of literature and shortlisted eighteen factors affecting mobile government. An online survey was set-up for experts identified using stratified sampling technique. Access to references was gained by using academic databases. Industry experts were sourced from communication companies, mobile phones suppliers, Internet service providers, application developers and consultants. Their research was based on stratified purposive sampling. This sampling does not need to be statistically representative, since it is not going to be used to generalize to the large population. This technique, not only makes it possible to gather a variety of

perspectives on the research problem, but it also enhances the capabilities of the data that can be confirmed from a variety of sources. As an extension, the Indian experts were approached initially with the 18 factors identified by Al-Khamayseh et-al. The study uses an online questionnaire based survey of Indian experts.

The overall research design for Phase I A is shown below:

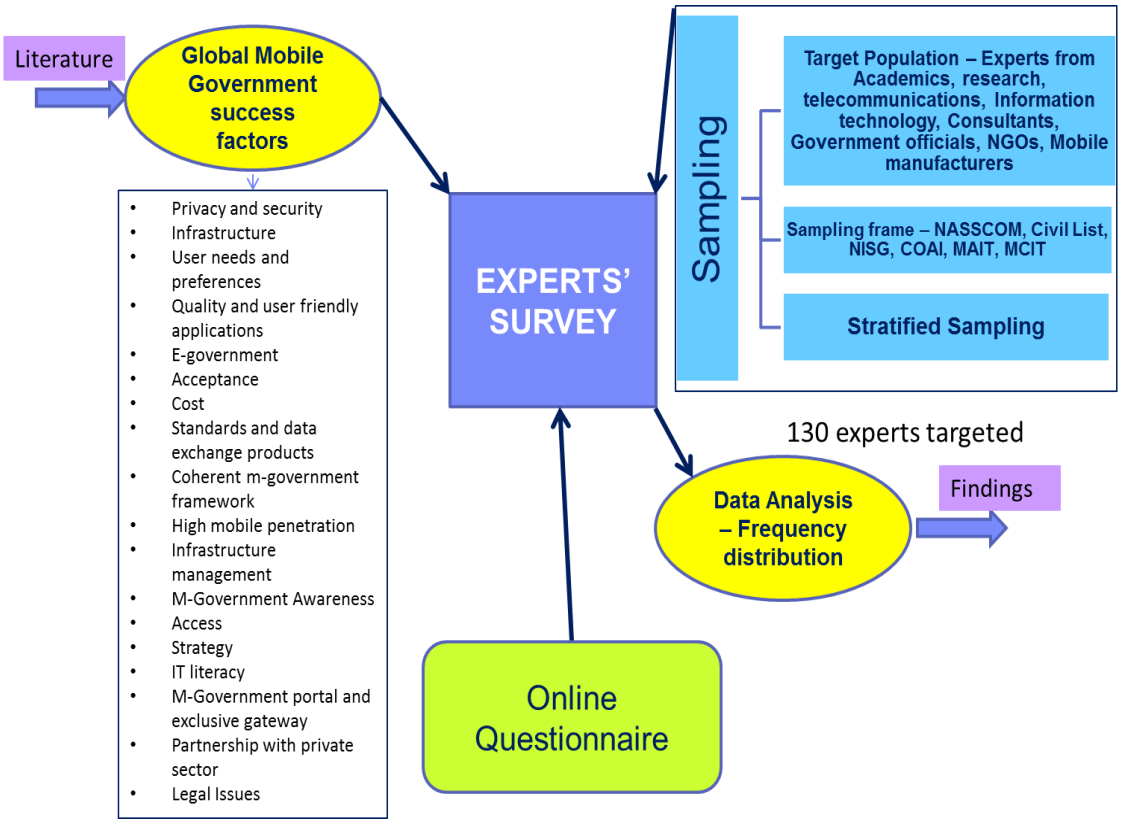


Figure 11 Research design - identification of factors affecting use of mobile government in India

3.6.1.1 Research Instrument:

The study uses a Questionnaire based survey with experts groups from researchers, academicians, government officials, telecom companies, IT companies, NGOs and consultants. As the study involved preference and ranking, rank order scaling has been used. The respondents have been asked to rank the factors based on their applicability to Indian conditions. The questionnaire also has unstructured questions on getting the remarks of experts on any other factors which have not been listed in the rank order.

Since this phase involves only experts as respondents, e-mail based requests have been used to elicit the response. An online questionnaire (attached at Appendix – 1) has been used. www.surveymonkey.com has been used a platform to collect responses.

3.6.1.2 Sampling

3.6.1.2.1 Target Population

The target population i.e. the collection of elements that possess the information sought by the researcher and about which the inference is to be made includes Expert groups from academics, research, communication companies, mobile phone suppliers, application developers, Government officials, consultants and NGOs.

3.6.1.2.2 Sampling Frame

The sampling frame i.e. a list or set of directions for identifying the target population includes the academic database and journals and publications have been used to identify expert Group from academics and research. Three types of telecom companies viz., mobile service providers, telecom equipment manufacturers and mobile handset manufacturers have been used as the target population for telecom expert groups. The directories by Telecom Regulatory Authority of India, COAI (Cellular Operators Association of India) and TEMA (Telecom Equipment Manufacturer Association) have been as the sampling frame. For the expert group from information technology companies, directories by the National Association for Software and Services Companies (NASSCOM) and Manufacturers' Association for Information technology (MAIT) have been used as the sampling frame. The expert group from Government have been drawn from the civil list, directory of officials of Ministry of Communications and Information Technology and Department of Administrative Reforms and Public Grievances. The list of empanelled consulting organizations with

the National Institute for Smart Government, Hyderabad has been used as the sampling frame for experts from consulting organizations.

3.6.1.2.3 Sampling method

Stratified sampling has been used with the experts' industry association as the stratification variable. The sampling is disproportionate considering the disproportionate size of the target population. Stratified sampling has been used as the population is skewed.

3.6.1.2.4 Data Analysis

Simple frequency distribution of ranks assigned by experts to different factors with average rank as the basis of ranking has been used.

3.6.2 Phase – I B: Identification of service quality parameters for mobile government in India

This part of the exploratory study has been done with the same methodology as Phase I A. A common questionnaire has been designed for experts' survey on factors as well as service quality parameters. For the purpose of service quality parameters, the Indian experts have been approached initially with the service quality parameters for e-governance in India. The study uses an online questionnaire based survey of Indian experts.

The overall research design for Phase I B is shown below:

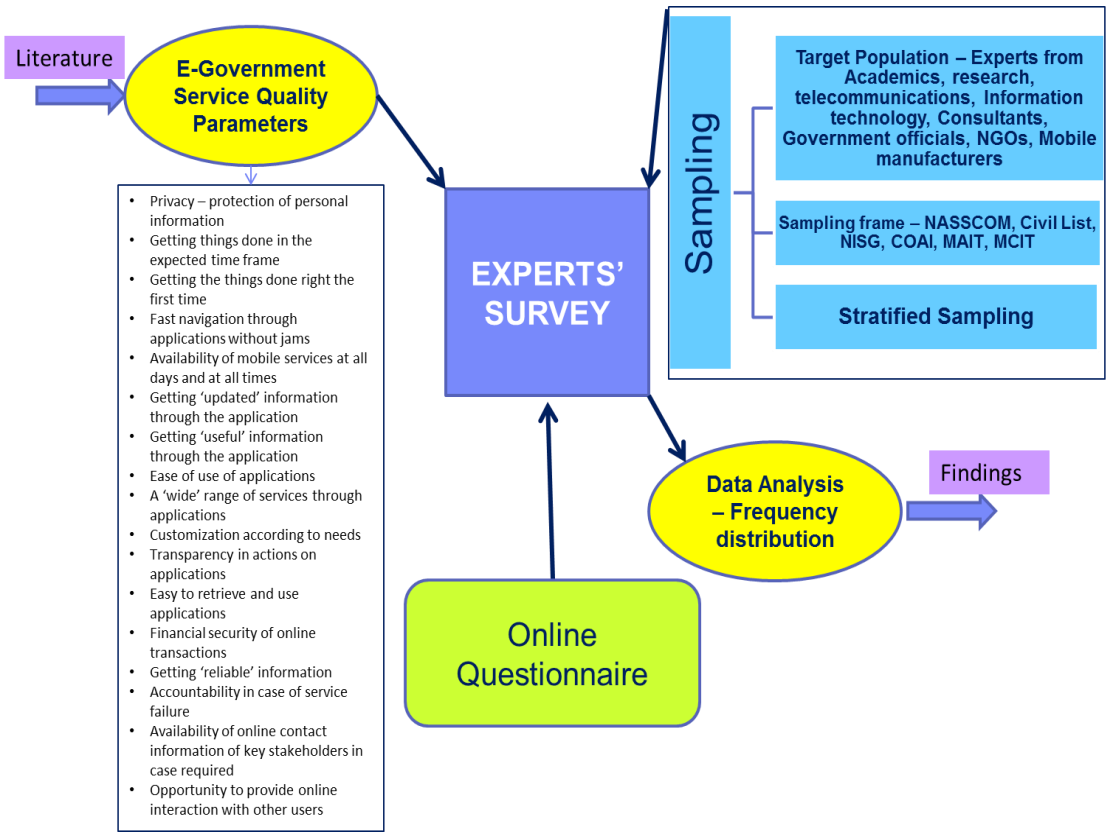


Figure 12 Research design: identification of service quality parameters for mobile government

3.6.2.1 Research Instrument:

This phase of study uses a Questionnaire based survey (common to phase I A above) with experts groups from researchers, academicians, government policy makers, telecom companies, IT companies, NGOs and consultants. As the study involved preference and ranking, rank order scaling has been used. The respondents have been asked to rank the service quality parameters based on their assessment of applicability to Indian conditions. The questionnaire also has unstructured questions on getting the remarks of experts on any other parameters which have not been listed in the questionnaire. Since this phase involves only experts as respondents, e-mail based requests have been used to elicit the response. The survey instrument was an online web based questionnaire (attached at Appendix– I) survey and around 130 professionals were approached with a web-link to survey on www.surveymonkey.com . The e-mail

sent to the identified target respondents also included a document on instructions on how to fill in the questionnaire.

The survey instrument had a total of eight questions. The first six relate to collecting the demographic information such as name, gender, age, sector employed, designation and organization. The seventh question contained a list of eighteen factors which were presented to respondents in a randomized manner. The respondents were requested to rank these factors in the order of importance as applicable to Indian conditions. The ranking was required to be done from one to eighteen with one being the most important and eighteen being the least important factor affecting the use of mobile government services in India. The eighth question was an open ended question wherein the respondents were asked to add any other factor that they feel has been left out. Some of the respondents also used this question to provide remarks/feedback.

3.6.2.2 Sampling

3.6.2.2.1 Target Population

The target population i.e. the collection of elements that possess the information sought by the researcher and about which the inference is to be made includes Expert groups from academics, research, communication companies, mobile phone suppliers, application developers, Government officials, consultants and NGOs.

3.6.2.3 Sampling Frame

The sampling frame i.e. a list or set of directions for identifying the target population includes the academic database and journals and publications have been used to identify expert Group from academics and research. Three types of telecom companies viz., mobile service providers, telecom equipment manufacturers and mobile handset manufacturers have been used as the target population for telecom expert groups. The directories by Telecom Regulatory Authority of India, COAI (Cellular Operators

Association of India) and TEMA (Telecom Equipment Manufacturer Association) have been as the sampling frame. For the expert group from information technology companies, directories by the National Association for Software and Services Companies (NASSCOM) and Manufacturers' Association for Information technology (MAIT) have been used as the sampling frame. The expert group from Government have been drawn from the civil list, directory of officials of Ministry of Communications and Information Technology and Department of Administrative Reforms and Public Grievances. The list of empanelled consulting organizations with the National Institute for Smart Government, Hyderabad has been used as the sampling frame for experts from consulting organizations.

3.6.2.4 Sampling method

Stratified sampling has been used with the experts' industry association as the stratification variable. The sampling is disproportionate considering the disproportionate size of the target population. Stratified sampling has been used as the population is skewed.

3.6.2.5 Sample size

Around 130 experts have been approached for this phase.

3.6.2.6 Data Analysis

Simple frequency distribution of ranks assigned by experts to different service quality parameters with average rank as the basis of ranking has been used.

3.6.3 Phase I C: Prioritization of sectors for offering G2C services over mobile devices

The G2C services in India are classified according to the type and sector viz. agriculture, transport, tax related etc. As the research in this area is currently non-existent, **this exploratory study uses Delphi method** to get a priority of sectors with the potential

of offering G2C services over mobile devices. Primary instrument for collecting the responses from participating experts is questionnaire. The Delphi method is a systematic, interactive forecasting method which relies on a panel of experts. The experts answer questionnaires in two or more rounds. After each round, a facilitator provides an anonymous summary of the experts' forecasts from the previous round as well as the reasons they provided for their judgments. Thus, experts are encouraged to revise their earlier answers in light of the replies of other members of their panel. It is believed that during this process the range of the answers will decrease and the group will converge towards the "correct" answer. Finally, the process is stopped after a pre-defined stop criterion (e.g. number of rounds, achievement of consensus, and stability of results) and the mean or median scores of the final rounds determine the results.

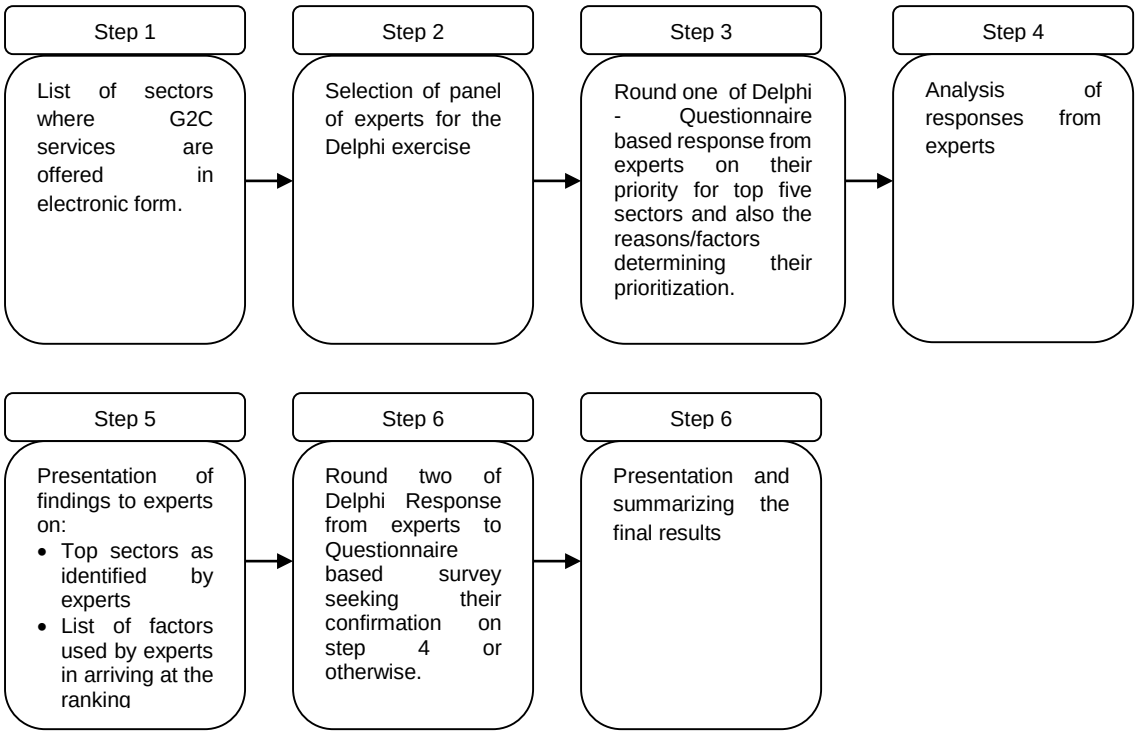


Figure 13 Approach to Delphi study

- **Step 1:** List of sectors where G2C services are offered – For the purpose of initial listing of Government services, the list of services as identified for the common services centers by Ministry of Communications and Information technology (www.csc.gov.in), has been used.
- **Step 2:** Selection of experts for the Delphi panel –

  The panel chosen for Delphi study comprised of experts meeting the following criteria:

  a. Should have worked in e-governance/ m-governance
  b. Work experience of more than ten years
  c. Directly involved in application of ICT in Government
  d. Involved in consulting/ implementation/ research or training

  The expert group comprised of experts representing consultancy (3), government (2), academia (1), IT Companies (1) and telecom (2).
- **Step 3: Delphi Round one -** Questionnaire based response from experts on their priority for top five sectors and also the reasons/factors determining their prioritization. The survey instrument was an online web based questionnaire survey with a web link to survey at www.surveymonkey.com The web based questionnaire was used considering the dispersed geographical location of experts. The questionnaire is attached at Appendix – 2. The first round questionnaire (Appendix – 2) had a total of 14 questions. The first two questions relate to collecting the demographic information such as name and sector that the expert works for. The third question contains a list of twenty seven sectors where G2C services are offered. The expert was required to select the top priority sector as identified by him/her. The fourth question required the expert to specify the reason/factor which he/she felt is primary one for the top ranking.

Similarly, questions five to twelve were repeated for sectors identified as priority two to five. Question thirteen required the experts to rank the remaining 22 sectors in the order of importance. Question 14 was an open ended question for experts to offer any comments/suggestions.

- **Step 4:** Analysis of responses from experts – The first round questionnaire based responses were analyzed for the following:
    - Top sectors for application of mobile government services (based on frequency of choice by experts for each sector)
    - Listing of reasons/factors used by experts in determining the priority for sectors for application of mobile government services and also the ranking of reasons based on the frequency of use by experts in ranking the sectors.
- **Step 5:** Presentation of findings of Round one to experts. A PowerPoint presentation covering the findings of round one was prepared and sent across individually to the experts. The presentation included the findings of round one on the following:
    - Top sectors based on frequency of choice by experts
    - Sector with highest priority based on distribution of experts' choice
    - Summary list of factors/reasons used by experts in determining the priority for sectors for application of mobile government services
    - Ranking of factors/reasons based on frequency of use by experts.
    - Average ranking of all sectors
- **Step 6:** Round two of Delphi - Another online questionnaire was sent across to all the experts. The questionnaire sought confirmation of experts to confirm the choice of sectors and factors/reasons or to suggest further changes. The same was also done through www.surveymonkey.com

- **Step 7:** Final analysis of the results and summarizing the findings.

3.7 Phase II: Descriptive research

The phase II is a descriptive phase involving the study of the following:

- Phase IIA: Study of relationship between mobile government service quality parameters and user acceptability of mobile government services.
- Phase II B: Study of relationship between factors affecting use of mobile government services in India and mobile government service quality parameters

3.7.1 Research Instrument:

This phase of study uses a Questionnaire/online based survey (common to phase IIA and IIB above) of Government officials and citizens. The respondents have been asked to rate the following:

a. The impact of mobile government service quality parameters on users' acceptability of services over mobile devices.
b. The impact of factors affecting use of mobile government services on mobile government service quality parameters.

The respondents have also been asked to rate the acceptability in general of government services over mobile devices. A combination of e-mail based requests, personal contacts, telephonic and field based contact have been used to elicit responses. www.surveymonkey.com has been used a platform to collect and analyze responses.

Since the respondents were required to indicate a degree of agreement or disagreement on impact of factors and service quality parameters, Likert scale has been used. Respondents have been asked to rate the impact on a five point scale. Since the number of factors was large, this phase of study has been limited to first six factors.

The survey instrument had a total of twenty nine questions. The first eleven questions relate to collecting the demographic information such as name, gender, age, current location (state/UT), profession, whether a user of e-government services, whether a user of mobile government services, whether a government employee, sector worked for, e-mail and phone number. Question 12 requires the respondent to choose the sector for which the response is being submitted. These sectors are the same which have been identified as the top priority sectors in Phase – IC. Respondents were given the choice that in case they want to submit the responses for more than one sector, they may fill in more than responses. Question 13 asks for a ranking of acceptability of mobile government services to users. The ranking was done on a five point Likert scale viz., not acceptable, somewhat acceptable, acceptable, highly acceptable and definitely acceptable. Question 14 required the respondents to rate the impact of service quality parameters on users' acceptability of mobile government services. Top seven ranked service quality parameters were presented to the respondents to be ranked on a five point Likert scale viz., No impact, Little impact, considerable impact, high impact and very high impact. Question 15 – 28 asked the respondents to rate the impact of individual factors on service quality parameters.

3.7.2 Sampling

3.7.2.1 Target Population

The target population i.e. the collection of elements that possess the information sought by the researcher and about which the inference is to be made includes the following:

a. Government agencies as providers of services
b. Citizens as users of services

3.7.2.2 Sampling Frame

The directory of officials in State and Central Government departments, autonomous organizations, corporations and banks have been used as the sampling frame for respondents from Government agencies. Users and non-users of electronic service delivery by Government have been selected randomly as respondents from the citizen group. For the purpose of geographic locations, states identified by Ministry of Communications and Information Technology as leaders and expectant leaders in their e-readiness assessment[3] viz., Delhi, Haryana, Maharashtra, Karnataka, Andhra, Uttarakhand and Chandigarh. Since the study was done last in 2010, some other states have also been included in the geographic sample.

3.7.2.3 Sampling method

Quota sampling has been used for Government officials. Random sampling has been chosen for citizens. The stratification of Government officials has been done based on central and state government employees.

3.7.2.4 Sample size

Around 50 Government officials and 300 citizens (users and non-users of e-government services) have been approached for this phase. As the questionnaire has a total of 17 items of questions a minimum sample size of ten times the items in the questionnaire i.e. 170 was targeted (SPSS 17 for researchers by SL Gupta and Hitesh Gupta – 2011)[43] .

3.7.3 Data Analysis

Since this will involve the examination of differences in the mean values of the dependent variable associated with the effect of controlled variable, ANOVA has been used as a test of means of two population. Two way ANOVA has been done on the dependent variable. E.g. one analysis is How do user acceptability levels (low, medium,

high, very high) interact with ease of use of application (no impact, considerable impact, high impact, very high impact).

The significance of the overall effect has been tested by an F test.

Since there are more than one service quality parameter and more than one factor, multi-variate regression model has also been used to examine the combined effect.

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

DATA ANALYSIS





CHAPTER - 4

4 CHAPTER 4: DATA ANALYSIS

As detailed in the preceding chapters, the research has been carried out in two phases as given below:

a) Phase I : Exploratory research covering the following:

   i. The identification of factors affecting use of mobile Government services in India

   ii. The identification of service quality parameters for mobile government in India

   iii. The prioritization of sectors/identification of citizen services for offering over mobile devices.

b) Phase II: Descriptive research covering the following:

   a. Study of relationship between mobile government service quality parameters (as identified at a (ii) above) and user acceptability of mobile government services.

   b. Study of relationship between factors affecting mobile government in India ((as identified at a (ii) above) and mobile government service quality parameters (as identified at a (ii) above).

   Phase II of study has been conducted for sectors identified at a(iii) above.

The research instruments used for different phases have been listed below:

Phase	Research Instrument
IA: Identification of factors affecting use of mobile government services in India	An online questionnaire based survey of Indian experts
IB: Identification of service quality parameters for mobile government services in India	

1C: Prioritization of sectors for mobile government in India	Questionnaire (As a part of the Delphi)
IIA: Study of relationship between mobile government service quality parameters and user acceptability of mobile government services	Questionnaire based survey of Indian Government officials and citizens
IIB: Study of relationship between factors affecting the use of mobile government services and mobile government service quality parameters	

Table 4.1 Research instruments for different phases

This chapter is an attempt to present the data as collected and also the analysis of the same.

4.1 Phase 1 A: Identification of factors affecting use of mobile government services in India

This phase involves an online questionnaire based survey of Indian experts. The questionnaire is attached at appendix - I .A total of 130 experts were approached for responses to an online questionnaire and 73 responses have been received. This section presents the data on the survey.

The survey instrument had a total of eight questions. The first six relate to collecting the demographic information such as name, gender, age, sector employed, designation and organization. The seventh question contained a list of eighteen factors which was presented to respondents in a randomized manner. The respondents were requested to rank these factors in the order of importance as applicable to Indian conditions. The ranking was required to be done from one to eighteen with one being the most important and eighteen being the least important factor affecting the mobile government services in India. The eighth question was an open ended question wherein the respondents

were asked to add any other factor that they feel has been left out. Some of the respondents also used this question to provide remarks/feedback.

4.1.1 Sector-wise distribution of respondents

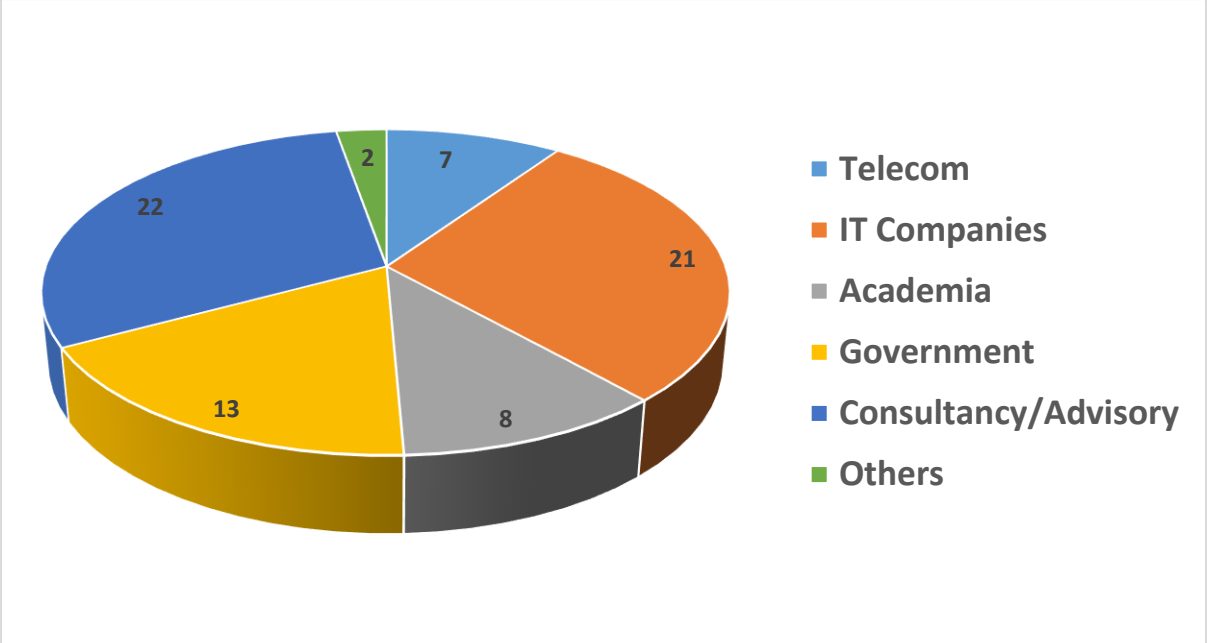


Figure 14 Sector wise distribution of respondents

4.1.2 Age Profile of respondents

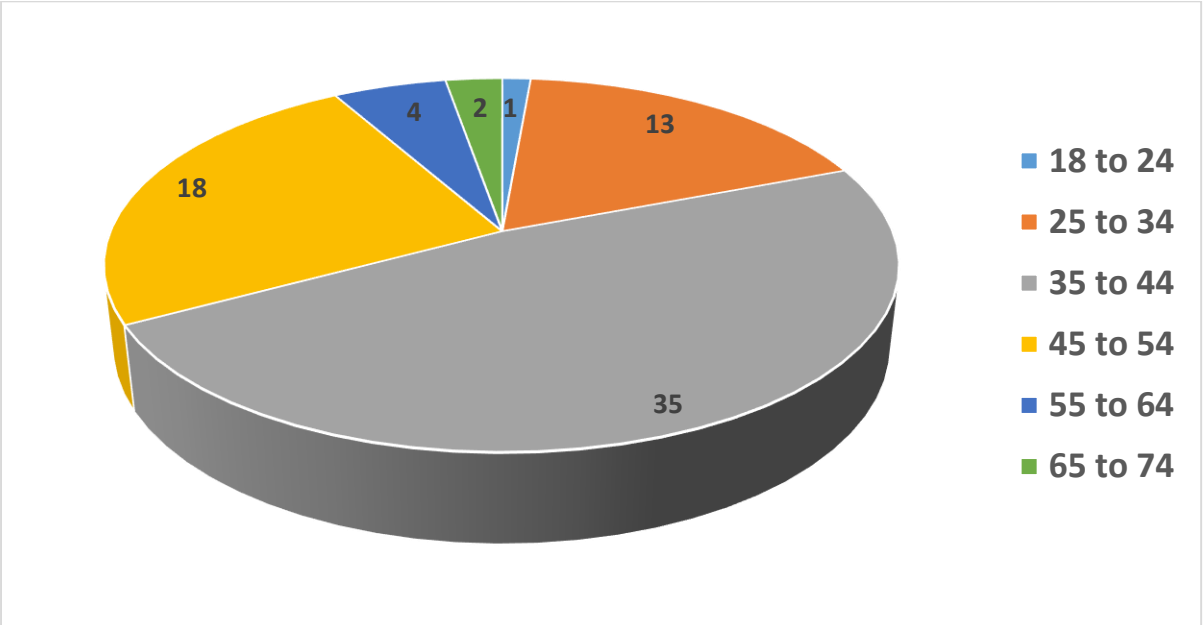


Figure 15 Age profile of respondents

4.1.3 Gender Profile of respondents

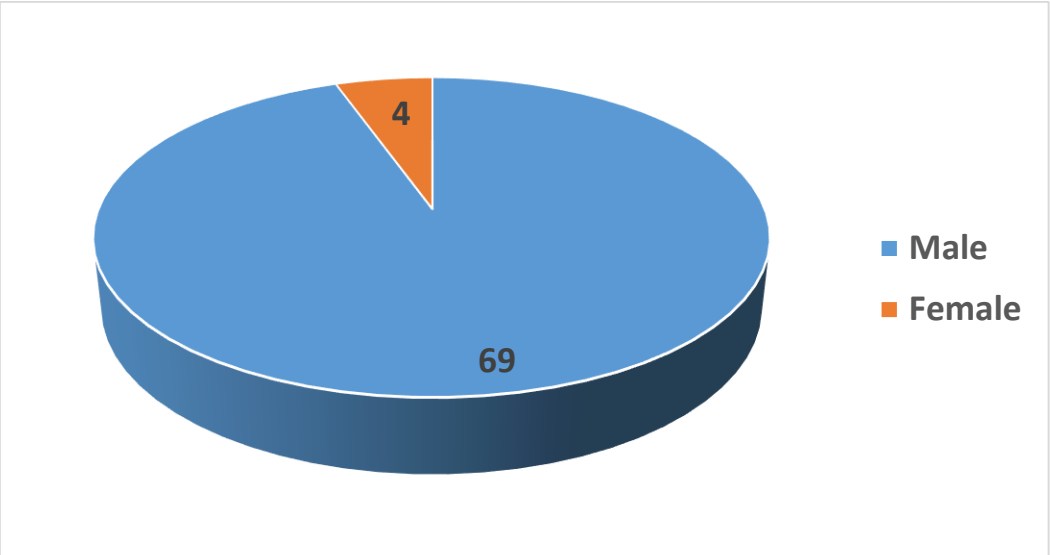


Figure 16 Gender profile of respondents

4.1.4 Average ranking to factors affecting use of mobile government in India

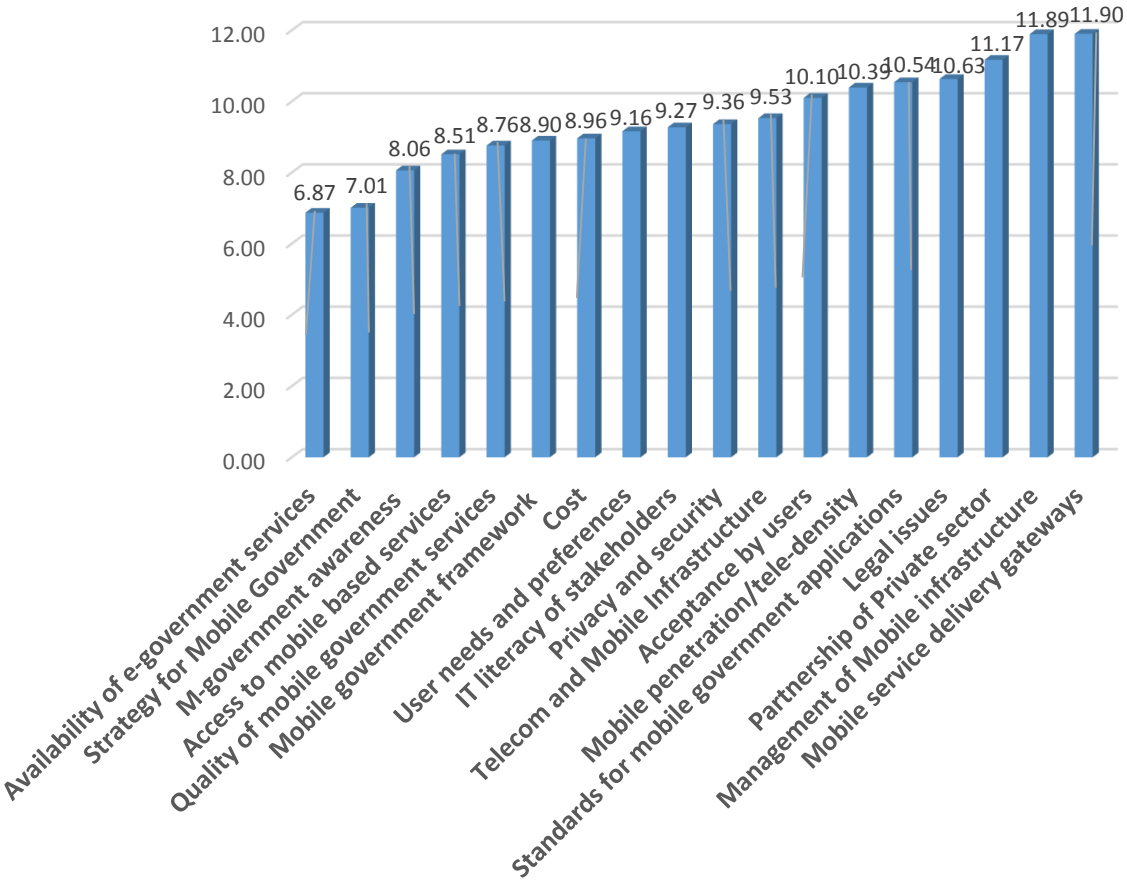


Figure 17 Average ranking to factors affecting use of mobile government in India

The summary of ranking assigned by respondents to factors affecting use of mobile government services in India have been tabulated below:

Factors		Average ranking
1	**E-Government** (Availability of e-government services)	**6.87**
2	**Strategy for Mobile Government**	**7.01**
3	**M-government awareness**	**8.06**
4	**Users' access** to mobile based services (e.g. availability of services over low cost handsets)	**8.51**
5	**Quality of mobile government** services and applications	**8.76**
6	**Framework:** Availability and adoption of a mobile government framework by Government	**8.90**
7	**Cost** of offering and availing services over mobile devices	**8.96**
8	**User Needs:** Addressing user needs and preferences – personalization of applications	**9.16**
9	**IT literacy** of stakeholders	**9.27**
10	**Privacy and security** concerns	**9.36**
11	**Infrastructure:** Availability and use of telecom and mobile Infrastructure for G2C services	**9.53**
12	**Acceptance** by users and change management	**10.10**
13	**Mobile penetration**/tele-density for wireless mobile phones)	**10.39**
14	**Standards** for mobile government applications	**10.54**
15	**Legal issues** (e.g. validity of mobile based G2C transactions)	**10.63**
16	**Partnership of Private sector**	**11.17**
17	**Management of Mobile and Application infrastructure**	**11.89**
18	**Availability of exclusive mobile service delivery gateways and portals**	**11.90**

Table 4.2 Summary of respondents' ranking of factors affecting use of mobile government in India

4.1.5 Other factors suggested by experts

The following additional factors have been suggested by respondents as applicable in Indian context:

a. Will and initiative of Government

b. Accessibility

c. Trust and responsiveness

d. Availability of low cost mobile infrastructure

4.2 Phase 1 B: Identification of service quality parameters for mobile government services in India

As mentioned earlier, the Phase IA and Phase IB have been combined as a single questionnaire. The data on respondents' profile is same as presented in section 4.1 above. Same set of experts have responded to questions about factors as well as service quality parameters

4.2.1 Average ranking to service quality parameters for mobile government in India

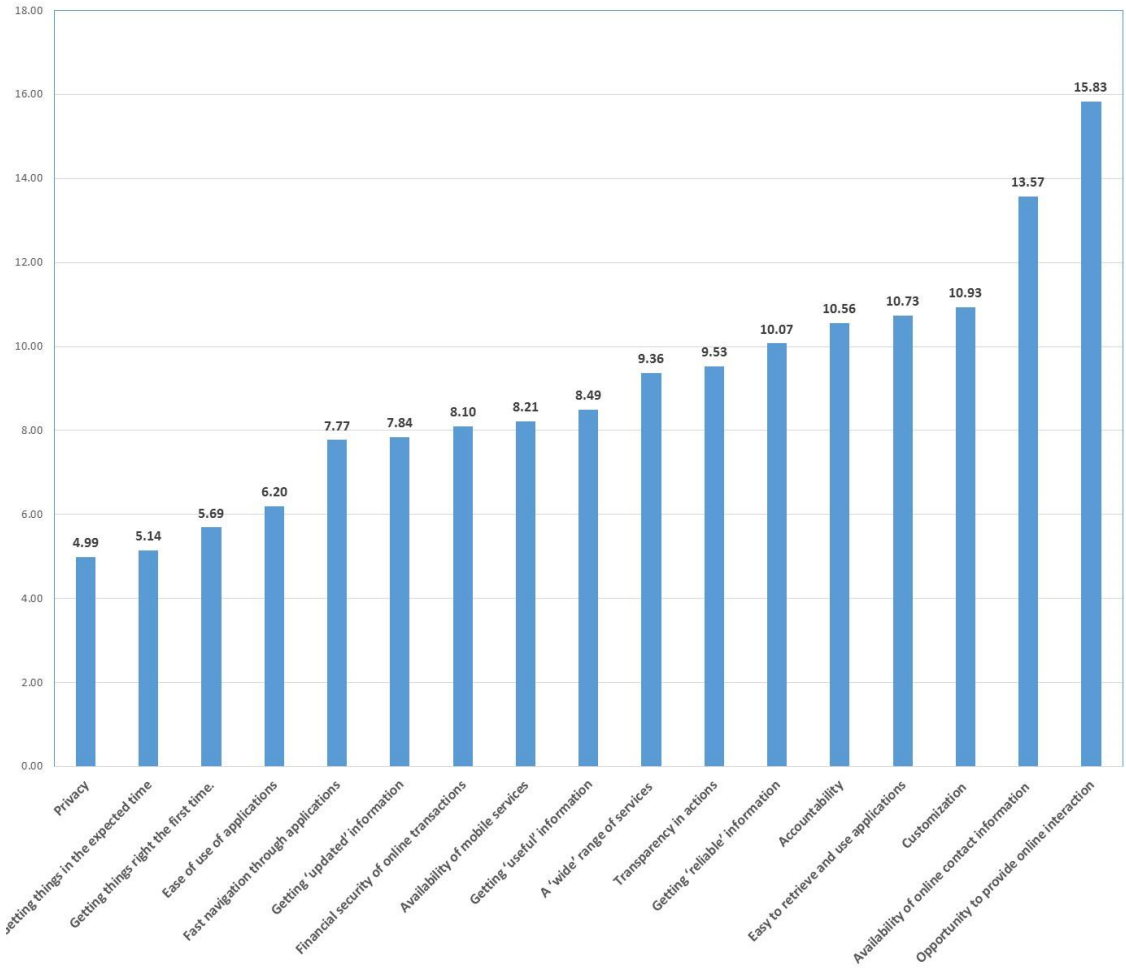


Figure 18Average ranking to service quality parameters by respondents

The summary of average ranking assigned by respondents to the service quality parameters has been tabulated below:

Service Quality Parameter	Average Ranking
Privacy – protection of personal information	4.99
Getting things done in the expected time frame	5.14
Getting things done right the first time.	5.69
Ease of use of applications	6.20
Fast navigation through applications without jams	7.77
Getting 'updated' information through the application	7.84
Financial security of online transactions	8.10
Availability of mobile services at all days and at all times	8.21
Getting 'useful' information through the application	8.49
A 'wide' range of services through applications	9.36
Transparency in actions on applications	9.53
Getting 'reliable' information	10.07
Accountability in case of service failure	10.56
Easy to retrieve and use applications	10.73
Customization according to needs	10.93
Availability of online contact information of key stakeholders in case required	13.57
Opportunity to provide online interaction with other users	15.83

Table 4.3 Average ranking of mobile government service quality parameters

4.2.2 Other service quality parameters suggested by experts

a. Local Language interface

b. Integrated approach to mobile government services

c. Device support

d. Integration with backend application

e. Effective grievance redressal

f. User friendliness of applications.

4.3 Phase 1 C: Delphi exercise on prioritization of sectors for mobile government services in India

This phase involved a Delphi exercise of Indian experts. Nine experts participated in the Delphi exercise. The experts represent IT, telecom, government, consulting and academia. A web based questionnaire has been used considering the dispersed geographical location of experts. As mentioned earlier, the first round questionnaire had a total of 14 questions. The first two questions relate to collecting the demographic information such as name and sector that the expert works for. The third question contained a list of twenty seven sectors where G2C services are offered. The expert was required to select the top priority sector as identified by him/her. The fourth question required the expert to specify the reason/factor which he/she felt is primary one for the top ranking. Similarly questions five to twelve were repeated for sectors identified as priority two to five. Question thirteen required the experts to rank the remaining 22 sectors in the order of importance. Question 14 was an open ended question for experts to offer any comments/suggestions.

4.3.1 Sector wise distribution of Delphi Experts

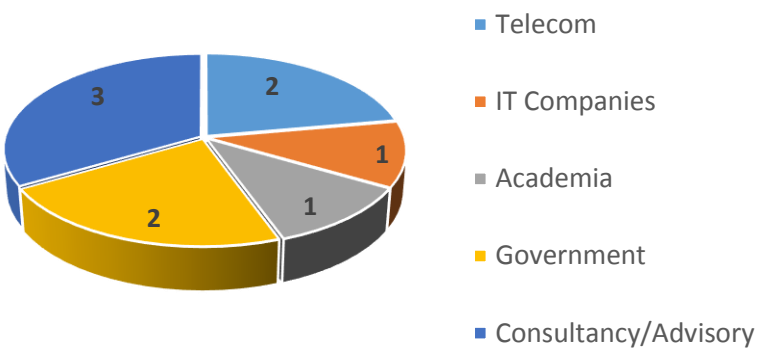


Figure 19 Sector-wise distribution of Delphi experts

4.3.2 Frequency of priority ranking for sectors by experts

Sector	Frequency of ranking by experts by priority					
	1	2	3	4	5	Total
Agriculture	1	1	1	2	1	6
Health	3		1	1	1	6
National ID	1					1
Railways	2					2
Rural Development	2		1	1	2	6
Land Records		2				2
Employment					1	1
Municipalities		2				2
Public Works Department				1		1
Judiciary					1	1
Social welfare		3		1	2	6
Education			3		1	4
Election			1	1		2
Food & Civil Supplies			2	1		3
Taxes				1		
Police		1				1

Table 4.4 Frequency of priority ranking of sectors by experts

The top sectors based on frequency of ranking by experts as given above is shown below:

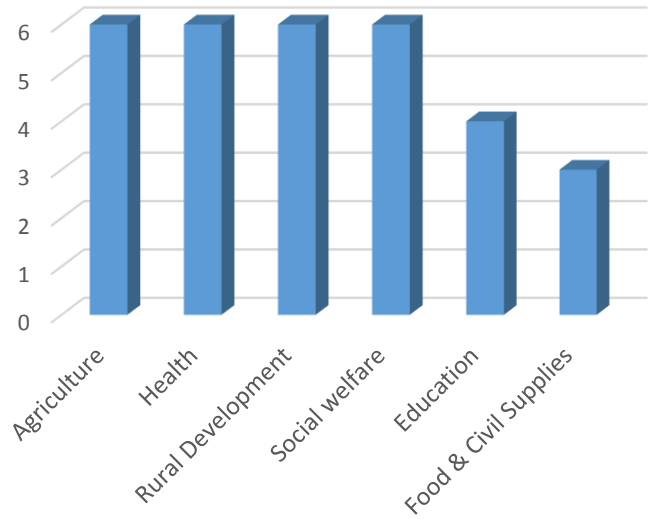


Figure 20 Top priority sectors for mobile government services

4.3.3 Reasons assigned by experts for prioritization:

The following are the reasons/factors for the prioritization by experts:

- Number of citizens impacted by the sector services
- Potential of improving the service quality (transparency, speed, streamlining etc.)
- Section/socio-economic profile of the users getting impacted
- Users' literacy, awareness and knowledge levels
- Access (or otherwise) to users to government applications through other means such as PC, Internet etc.
- Tele-density/mobile penetration
- Frequency of use of government services /interaction with Government
- Demand supply gap in services infrastructure
- Failure of traditional modes of communication/interaction
- Need for collaboration among multiple agencies

- The speed at which the impact can be made
- Policy level priority by Government to the sector
- Higher visibility for the change (once brought in)
- Sectors yet to be taken up
- Availability of global references/case studies in the sector as a reference point

4.4 Phase IIA: Descriptive research on relationship between mobile government service quality parameters and user acceptability of mobile government services

As mentioned in chapter 3, this phase of study uses a Questionnaire/online based survey) of Government officials and citizens. The survey instrument had a total of twenty nine questions. The first eleven questions relate to collecting the demographic information such as name, gender, age, current location (state/UT), profession, whether a user of e-government services, whether a user of mobile government services, whether a government employee, sector worked for, e-mail and phone number. Question 12 requires the respondent to choose the sector for which the response is being submitted. These sectors are the same which have been identified as the top priority sectors in Phase – IC. Question 13 asks for a ranking of acceptability of mobile government services to users. The ranking was done on a five point Likert scale viz., not acceptable, somewhat acceptable, acceptable, highly acceptable and definitely acceptable. Question 14 required the respondents to rate the impact of service quality parameters on users' acceptability of mobile government services. Top seven ranked service quality parameters were presented to the respondents to be ranked on a five point Likert scale viz., No impact, Little impact, considerable impact, high impact and very high impact.

4.4.1 Age profile of respondents

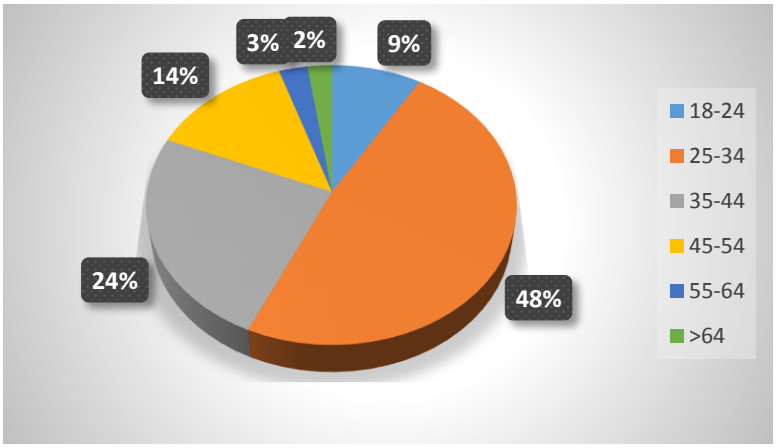


Figure 21 Age profile of respondents

4.4.2 Gender profile of respondents

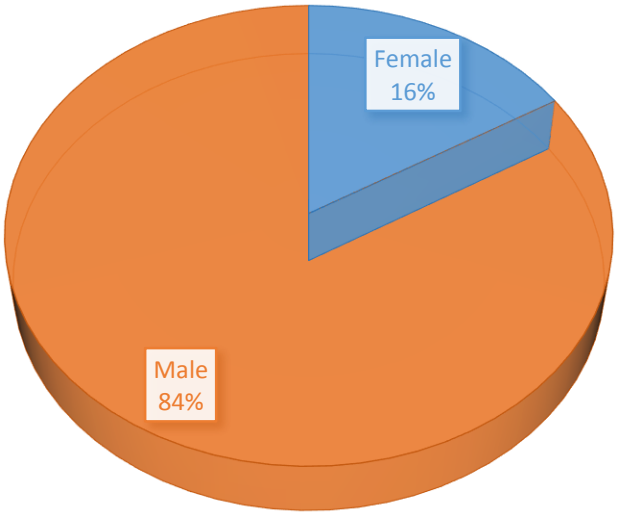


Figure 22 Gender profile of respondents

4.4.3 Location-wise distribution of respondents

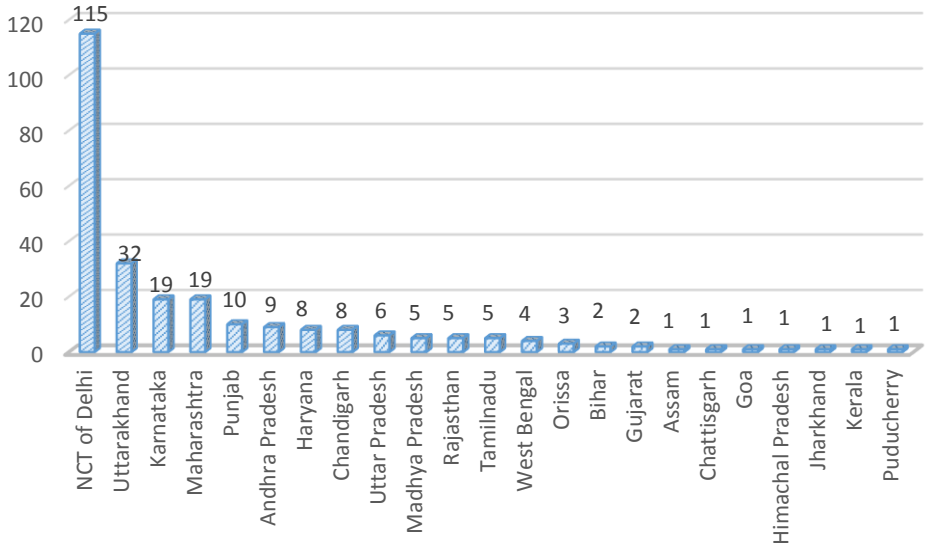


Figure 23 Location-wise distribution of respondents (total responses = 257)

4.4.4 Profession profile of respondents

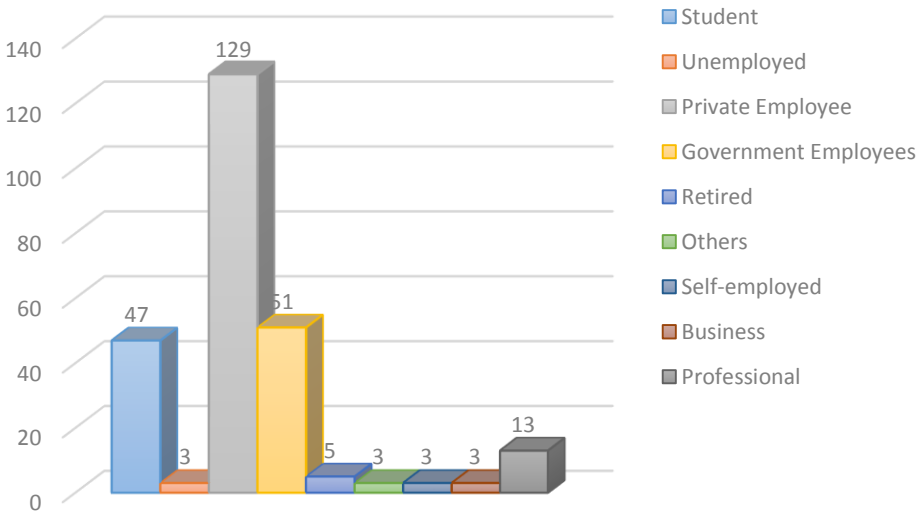


Figure 24Profession profile of respondents

4.4.5 Whether respondents are users of e-government services?

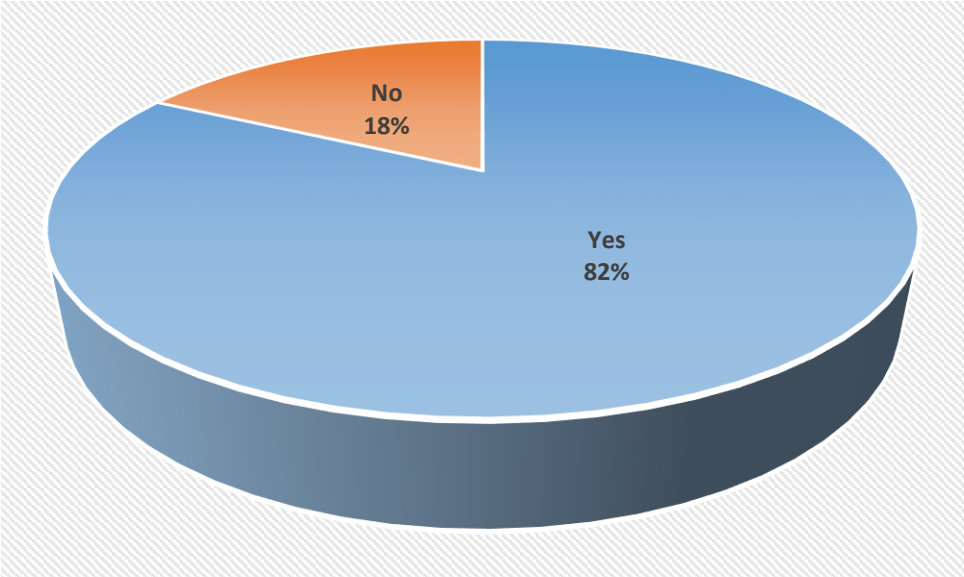


Figure 25 e-government service usage profile of respondents

4.4.6 Whether respondents are users of mobile government services?

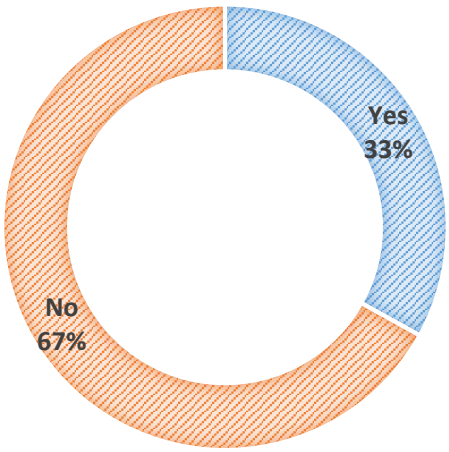


Figure 26 Mobile government service usage profile of respondents

4.4.7 Percentage of respondents who are Government employees involved in providing e-government services?

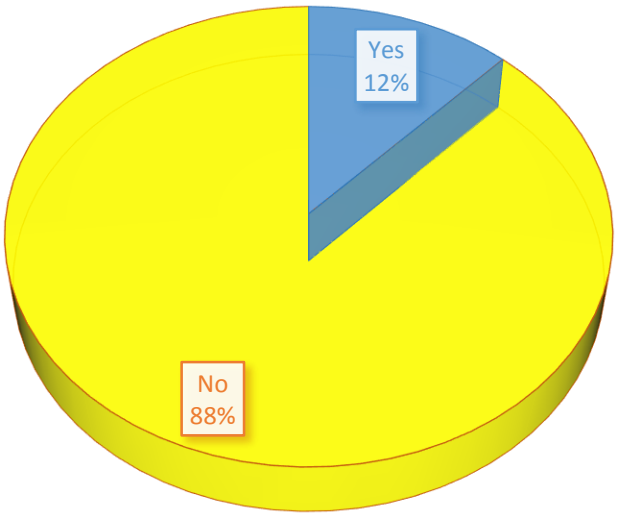


Figure 27 Percentage of respondents who are government employees providing e-government services

4.4.8 Sector-wise distribution of respondents

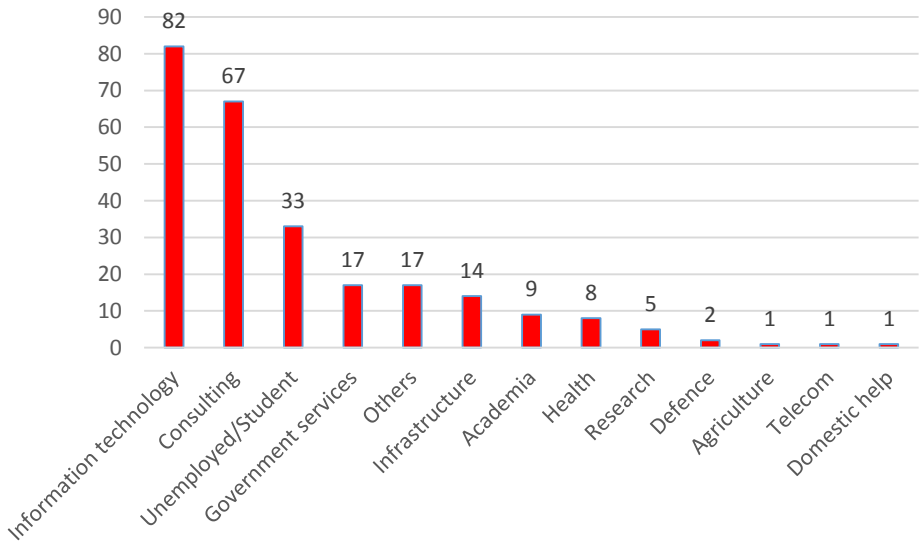


Figure 28 Sector-wise distribution of respondents

4.4.9 Sector-wise distribution of responses

The respondents were given the choice of submitting their response for the sector (one among the top seven identified in the Delphi exercise). The distribution of the responses based on the sectors is given below.

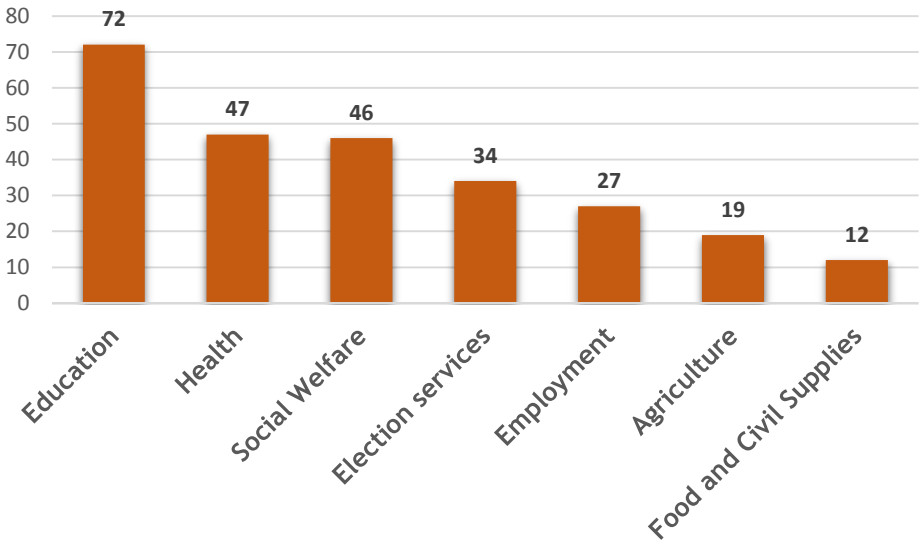


Figure 29 Sector-wise distribution of responses

4.4.10 Rating by respondents of acceptability of mobile government services

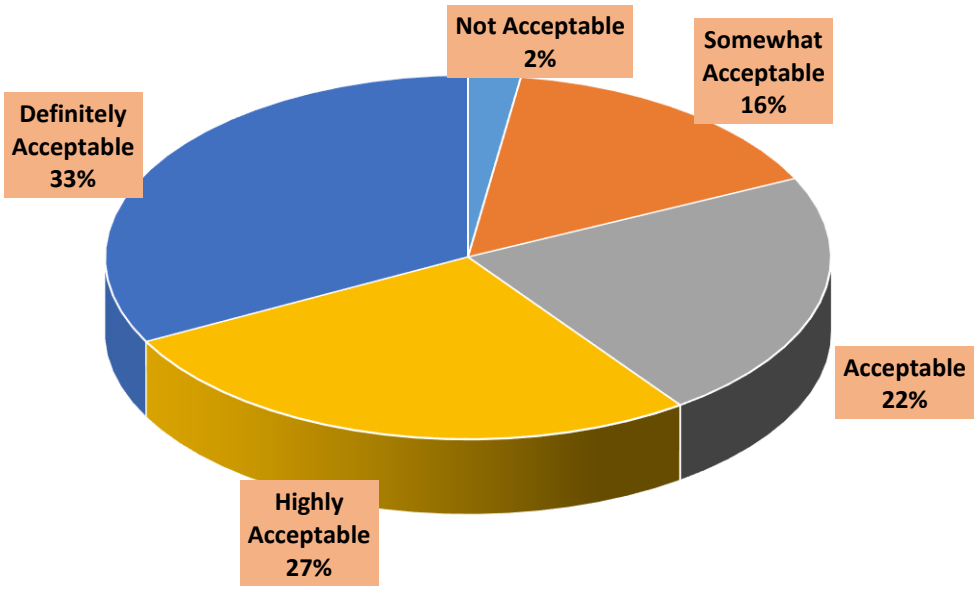


Figure 30 Rating of acceptability of mobile government services

4.4.11 Effect of service quality parameters on acceptability of m-government services

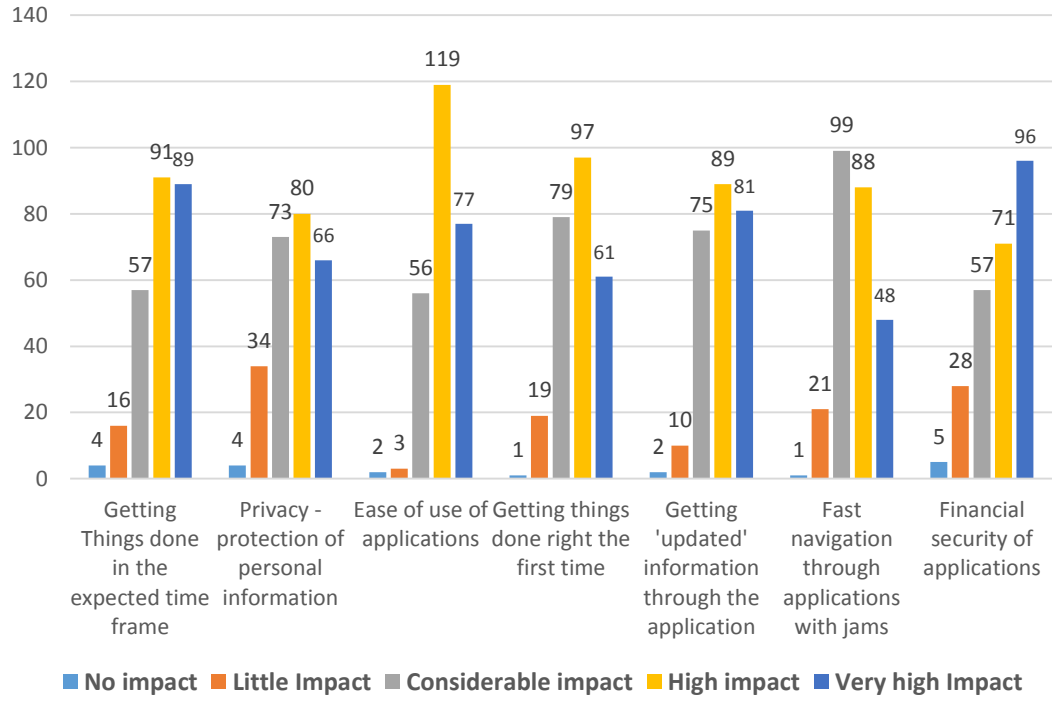


Figure 31 Respondents' rating on effect of service quality parameters on user acceptability of mobile government services

4.5 Phase IIB: Relationship between mobile government service quality parameters and factors affecting use of mobile government services

This phase is aimed at establishing the relationship between factors affecting mobile government and service quality parameters for mobile government. A common questionnaire has been used for Phase II A and Phase B. The profile of respondents is same as detailed in section 4.4 above. The questionnaire had 28 questions. The first 12 questions were targeted at collecting the demographic information, question 13-14 were targeted to get information on impact of service quality parameters on the user acceptability of mobile government services and question 15 – 28 asked the respondents

to rate the impact of individual factors on service quality parameters and also respondents' rating of mobile government in achieving the service quality parameters. This section highlights the data as collected for this phase.

4.5.1 Respondents' rating on mobile government as a means to get things done in the expected time frame

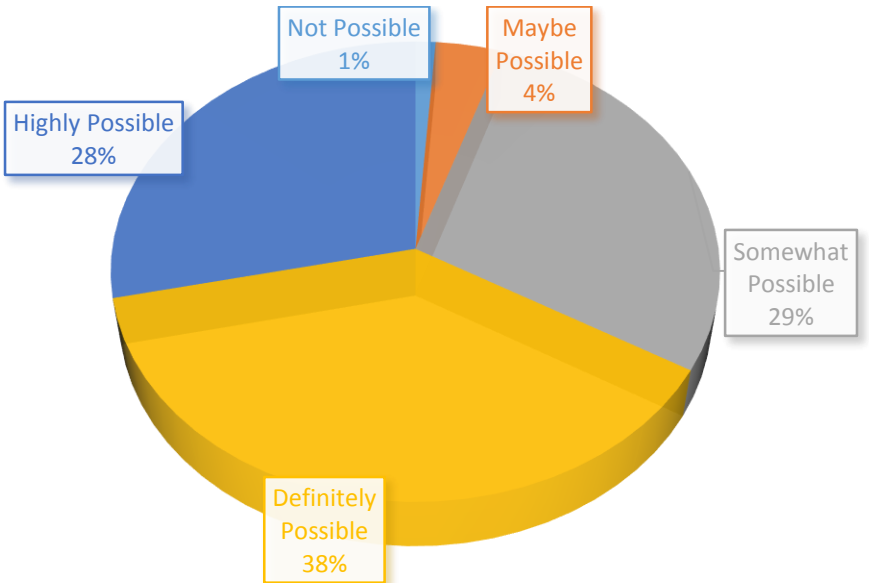


Figure 32 Respondents' rating on mobile government as a means to get things done in the expected time frame

4.5.2 Effect of factors affecting mobile government on the service quality parameter on "Getting this done in the expected time frame"

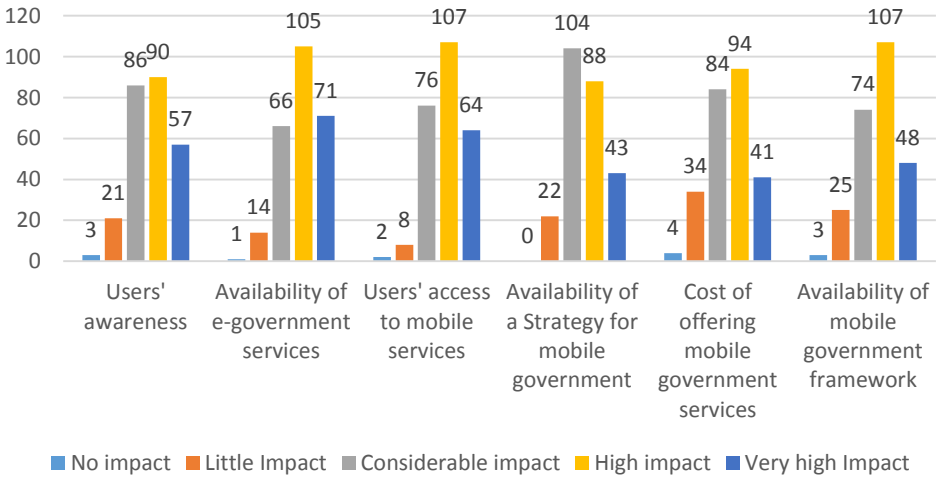


Figure 33 Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Getting things done in the expected time frame"

4.5.3 Respondents' rating on mobile government as a means to maintain privacy of information

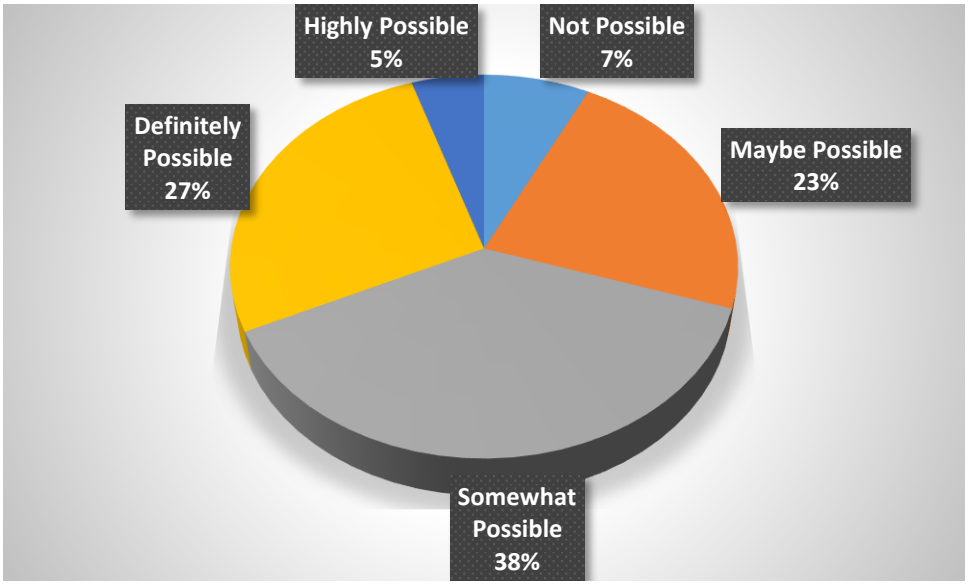


Figure 34Respondents' rating on mobile government as a means to maintain privacy of information

4.5.4 Effect of factors affecting mobile government on the service quality parameter on "Maintaining privacy of information"

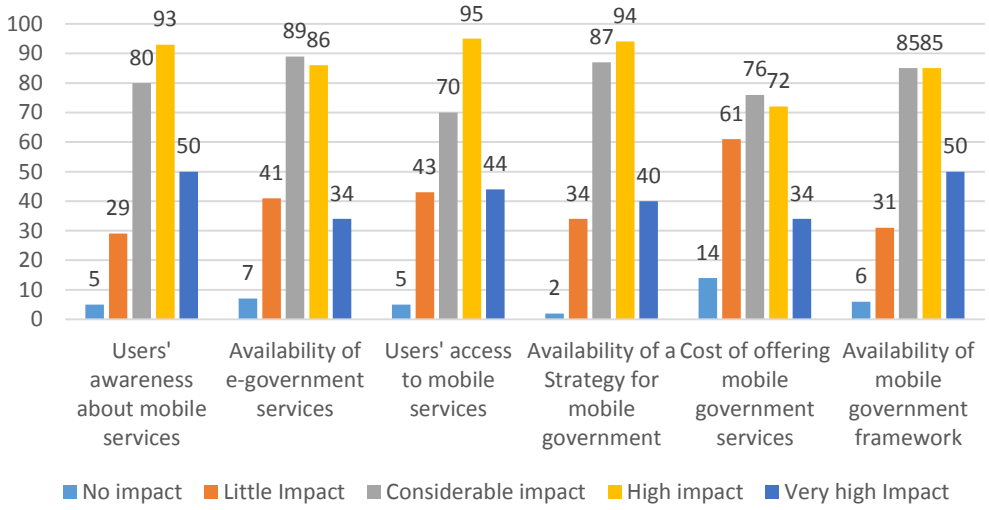


Figure 35 Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Maintaining privacy of Information"

4.5.5 Respondents' rating on mobile government as a means to achieve ease of use of applications

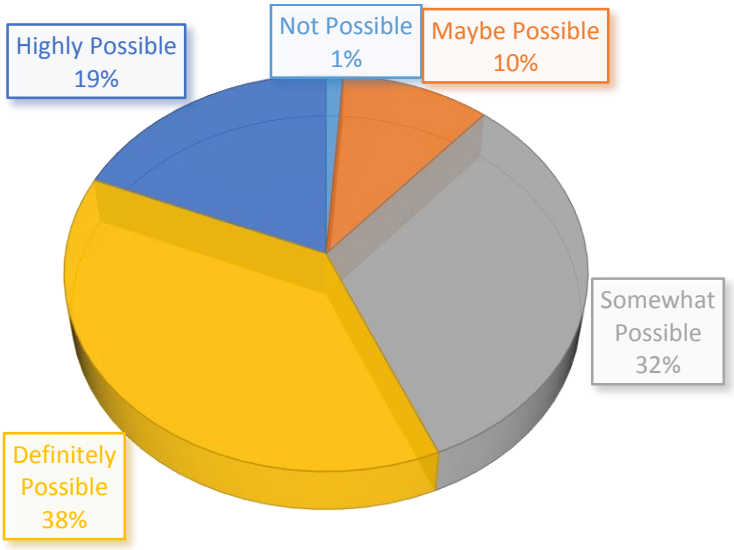


Figure 36: Respondents' rating on mobile government as a means to achieve ease of applications

4.5.6 Effect of factors affecting mobile government on the service quality parameter on "Ease of use of applications"

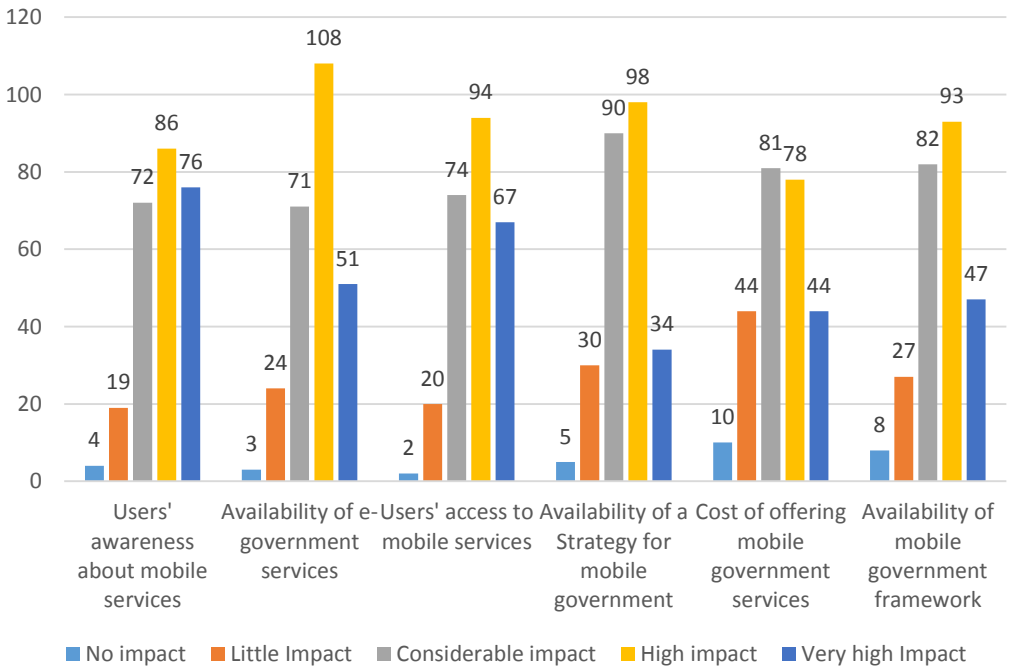


Figure 37: Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Ease of use of applications"

4.5.7 Respondents' rating on mobile government as a means to getting the things done right the first time

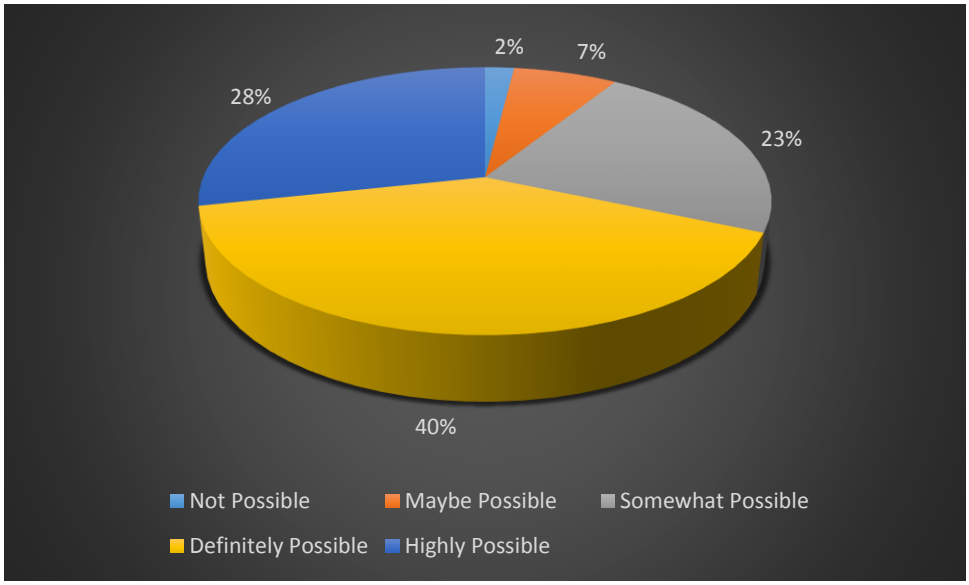


Figure 38: Respondents' rating on mobile government as a means to getting the things done right the first time

4.5.8 Effect of factors affecting mobile government on the service quality parameter on "Getting things right the first time"

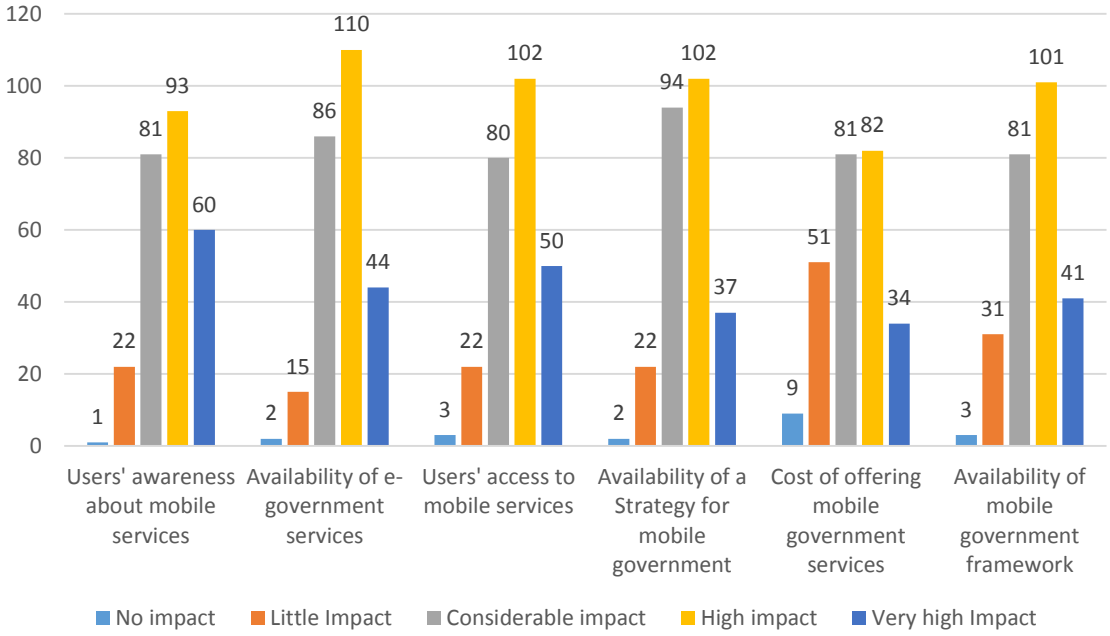


Figure 39: Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Getting things done right the first time"

4.5.9 Respondents' rating on mobile government as a means to getting updated information

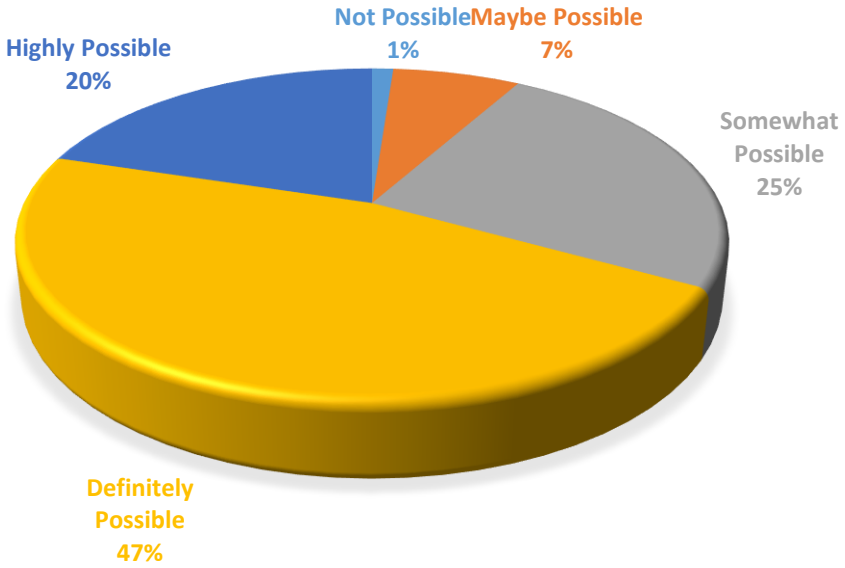


Figure 40: Respondents' rating on mobile government as a means to getting updated information

4.5.10 Effect of factors affecting mobile government on the service quality parameter on "Getting updated information"

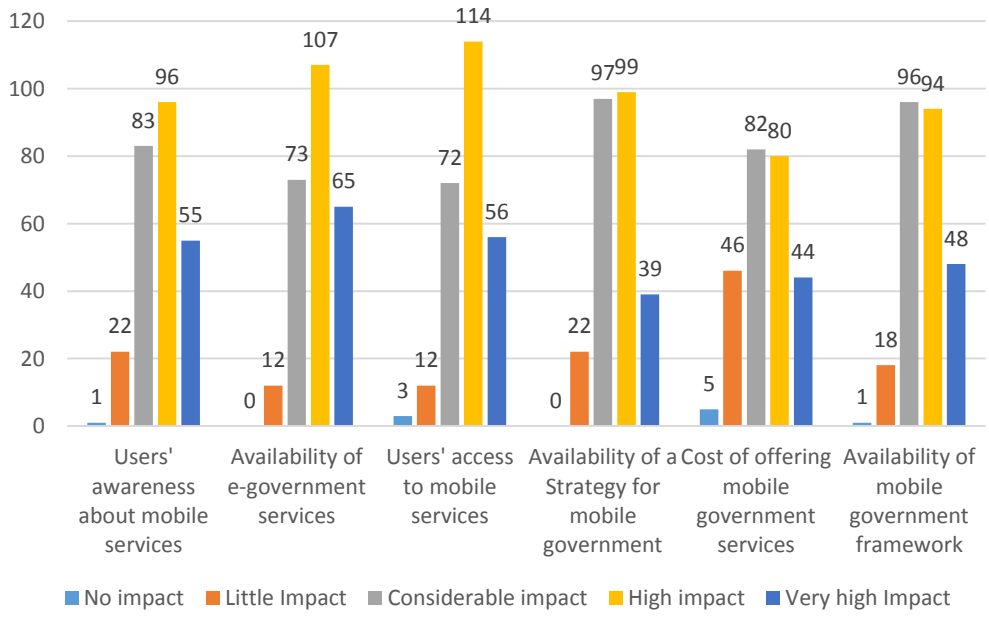


Figure 41: Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Getting updated information"

4.5.11 Respondents' rating on mobile government as a means to getting fast movement through the applications

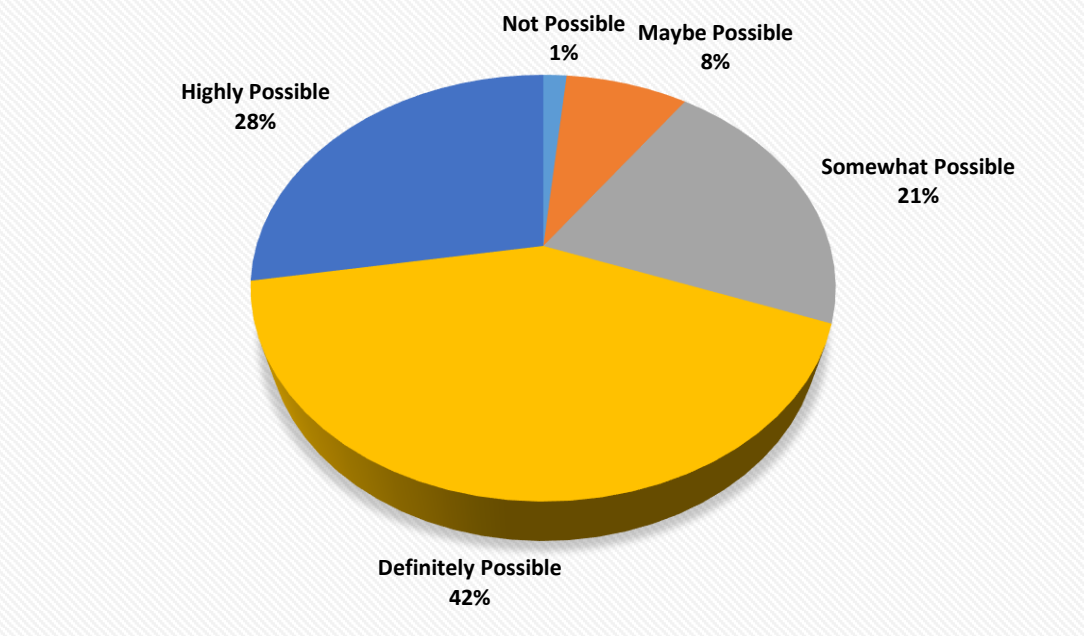


Figure 42: Respondents' rating on mobile government as a means to getting fast movement through the applications

4.5.12 Effect of factors affecting mobile government on the service quality parameter on "Getting fast movement through the applications"

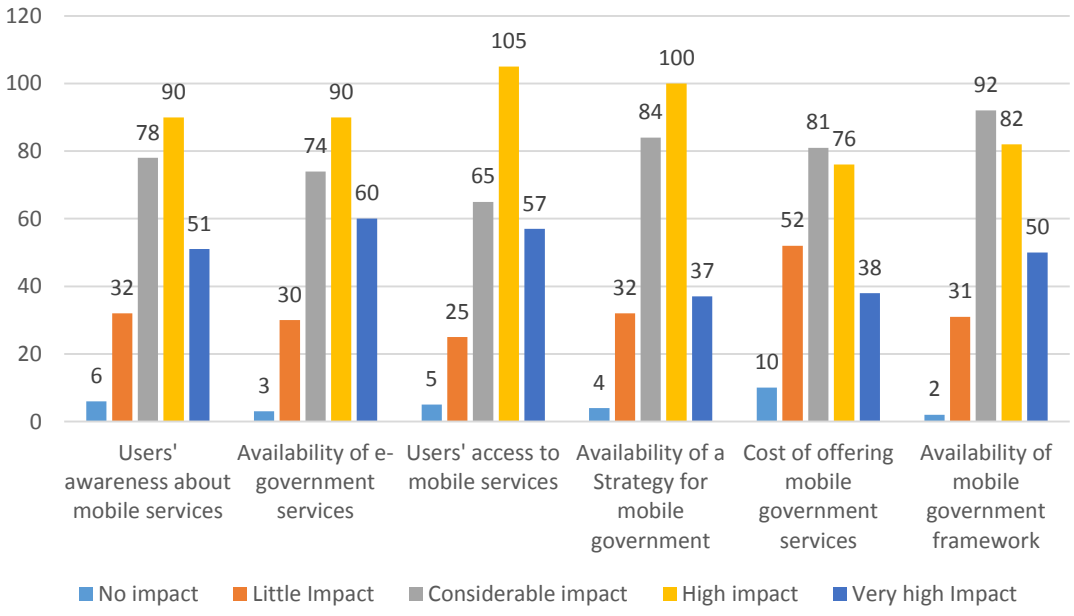


Figure 43: Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Getting fast movement through the applications"

4.5.13 Respondents' rating on mobile government as a means to achieving financial security of transactions

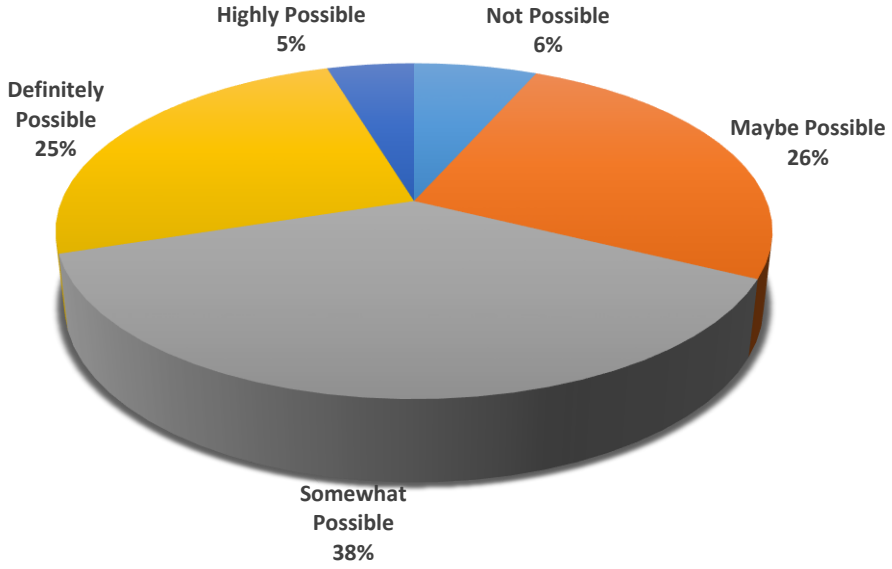


Figure 44: Respondents' rating on mobile government as a means to achieving financial security of applications

4.5.14 Effect of factors affecting mobile government on the service quality parameter on "Financial security of transactions"

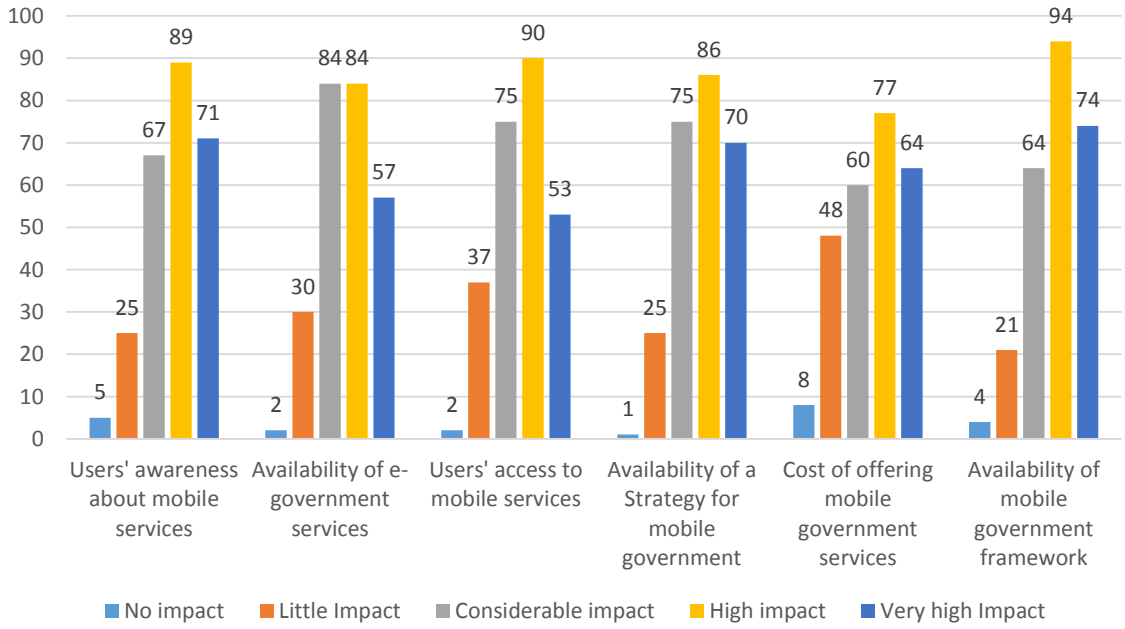


Figure 45: Respondents' rating on impact of factors affecting mobile government on the service quality parameter on "Financial security of transactions"

4.6 Data Analysis

This section presents the analysis of data for both the phases i.e. the exploratory phase (Phase – IA, Phase – IB and Phase IC) and the descriptive phases (Phase IIA and Phase IIB). This section details the findings of the exploratory phase and highlights the outcome of hypothesis testing for Phase II i.e. study of relationship between services quality parameters and user acceptability of mobile government services and also on the study of relationship between factors affecting mobile government and service quality parameters.

4.6.1 Phase – I: Exploratory Phase

4.6.1.1 Phase – I A: Identification of factors affecting use of mobile government services in India

As mentioned earlier in section 4.6, this phase of study uses a Questionnaire/online based survey with experts groups from researchers, academicians, government policy makers, telecom companies, IT companies and NGOs. As the study involved preference and ranking, rank order scaling has been used. The respondents have been asked to rank the factors based on their applicability to Indian conditions. Stratified sampling has been used with the experts' industry association as the basis of stratification. The sampling is disproportionate considering the disproportionate size of the target population. Stratified sampling has been used as the population is skewed.

The data analysis has been done as given below:

Exploratory Research question	Tools for data analysis
What are the factors affecting use of mobile government services in India?	Simple frequency distribution of ranks assigned by experts to different factors with average rank as the basis of final rating of importance in India
What is the difference between factors affecting use of mobile	Rank correlation has been done to assess the statistical difference between ranking in

government services as identified globally vis-à-vis the corresponding factors for India?	Indian conditions Vis-à-vis the other geogrpahies

Table 4.5 Tools for data analysis

4.6.1.2 Respondents' ranking of identified factors:

The users' responses have been analysed based on average ranking assigned to each factor as tabulated below:

	Factors	Average Ranking by Respondents
1	**E-Government** (Availability of e-government services as a pre-requisite for mobile government services)	**6.87**
2	**Strategy for Mobile Government**	**7.01**
3	**M-government awareness** (Awareness of stakeholders about the availability of Government to citizen services over mobile)	**8.06**
4	**Users' access** to mobile based services (e.g. availability of services over low cost handsets)	**8.51**
5	**Quality of mobile government** services and applications	**8.76**
6	**Framework:** Availability and adoption of a mobile government framework by Government	**8.90**
7	**Cost** of offering and availing services over mobile devices	**8.96**
8	**User Needs:** Addressing user needs and preferences – personalization of applications	**9.16**
9	**IT literacy** of stakeholders	**9.27**
10	**Privacy and security** concerns	**9.36**
11	**Infrastructure:** Availability and use of telecom and mobile Infrastructure for G2C services	**9.53**
12	**Acceptance** by users and change management	**10.10**
13	**Mobile penetration**/tele-density for wireless mobile phones)	**10.39**
14	**Standards** for mobile government applications	**10.54**
15	**Legal issues** (e.g. validity of mobile based G2C transactions)	**10.63**
16	**Partnership of Private sector** (in mobile government application development and management)	**11.17**
17	**Management of Mobile and Application infrastructure**	**11.89**
18	**Availability of exclusive mobile service delivery gateways and portals**	**11.90**

Table 4.6 Respondents' ranking of identified factors

The order of factors as ranked by respondents in terms of applicability to Indian conditions indicate that the following factors are considered to be most important in Indian conditions:

1. *E-Government i.e. availability of e-government services as a pre-requisite for mobile government*
2. *A strategy for mobile government*
3. *Mobile Government Awareness*
4. *Users' access to services*
5. *Quality of mobile government services*
6. *Availability of mobile government framework*

4.6.1.3 Analysis of difference between ranking of factors as identified globally vis-à-vis India

It is also observed that the importance assigned to factors by Indian experts for Indian conditions is different and not correlated to the one identified by Shadi Al-Khamayaseh, Elaine Lawrence and Agnieszka Zmijewska (2006) [3] wherein 81% of the respondents were from Europe. The spearman's rank correlation on ranking of factors shows r = 0.003 with an insignificant value of p = 0.117 (>0.05). This indicates that there is no correlation between the two ranks. This confirms the view that Indian specific factors are different from developed nations.

4.6.2 Phase – I B: Identification of service quality parameters for mobile government in India

The identification of service quality parameters has been done using the same methodology as for identification of factors affecting mobile government, as explained above. The study uses an India specific extension to the approach adopted by Shadi Al-Khamayseh, Elaine Lawrence and Agnieszka Zmijewska (2008) [3] in identifying success factors in Interactive mobile government. The purpose behind using an extension of their approach is twofold – one to start with an initial set of e-Government service quality parameters identified by researchers as the basis of identification of

service quality parameters for mobile government in India and second to prioritize the identified factors with specific reference to Indian conditions.

4.6.2.1 Analysis of results of users' ranking of identified service quality parameters

The users' responses have been analysed based on average ranking assigned to each service quality parameter. The average of ranks assigned by respondents to each service quality parameter has been tabulated below:

Service Quality Parameter	Average Ranking	Relative Importance of the service quality parameter
Privacy – protection of personal information	4.99	1
Getting things done in the expected time frame	5.14	2
Getting things done right the first time.	5.69	3
Ease of use of applications	6.20	4
Fast navigation through applications without jams	7.77	5
Getting 'updated' information through the application	7.84	6
Financial security of online transactions	8.10	7
Availability of mobile services at all days and at all times	8.21	8
Getting 'useful' information through the application	8.49	9
A 'wide' range of services through applications	9.36	10
Transparency in actions on applications	9.53	11
Getting 'reliable' information	10.07	12
Accountability in case of service failure	10.56	13
Easy to retrieve and use applications	10.73	14
Customization according to needs	10.93	15
Availability of online contact information of key stakeholders in case required	13.57	16
Opportunity to provide online interaction with other users	15.83	17

Table 4.7 Ranking of mobile government service quality parameters

The following service quality parameters have been assigned an average ranking of less than 10 (out of 17) based on experts' perception of their importance in Indian conditions

1. Privacy – protection of personal information

2. Getting things done in the expected time frame
3. Getting things done right the first time.
4. Ease of use of applications
5. Fast navigation through applications without jams
6. Getting 'updated' information through the application
7. Financial security of online transactions
8. Availability of mobile services at all days and at all times
9. Getting 'useful' information through the application
10. A 'wide' range of services through applications
11. Transparency in action on applications.

4.6.3 Data Analysis – prioritization of sectors for mobile government services in India

As the research in this area is currently non-existent, **this exploratory study uses Delphi method** to get a priority of sectors with the potential of offering G2C services over mobile devices. Primary instrument for collecting the responses from participating experts is questionnaire. The Delphi technique has been used to arrive at the following:

a. Top sectors based on priority for application of mobile government based delivery of government services.
b. Top reasons/factors determining the priority of sectors for use of mobile government services.

4.6.3.1 Analysis of results of round one of Delphi

The experts were presented with an initial set of twenty seven sectors where G2C services are offered through common service centres i.e. in electronic form. The experts were required to select the top five priority sectors and also identify the reasons/factors for such rankings.

The list of top sectors as identified by experts in round one is given below:

- Health and Family Welfare
- Agriculture
- Rural Development

- Social Welfare
- Education
- Municipalities
- Food and Civil Supplies

4.6.3.1.1 Reasons/factors identified by experts as the basis of the above ranking of sectors:

The experts identified the following reasons/factors determining the priority of the sectors (in the order of frequency of use by experts)

1. Number of citizens impacted by the sector services
2. Potential of improving the service quality (transparency, speed, streamlining etc.)
3. Section/socio-economic profile of the users getting impacted
4. Users' literacy, awareness and knowledge levels
5. Access (or otherwise) to users to government applications through other means such as PC, Internet etc.
6. Tele-density/mobile penetration
7. Frequency of use of government services /interaction with Government
8. Demand supply gap in services infrastructure
9. Failure of traditional modes of communication/interaction
10. Need for collaboration among multiple agencies
11. The speed at which the impact can be made
12. Policy level priority by Government to the sector
13. Higher visibility for the change (once brought in)
14. Sectors yet to be taken up
15. Availability of global references/case studies in the sector as a reference point

4.6.3.1.2 Ranking of all sectors:

The average ranking of all sectors for priority assignment from the perspective of mobile government services, as identified by experts is given below:

Sector	Average Ranking
Health & family welfare	5.44
Agriculture	5.67
Education	7.89
Employment	9.33
Election	9.67
Food and civil supplies	9.78
Social Welfare	10.22
Direct taxes	10.33
Municipalities	11.11
Rural Development	11.22
Commercial taxes	12.56
Information and Public Relations	14.67
Excise & customs	15.00
Company Affairs	15.11
Land Records	15.11
Transport	15.33
Fisheries	15.89
National ID	15.89
Public works department	15.89
Labour	16.56
Railways	16.56
Industrial Policy and Promotion	17.33
Police	18.22
Passport & Visa	18.89
Judiciary	19.56
Property Registration	19.56

Table 4.8 Ranking of sectors by Delphi experts

4.6.4 Analysis of results of round two of Delphi

The presentation of round resulted in discussions with individual experts. The experts confirmed that the findings of round one can be taken as final for the purpose of identification of top five sectors and top five reasons/factors determining the priority.

4.7 Analysis of Phase – II: Descriptive Research

4.7.1 Phase II A: Study of relationship between users' acceptability and service quality parameters

As identified in Phase – I, the following are the top ranked service quality parameters for mobile government services in India:

i. Privacy – protection of personal information
ii. Getting things done in the expected time frame
iii. Getting things done right the first time.
iv. Ease of use of applications
v. Fast navigation through applications without jams
vi. Getting 'updated' information through the application
vii. Financial security of online transactions

The following seven hypotheses have been formulated:

1. Ho: There is no significant relationship between users' acceptability of mobile government services and 'privacy of information'
2. Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting things done in the expected time frame'
3. Ho: There is no significant relationship between users' acceptability of mobile government services and 'ease of use of applications'
4. Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting things right the first time'
5. Ho: There is no significant relationship between users' acceptability of mobile government services and 'financial security of online transactions'
6. Ho: There is no significant relationship between users' acceptability of mobile government services and 'fast navigation through the applications without jams'

7. Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting updated information'

A total of 257 responses were received for this survey.

4.7.1.1 Pilot testing and measure of internal consistency of questionnaire:

For the purpose of checking the internal consistency of questionnaire cronbach's alpha was measured as a test for internal consistency. The test results are tabulated below:

Data Set (questions)	Cronbach's Alpha
Relationship between user acceptability and service quality parameters	0.701
Relationship between factors affecting mobile government and service quality parameter on "getting things done in the expected time frame"	0.690
Relationship between factors affecting mobile government and service quality parameter on "Privacy"	0.700
Relationship between factors affecting mobile government and service quality parameter on "Ease of use of mobile applications"	0.730
Relationship between factors affecting mobile government and service quality parameter on "getting things done right the first time"	0.711
Relationship between factors affecting mobile government and service quality parameter on "getting updated information"	0.721
Relationship between factors affecting mobile government and service quality parameter on "fast navigation through the applications without jams"	0.698
Relationship between factors affecting mobile government and service quality parameter on "financial security of online transactions"	0.710

Table 4.9 Testing of internal consistency of questionnaire

As the cronbach's alpha values are more than 0.6, the measures are found to be internally consistent.

For the purpose of pilot testing, the questionnaire was run through thirty respondents who were verbally contacted for feedback on understanding of words, questions, directions to fill in the responses, time to complete etc.

4.7.1.2 Data Analysis:

Hypothesis wise listing of variables is as given below:

Hypothesis	Dependant variable	Independent variable
There is a significant relationship between user acceptability of mobile government services and service quality parameters	Rating of users' acceptability	Rating of impact of service quality parameters such as ease of use, getting things done right the first time, updated information etc.
There is a significant relationship between the factors affecting use of mobile government services and the service quality parameters	Rating of impact of factors on service quality parameters	Factors affecting use of mobile government services

Table 4.10 Dependent and independent variables

Since this will involve the examination of differences in the mean values of the dependent variable associated with the effect of controlled variable, ANOVA has been used as a test of means of two population. Two way ANOVA has been done on the dependent variable. E.g. one analysis is how do user acceptability levels (low, medium, high, very high) interact with ease of use of application (no impact, considerable impact, high impact, very high impact). The significance of the overall effect has been tested by an F test. SPSS version 18 has been used for data analysis.

ANOVA has been used to see whether the change in dependent variable e.g. user acceptability is caused by independent variable i.e. service quality parameters. The ANOVA first assumes that these two groups (independent and dependent variable) differ significantly meaning that a high rating on service quality parameters does not mean a high rating on user acceptability. If the F ratio obtained has a P value less than .05 at 5% significance level then, the assumption is rejected and we can conclude that both groups are same, i.e. a high rating on service quality parameters results in a high user acceptability or independent variable significantly affects the dependent variable (Field, 2005). Since there are more than one service quality parameter and more than one factor, multi-variate regression model has also been used to examine the combined effect.

4.7.1.3 Hypothesis testing

1. *Ho: There is no significant relationship between users' acceptability of mobile government services and 'privacy of information'*

The service quality parameter on privacy is observed to be correlated to user acceptability of mobile government services in a significant way (r= 0.310, p= .000). Also, results of ANOVA also confirm a significant relationship of this parameter with users' acceptability of mobile government services (F= 9.107, p= .000). The significance testing has been done at 95% confidence level.

Hence Ho is not accepted.

2. *Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting things done in the expected time frame'*

The service quality parameter on 'getting things done in expected time frame' is also observed to be correlated to user acceptability of mobile government services in a

significant way (r= 0.303, p= .000). Also, results of ANOVA also confirm of a significant relationship of this parameter with user acceptability (F= 8.684, p= .000).

Therefore Ho is not accepted.

3. *Ho: There is no significant relationship between users' acceptability of mobile government services and "ease of use of applications"*

The service quality parameter on 'ease of use of applications" is observed to be correlated with users' acceptability of mobile government services(r= 0.266, p= .000) in a highly significant way. The results of the ANOVA also highlight a strong positive relationship of this parameter with users' acceptability of mobile government services (F= 7.160, p= .000).

Therefore Ho is not accepted.

4. *Ho: There is no significant relationship between users' acceptability of mobile government services and "getting things right the first time"*

The service quality parameter on 'getting things done right the first time' is also observed to be correlated to users' acceptability of mobile government services in a significant way (r= 0.326, p= .000). Also, the ANOVA shows a strong relationship between 'getting things done right the first time' and users' acceptability of mobile government services (F= 10.764, p= .000).

Therefore Ho is not accepted.

5. *Ho: There is no significant relationship between users' acceptability of mobile government services and 'financial security of online transactions'*

The service quality parameter on financial security of online transactions is also observed to be correlated to users' acceptability of mobile government services in a significant way (r= 0.344, p= .000). Also, results of ANOVA also confirm a significant

relationship of this parameter with users' acceptability of mobile government services (F= 11.306, p=.000).

Therefore Ho is not accepted.

6. *Ho: There is no significant relationship between users' acceptability of mobile government services and 'fast navigation through the applications without jams'*

The service quality parameter on "fast navigation through applications jams' is also observed to be correlated to users' acceptability of mobile government services in a significant way (r= 0.193, p= .002). Also, results of ANOVA confirm of a significant relationship of this parameter with users' acceptability of mobile government services (F= 3.815, p=.011).

Hence Ho is not accepted.

7. *Ho: There is no significant relationship between users' acceptability of mobile government services and 'getting updated information'*

The service quality parameter on 'getting updated information' is also observed to be correlated with users' acceptability of mobile government services in a significant way (r= 0.387, p= .000). The results of ANOVA also confirm a significant relationship of this parameter with users' acceptability of mobile government services (F= 14.847, p= .000).

Hence Ho is not accepted.

To study the combined relationship, multivariate regression analysis has been done. The overall multivariate analysis of the parameter on user acceptability shows that that the service quality parameter on 'updated information' is the most prominent one that affects user acceptability (Std. Beta= 0.263, t= 4.042, p=. 000), followed by the parameter on 'financial security of online transactions' (Std. Beta= 0.140, t= 2.213, p=.

028), followed by ‘privacy’ (Std. Beta= 0.140, t= 2.070, p=. 039). Lastly, parameter such as ‘ease of use’, ‘getting things done right the first time’, ‘getting things done in expected time’, ‘fast navigation through application without jams’ were found to have no effect on users’ acceptability of mobile government services in the multivariate analysis. The overall model has a R^2 value of 0.249 and adjusted R^2= 0.228, with F= 11.760, p= .000 indicating a significant model.

4.7.1.4 Conclusions:

Based on the analysis above, the following conclusions can be drawn:

a. There is a significant relationship between all the service quality parameters viz., financial security, privacy, ease of use, getting updated information, fast navigation through the applications without jams and getting things right the first time and the users’ acceptability of mobile government services.

b. While the service quality parameters affect the users’ acceptability significantly in an individual manner, a combined effect shows that ‘updated information’ is the most significant parameter followed by ‘financial security’ and ‘privacy’

4.7.2 Phase II B: Study of relationship between factors affecting mobile Government and service quality parameters

Based on the factors and service quality parameters identified in Phase – I, this phase is aimed to study the inter-relationship between the two. The following seven hypotheses have been formulated:

1. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘privacy of information’
2. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘getting things done in the expected time frame’

3. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘ease of use of applications’
4. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘getting things right the first time’
5. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘financial security of online transactions’
6. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘fast navigation through the applications without jams’
7. Ho: There is no significant relationship between factors affecting use of mobile government services and ‘getting updated information”’

4.7.2.1 Hypothesis testing

1. *Ho: There is no significant relationship between factors affecting use of mobile government services and privacy of information*

The multivariate analysis suggests that the combined effect of factors (viz., users’ awareness, availability of e-government services, users’ access, strategy for mobile government, cost of offering services and mobile government framework) is not found to be significant on privacy of information(F= 0.635, sig= .702). The significance testing has been done at 95% confidence level.

Hence Ho is accepted.

Also ANOVA results with individual factors have also not established a significant relationship between any of the factors and the service quality parameter on privacy.

Factor	F	Sig.
Users' Awareness	0.889	0.471
Availability of e-government services	0.892	0.469
Users' access	1.883	0.114
Strategy for mobile government	0.513	0.726
Cost of offering services	1.663	0.159
Framework of mobile government	0.377	0.825

Table 4.11 Relationship between factors affecting mobile government and privacy of information

None of the above factors are found to have a significant relationship individually with the parameter on 'privacy of information'.

2. *Ho: There is no significant relationship between factors affecting use of mobile government services and "getting things done in the expected time frame*

The multivariate analysis suggests that the combined effect of factors is not found to be significant on 'getting things done in the expected time frame' (F= 1.523, sig= .171).

Hence Ho is accepted.

The ANOVA results with individual factors have been tabulated below:

Factor	F	Sig.
Users' Awareness	2.950	0.021
Availability of e-government services	2.875	0.023
Users' access	2.037	0.090
Strategy for mobile government	0.846	0.470
Cost of offering services	0.471	0.757
Framework of mobile government	2.010	0.094

Table 4.12 Relationship between factors affecting mobile government and "getting things done in the expected time frame

While the combined effect is not significant, the factors on 'user awareness' and 'user access' are found to have significant impact on the service quality parameter on 'getting things done in the expected time frame'.

3. *Ho: There is no significant relationship between factors affecting use of mobile government services and 'ease of use of applications'*

The multivariate analysis suggests that the combined effect of factors is found to be significant on ease of use of applications (F= 2.3043, p= .035).

Hence Ho is not accepted.

The ANOVA results with individual factors have been tabulated below:

Factor	F	Sig.
Users' Awareness	4.618	.001
Availability of e-government services	1.732	.143
Users' access	1.783	.133
Strategy for mobile government	2.089	.083
Cost of offering services	2.671	.033
Framework of mobile government	0.831	0.506

Table 4.13 Relationship between factors affecting mobile government and "ease of use of applications"

From ANOVA tables above, it is evident that the factors on awareness (F=4.618, p=0.001) and cost (F=2.671 and p = 0.033) are found to significantly affect the 'ease of use of applications'

4. *Ho: There is no significant relationship between factors affecting use of mobile government services and 'getting things right the first time'*

The multivariate analysis suggests that the combined effect of factors is not found to be significant on getting things done right the first time (F= 1.019, sig= .419).

Hence Ho is accepted.

The ANOVA results with individual factors have been tabulated below:

Factor	F	Sig.
Users' Awareness	0.848	0.496
Availability of e-government services	0.743	0.563
Users' access	1.311	0.266
Strategy for mobile government	0.331	0.857
Cost of offering services	0.662	0.619
Framework of mobile government	0.401	0.808

Table 4.14 Relationship between factors affecting mobile government and "getting things right the first time"

While the combined effect is not significant, none of the factors is found to significantly affect the service quality parameter on "getting things done right the first time" in a significant manner.

5. *Ho: There is no significant relationship between factors affecting use of mobile government services and 'financial security of online transactions'*

The multivariate analysis suggests that the combined effect of factors is not significant on financial security (F= 1.463, sig= .192).

Hence Ho is accepted.

The ANOVA results with individual factors have been tabulated below:

Factor	F	Sig.
Users' Awareness	0.308	0.872
Availability of e-government services	0.658	0.622
Users' access	2.392	0.051
Strategy for mobile government	2.214	0.068
Cost of offering services	3.572	0.007
Framework of mobile government	0.512	.727

Table 4.15 Relationship between factors affecting mobile government and financial security

While the combined effect is not significant, the factor on cost affects the service quality parameter significantly.

6. *Ho: There is no significant relationship between factors affecting use of mobile government services and 'fast navigation through the applications without jams'*

The multivariate analysis suggests that the combined effect of factors is not found to be significant on 'fast navigation through the application without jams' (F= 1.158, sig= .329).

Hence Ho is accepted.

The ANOVA results with individual factors have been tabulated below:

Factor	F	Sig.
Users' Awareness	1.412	0.230
Availability of e-government services	1.608	0.173
Users' access	2.347	0.055
Strategy for mobile government	2.574	0.038
Cost of offering services	0.995	0.411
Framework of mobile government	1.927	0.106

Table 4.16 Relationship between factors affecting mobile government and "fast navigation through the applications without jams"

While the combined effect is not significant, the factor on 'strategy for mobile government' is found to affect this service quality parameter significantly.

7. *Ho: There is no significant relationship between users' acceptability and "getting updated information"*

The multivariate analysis suggests that the combined effect of factors is found to be significant on getting updated information (F= 2.594, sig= .019).

Hence Ho is not accepted.

The ANOVA results with individual factors have been tabulated below:

Factor	F	Sig.
Users' Awareness	4.153	0.03
Availability of e-government services	1.157	0.327
Users' access	3.120	0.016
Strategy for mobile government	0.238	0.870
Cost of offering services	0.308	0.873
Framework of mobile government	0.819	0.514

Table 4.17 Relationship between users' acceptability and "getting updated information"

From the ANOVA tables, it is evident that the factors on awareness and access are found to significantly affect the service quality parameter on 'getting updated information'.

4.7.2.2 Conclusions:

Based on the analysis above, the following conclusions can be drawn:

- There is a significant relationship between factors affecting use of mobile government services and service quality parameters of getting updated information and 'ease of use of applications'.
- None of the factors has a significant relationship with 'privacy of Information'
- The factors of awareness and access are found to have significant relationship with the service quality parameter on 'getting things done in the expected time frame'
- The factors on awareness and cost significantly affect the parameter on 'ease of use of applications'
- The factor on cost significantly affects the 'financial security'
- The factor on strategy significantly affects the service quality parameter on 'fast navigation through the applications without jams'

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

CHAPTER - 5

5.1.1 Findings on Identification of factors affecting use of mobile Government services in India

The users' responses have been analysed based on average ranking assigned to each factor as tabulated below:

	Factors	Average Ranking
1	**E-Government** (Availability of e-government services)	**6.87**
2	**Strategy for Mobile Government**	**7.01**
3	**M-government awareness**	**8.06**
4	**Users' access** to mobile based services (e.g. availability of services over low cost handsets)	**8.51**
5	**Quality of mobile government** services and applications	**8.76**
6	**Framework:** Availability and adoption of a mobile government framework by Government	**8.90**
7	**Cost** of offering and availing services over mobile devices	**8.96**
8	**User Needs:** Addressing user needs and preferences – personalization of applications	**9.16**
9	**IT literacy** of stakeholders	**9.27**
10	**Privacy and security** concerns	**9.36**
11	**Infrastructure:** Availability and use of telecom and mobile Infrastructure for G2C services	**9.53**
12	**Acceptance** by users and change management	**10.10**
13	**Mobile penetration**/tele-density for wireless mobile phones)	**10.39**
14	**Standards** for mobile government applications	**10.54**
15	**Legal issues** (e.g. validity of mobile based G2C transactions)	**10.63**
16	**Partnership of Private sector**	**11.17**
17	**Management of Mobile and Application infrastructure**	**11.89**
18	**Availability of exclusive mobile service delivery gateways and portals**	**11.90**

Table 5.1 Ranking of factors affecting use of mobile government in Ind

5.1.1.1 Analysis of results of experts' survey

The order of factors as ranked by respondents in terms of applicability to Indian conditions indicates that the following five factors are considered by experts to be most important in Indian conditions:

i. *E-Government i.e. availability of e-government services as a pre-requisite for mobile government*
ii. *A strategy for mobile government*
iii. *Mobile Government Awareness*
iv. *Users' access to services*
v. *Quality of mobile government services*

- The availability of e-Government services as a pre-requisite for mobile Government has been ranked as the most important factor by the experts. This confirms that experts perceive that for mobile government services to be used; the electronic delivery of services is a pre-requisite and may be indicative of a possible preference by experts for transition from electronic government to mobile government. *The literature review (D C Mishra and others) [18] suggests that most researchers believe that m-government should be an integral part of e-government and not exist as a separate discipline*

- The need for a strategy for mobile government in India has been identified as the second most important factor. This may be indicative of the experience of experts about e-Government in *India meeting varying degree of success on account of absence of a well-defined strategy and hence there is a perceived need for a well-defined strategy for mobile government in India*. The importance of strategy has been elaborated by a number of researchers and practitioners. The Working Group on E-government in the Developing World (Roadmap for E-government in the Developing World, 2002) [11] introduced "10 Questions E-government Leaders Should Ask themselves" wherein strategy was the first question.
- The user awareness about mobile government services has been ranked as the third most important factor by respondents. *This is perceived to be a direct outcome of Indian experience of top-down e-government strategy rather than creating a bottom up inclusive strategy.*

- Access to mobile services has been identified as the next most important factor based on average rank. This can be related to the information that while the tele-density is highest in India, *most of the users have access to low cost, low feature devices and hence access over these devices is perceived to be an important factor*. Although smartphones form less than 30% of total mobile devices volume sold in India in 2013, they contributed to over 75% of industry revenue (source: India Smartphone and Tablet outlook 2014) [44]
- Quality of mobile government services is the fifth most important factor based on average rank as identified by experts. *This also can be related to the experts' perception on need for good quality of mobile government services based on the experiences in quality of e-government services offered so far*. The identification of e-government service quality parameters in India (Ashok Agarwal and others 2007) [38]

Based on the above, it is perceived that experts perceive the availability of e-government and the need for strategy, framework, access and quality as the key factors related to mobile government in India. Not surprisingly, tele-density and mobile penetration finds a low importance as enough has been achieved there. Surprisingly, the PPP and legal issues have been rated very low. However, this could be due to the non-availability of any embryonic experience in the mobile government space. Even Privacy and security concerns have not been rated as a factor of high importance for Indian conditions.

It is also observed that the importance assigned to factors by Indian experts for Indian conditions is different and not correlated to the one identified by Shadi Al-Khamayaseh, Elaine Lawrence and Agnieszka Zmijewska (2006)[2] wherein 81% of the respondents were from Europe. The spearman's rank correlation on ranking of factors shows r =

0.003 with an insignificant value of p = 0.117 (>0.05). This indicates that there is no correlation between the two ranks. ***This confirms the view that Indian specific factors are different from developed nations.***

The respondents were provided with the option of adding any more factors that they feel are relevant to Indian conditions and not covered by the factors identified above based on literature review. The additional qualitative inputs received form experts towards addition of factors specific to Indian conditions are listed below:

- Willingness and Initiative of Government
- Trust and responsiveness levels
- Availability of low cost smart phones
- Regulation on unification of numbers for mobile connections
- Local language application development

5.2 Findings on Identification of mobile government service quality parameters in India

5.2.1 Analysis of results of users' ranking of identified service quality parameters

The average of ranks assigned by respondents to each service quality parameter has been tabulated below:

Service Quality Parameter	Average Ranking	Relative Importance of the service quality parameter
Privacy – protection of personal information	4.99	1
Getting things done in the expected time frame	5.14	2
Getting things done right the first time.	5.69	3
Ease of use of applications	6.20	4
Fast navigation through applications without jams	7.77	5

Getting 'updated' information through the application	7.84	6
Financial security of online transactions	8.10	7
Availability of mobile services at all days and at all times	8.21	8
Getting 'useful' information through the application	8.49	9
A 'wide' range of services through applications	9.36	10
Transparency in actions on applications	9.53	11
Getting 'reliable' information	10.07	12
Accountability in case of service failure	10.56	13
Easy to retrieve and use applications	10.73	14
Customization according to needs	10.93	15
Availability of online contact information of key stakeholders in case required	13.57	16
Opportunity to provide online interaction with other users	15.83	17

Table 5.2: Ranking of mobile government service quality parameters

The top rated ten service quality parameters for mobile government services have been listed below:

i. Privacy – protection of personal information
ii. Getting things done in the expected time frame
iii. Getting things done right the first time.
iv. Ease of use of applications
v. Fast navigation through applications without jams
vi. Getting 'updated' information through the application
vii. Financial security of online transactions
viii. Availability of mobile services at all days and at all times
ix. Getting 'useful' information through the application

x. A ‘wide’ range of services through applications

xi. Transparency in action on applications.

- The protection of personal information and privacy has been ranked as the most important service quality parameter. Privacy is the ability of an individual or group to seclude themselves or information about themselves and thereby express themselves selectively. The experts perceive that as e-government embraces mobile technology, privacy of personal information assumes critical importance. The perception could be due the portability and transferability of handsets coupled with number portability in India. As on May 2014, 100 million subscribers have availed number portability in India since its introduction in 2011 (source: Telecom Regulatory Authority of India)
- The requirement of getting things done in the expected time frame has been ranked as the next most important service quality parameter. This is in line with the expectation of timely delivery of e-government service. *The ranking assumes importance for researchers considering the fact that mobile based government service delivery may have dependence on mobile technology which is still evolving and hence the robust application and functional design for timely delivery could assume importance.*
- Getting things done right the first time has been perceived as the next most important service quality parameter. This is also in line with e-government service quality parameters. This may be attributable to the importance being assigned by the experts to the requirement of getting the information and/or transactions built rightly into the applications so that the users are able to get their service right in the first time itself. *Repetitive requests for the same service could be a deterrent to user satisfaction.* [38]

- The ease of use of applications has been identified as the next most important parameter. *This can be attributable to the specific requirements of navigation and handling of application features in a mobile device.* Similarly the speed of navigation has been ranked as the next most important parameter.
- Besides the above five, getting 'updated' information, security of financial transactions, availability of mobile network, getting 'useful' information, availability of a wide range of applications and transparency in actions on applications have been identified as important service quality parameters.

5.2.1.1 Other service quality parameters suggested by Experts:

The respondents were provided with the option of adding any more service quality parameters that they feel are relevant to mobile government in Indian conditions and not covered by the e-government service quality parameters identified above based on literature review. The additional qualitative inputs received from experts towards the addition of service quality parameters for mobile government in Indian conditions are listed below:

a) Service quality parity across devices and networks
b) Assurance of service delivery time
c) Integration with e-government channels
d) Service quality assurance over low cost devices

This phase of study confirms that: service quality parameters as identified for e-government services can also be seen as applicable for mobile government services (Ashok Agarwal and others) [38]. Lu et [42] all defined the mobile service quality parameters across three dimensions viz., outcome quality parameters, interaction quality parameters and environment quality parameters. The important mobile government service quality parameters can be listed as given under:

a. Outcome quality parameters – Getting things done in the expected time frame, getting things done right the first time, transparency in action on applications

b. Interaction quality parameters – Privacy and security, ease of use, getting updated information, financial security of transaction, getting useful information

c. Environment quality parameters - Availability of mobile services at all times, a wide range of mobile applications

5.3 Findings on Prioritization of sectors for mobile government services

As mentioned earlier, Delphi technique has been used to arrive at the following:

- Top sectors based on priority for application of mobile government based delivery of government services.
- Top reasons/factors determining the priority of sectors for use of mobile government services.

5.3.1.1 Analysis of results of round one of Delphi

5.3.1.1.1 Sectors with highest priority for application of mobile government services:

The list of top sectors as identified by experts in round one is given below:

- Health and Family Welfare
- Agriculture
- Rural Development
- Social Welfare
- Education

- Municipalities
- Food and Civil Supplies

5.3.1.1.2 Reasons/factors identified by experts as the basis of the above ranking of sectors:

The experts identified the following reasons/factors determining the priority of the sectors (in the order of frequency of use by experts)

- Number of citizens impacted by the sector services
- Potential of improving the service quality (transparency, speed, streamlining etc.)
- Section/socio-economic profile of the users getting impacted
- Users' literacy, awareness and knowledge levels
- Access (or otherwise) to users to government applications through other means such as PC, Internet etc.
- Tele-density/mobile penetration
- Frequency of use of government services /interaction with Government
- Demand supply gap in services infrastructure
- Failure of traditional modes of communication/interaction
- Need for collaboration among multiple agencies
- The speed at which the impact can be made
- Policy level priority by Government to the sector
- Higher visibility for the change (once brought in)
- Sectors yet to be taken up
- Availability of global references/case studies in the sector as a reference point

5.3.1.2 Conclusion

The following conclusions can be drawn from this exploratory study based on Delphi:

a. The top priority sectors for application of mobile government services in India are:

    i. Health and Family Welfare

ii. Agriculture
iii. Rural Development
iv. Social Welfare
v. Education
vi. Municipalities
vii. Food and Civil Supplies

b. The top reasons/ factors determining the priority of the sectors for Indian conditions are as given below:
    i. Number of citizens impacted by the sector services
    ii. Potential of improving the service quality (transparency, speed, streamlining etc.)
    iii. Section/socio-economic profile of the users getting impacted
    iv. Users' literacy, awareness and knowledge levels
    v. Access (or otherwise) to users to government applications through other means such as PC, Internet etc.
    vi. Tele-density/mobile penetration
    vii. Frequency of use of government services /interaction with Government

5.4 Findings of Phase – II: Descriptive Research

As mentioned earlier, the Phase – II involves a descriptive research on:

i. **Phase II A**: Study of relationship between users' acceptability of mobile government services and service quality parameters
ii. **Phase IIB:** Study of relationship between factors affecting mobile Government services and the service quality parameters.

5.4.1 Phase II A: Study of relationship between users' acceptability and service quality parameters

As identified in Phase – I, the following are the top ranked service quality parameters for mobile government services in India:

i. Privacy – protection of personal information
ii. Getting things done in the expected time frame
iii. Getting things done right the first time.
iv. Ease of use of applications
v. Fast navigation through applications without jams
vi. Getting 'updated' information through the application
vii. Financial security of online transactions

5.4.1.1 Conclusions:

Based on the data analysis highlighted in Chapter 4, the following conclusions can be drawn:

a. There is a significant relationship between service quality parameters viz., financial security, privacy, ease of use, getting updated information, fast navigation through the applications without jams and getting things right the first time and the user acceptability of mobile government services.
b. While the parameters affect the acceptability significantly in an individual manner, a combined effect shows that updated information is the most significant parameter followed by financial security and privacy.

The following inference can be drawn for the above findings:

a. The service quality parameters for e-government are perceived to be applicable for mobile government also.
b. The service quality parameters have a significant relationship with the users' acceptability. Government organizations designing the mobile government applications should therefore need to ensure fulfillment of requirement of the e-governance service quality parameters.
c. Ease of use as a service quality parameter is found to significantly affect the acceptability of mobile government services by users. This can be related to three broad areas:
    i. The availability of smart phones as a proportion to total number of mobile phones which currently stands at 30%
    ii. Current limitation of PC and Internet based applications in e-government scenario, which because of limitation of language adds to the difficulty of usage of government applications.
    iii. The availability of fast speed of internet connections by mobile service providers.

The implications for the same therefore are:

- The availability of cheaper smart phones can help improve the acceptability of mobile government applications.
- The infrastructure on fast internet speed can help improve the acceptability.
- Voice based/ local language based application interfaces can help increase the acceptability.

d. Getting updated information is another key parameter affecting the user acceptability of mobile government applications. This may be related as

attributable to the infrequent updation of website content by Government departments and organizations. On mobiles, the need for updated information could substantially increase given the personalized and anytime, anywhere access. Government organizations can prioritize putting in mechanism in place for getting updated information on mobile government applications as this may be of paramount importance.

e. Getting things done right the first time is a requirement for user acceptability of mobile government services. This may be a pointer to the experience of users on e-government applications which have been poorly designed. Government organizations may need to look at the service levels for ensuring getting things done right the first time. Participation of private sector through service levels (e.g. Passport Sewa, Income tax) on a PPP basis can be explored to achieve the same. Similarly the parameter on "fast navigation through applications without jams" is also attributable to the design of applications which can be handled through service levels designed for the purpose.

f. The users are concerned on privacy and financial security of the applications. Adequate measures to ensure privacy and financial security should form a part of the mobile application conceptualization, design and implementation. Government organizations like the Department of Post in India have already began attempting biometric/Adhaar based authentication on hand held devices. Given the portability of mobile devices and frequent exchange of hands, authentication based personalization of hand held devices for

application access could form an important requirement of the technical design of the mobile government applications.

5.4.2 Phase II B: Study of relationship between factors affecting mobile Government and service quality parameters

Based on the factors and service quality parameters identified in Phase – I, this phase is aimed to study the inter-relationship between the two.

5.4.2.1 Conclusions:

Based on the analysis above, the following conclusions can be drawn:

a. There is a significant relationship between factors affecting use of mobile government services and service quality parameters of getting updated information and ease of use of applications.
b. None of the factors has a significant relationship with Privacy of Information.
c. The factors of awareness and access are found to have significant relationship with the parameter on getting things done in the expected time frame.
d. The factors on awareness and cost significantly affect the parameter on ease of use of applications.
e. The factor on cost significantly affects the financial security.
f. The factor on strategy significantly affects the service quality parameter on “fast navigation through the applications without jams”
g. The factors on awareness and access significantly affect the service quality parameter on “getting updated information”.

The following inference can be drawn for the above findings:

i. None of the factors seem to affect the privacy of information. This could be due to the fact that the maturity of mobile government applications has not reached the levels wherein privacy is seen as a key issue.

ii. Factors affecting the service quality parameters include awareness, access, strategy and cost. In the e-governance scenario, a full-fledged component on awareness and access has been provided for. Going forward, as the mobile government framework takes shape in India, the awareness about the mobile devices to be used for government services needs to be handled on priority.

iii. Similarly the strategy on ensuring user experience can help improving the facts navigation through applications.

iv. The inclusion of financial security requirements can help improve the financial security. As the Government organizations plan for mobile government applications, an advance planning on this aspect can help improve acceptability.

v. It is pertinent to mention that if we correlate the findings of this phase with phase II A wherein it has been established that the service quality parameters affect the acceptability of applications by users, the factors that Indian Government organizations need to take cognizance of are awareness, access, strategy and cost.

5.4.3 Discussion on sector-wise analysis

The sector-wise percentage distribution of respondents for Phase – II is given below:

- Education – 28%
- Health – 18%
- Social Welfare – 18%
- Election services – 13%

- Employment – 11%
- Agriculture – 7%
- Food and civil supplies – 5%

Given the above distribution, the sample size for individual sector wise study of relationship between factors affecting mobile government and service quality parameters is too small for meaningful conclusions and analysis. The same has therefore been suggested as a future scope of work. However, for the purpose of discussions, four sectors for which more than 30 responses were received have been taken up for analysis to study the significance of relationship between service quality parameters and factors affecting mobile government. These sectors are education, health, social welfare and election services. Based on the sample sizes, the relationship between factors affecting mobile government and service quality parameters was not found to be significant for all the four sectors. The summary of findings have been listed below:

5.4.3.1 Health:

- Significant relationship has been observed between the factor on user awareness and the service quality parameters on ‘getting things done in the expected time frame’ and ‘ease of use of applications’.
- Similarly significant relationship has been observed between the factor on users’ access with the service quality parameter on ‘ease of use of applications’.
- Significant relationship has been observed between the factor on cost of offering services with the service quality parameter on ‘getting updated information’.

5.4.3.2 Social welfare

- None of the factors were found to have a significant relationship with any of the service quality parameters.

5.4.3.3 Education

- None of the factors were found to have a significant relationship with any of the service quality parameters.

5.4.3.4 Election services

- Significant relationship has been observed between the factor on strategy for mobile government and the service quality parameters on 'fast navigation through the applications'.
- Significant relationship has been observed between the factor on cost of offering services and the service quality parameters on 'fast navigation through the applications', 'getting things done right the first time' and 'financial security of applications'.
- Significant relationship has been observed between the factor on availability of e-government services and the service quality parameter on 'getting things done right the first time'.
- Significant relationship has been observed between the factor on framework for mobile government and the service quality parameter on 'getting things done in the expected time frame'.

5.5 Conclusions and recommendations:

The following recommendations can be drawn from the research work:

a. As mobile devices are progressively becoming a medium of offering government to citizen services, the government needs to focus on the following important aspects:

i. Ensuring the availability of e-government services (i.e. availability of internet based channel for offering government services) before taking up mobile as a medium of services.

ii. Formulate a strategy on mobile government

iii. Ensure an awareness drive on mobile based delivery of government services so that citizens are aware of the same.

iv. Ensuring availability of low cost smart phones

v. Ensuring growth in telecom infrastructure particularly the data transfer infrastructure.

vi. Define service quality parameters of mobile government services before launch of mobile based government service delivery in any sectors

vii. Ensuring that privacy of information is kept as a key requirement in mobile based delivery of government services.

viii. Ensuring robust application design of mobile applications for timely delivery of services.

ix. Ensuring that users' experience of repetitive attempts to avail the services as seen in e-government is not done.

x. Having a strategy to ensure ease of use of applications.

xi. Put a mechanism for continuous updation of mobile application content.

xii. Focus on the following as the priority sectors to start with in India:

- Health and Family Welfare
- Agriculture
- Rural Development
- Social Welfare
- Education
- Municipalities
- Food and Civil Supplies

xiii. Prioritize the remaining sectors for application of government services based on the following suggestive parameters:

- Number of citizens impacted by the sector services
- Potential of improving the service quality (transparency, speed, streamlining etc.)
- Section/socio-economic profile of the users getting impacted
- Users' literacy, awareness and knowledge levels
- Access (or otherwise) to users to government applications through other means such as PC, Internet etc.
- Tele-density/mobile penetration
- Frequency of use of government services /interaction with Government
- Demand supply gap in services infrastructure
- Failure of traditional modes of communication/interaction
- Need for collaboration among multiple agencies
- The speed at which the impact can be made
- Policy level priority by Government to the sector
- Higher visibility for the change (once brought in)
- Sectors yet to be taken up

- Availability of global references/case studies in the sector as a reference point

xiv. Include financial security of applications as a key requirement.

xv. Focus on personalization of applications based on authentication of users.

xvi. Provide local language interfaces.

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

LIMITATIONS AND SCOPE FOR FUTURE RESEACRH

CHAPTER - 6

CHAPTER 6: LIMITATIONS OF RESEARCH AND SCOPE FOR FUTURE WORK

6.1 Limitations of Research

The following are the limitations of this research study

a. Majority of respondents are from urban areas.

b. The study has done keeping a consolidated view of responses for all identified sectors. For the purpose of sector specific analysis of relationship between factors and service quality parameters as presented in the findings is based on a limited sample size for each of the sectors.

c. The responses are obtained for broad sectors and not the services and sub-services within each sector.

d. The study is restricted to G2C services only and other government services viz., G2B, G2G and G2E have not been covered.

6.2 Scope for future work

The above study offers the scope for the following areas of future research:

a. The factors identified could be refined further into sub factor and specific research studies can be undertaken to assess the impact on users' acceptability.

b. The variation in user acceptability based on the geographic variation in India could be studied.

c. The variation in users' acceptability based on types of government services (G2C, G2B, G2G and G2E) could be studied.

d. The service quality parameters identified could be refined further into sub parameters and specific research studies can be undertaken to assess the impact on user acceptability.

e. Prioritization of services under each sector identified in Phase I could be taken up.

f. Similar study may be done after a period of three or four years to assess any difference in perception based on the maturity gained in mobile government applications.

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

REFERENCES

REFERENCES

[1] Paritosh Sharma (2009). *Airtel Represented at The Mobile VAS SUMMIT 2009* [Online]. Available: http://www.slideshare.net/paritoshsharma/airtel-represented-at-the-mobile-vas-summit-2009

[2] Shadi Al-khamayseh, Elaine Lawrence and Agnieszka Zmijewska (2008). *Towards Understanding Success Factors in Interactive Mobile Government* [Online]. Available: http://www.mgovernment.org/resources/euromgvo2006/.../2_Al-Khamayseh.pdf

[3] Department of Information Technology, Government of India (2010). *India e-readiness assessment report 2008 for states/ union territories.* [Online]. Available: http://deity.gov.in/content/e-readiness-assessment-reports

[4] El-KikI, Tarek and Lawrence Elaine (2007). *Mobile User Needs: Strategic data for mobile government services* [Online}. Available: http://epress.lib.uts.edu.au/research/bitstream/handle/10453/10714/2007000008OK.pdf?sequence=1

[5] Suomi, R. B. (2006). "Five Finnish Innovations in Mobile Government and their root factors", *Proceedings of the CollECTer Euro 2006 Conference, 113-128, 2006.*

[6] Manish Kumar and Omesh Prasad Sinha. "M-Government - Mobile Technology for e-Government" *Towards Next Generation e-Government*. Gift Publishers, 2007 pp 294-301

[7] Ntaliani M., Costopoulou C. and Karestsos S. "Mobile government: A challenge for agriculture", *Government Information Quarterly* 25, pp 699-716,

[8] Aichholzer, Georg (2004). *Scenarios of e-government in 2010 and implications for strategy design*.[Online]. Available: http://ejeg.com/volume-2/volume2-issue-1/v2-i1-art1-aicholzer.pdf

[9] Mohan Datar (2007). "Determining Priorities of e-Government: A Model Building Approach". *Foundations of e-Government - Proceedings of the 5th International Conference on e-Governance*

[10] Östberg, O. 2003. *A Swedish View on 'Mobile Government* [Online]. Available: http://www.statskontoret.se/upload/Publikationer/2003/2003128.pdf .

[11] World Bank (2007). "Background note: M-Government Conference – November 29, 2007" World Bank e-Development Thematic Group Report 2007.

[12] Carroll, Jennie (2006). "What's in It for me?: Taking M-Government to the People" *Proceedings of the 19th Bled e-Conference, June 5-7, 2006,Association for Information Systems*

[13] Song, Gang. (2005). *mGov 2005 presentation* [Online]. Available: http://www.mgov.cn/

[14] Tania Gessi, Devindra Ramnarine, John Wilkins (2006). "Introducing a New e-Governance Framework in the Commonwealth: From Theory to Practice". *CAPAM Biennial Conference, Sydney, Australia: 21-25 October 2006*

[15] Charru Malhotra, V. M. Chariar, L.K. Das, and P. V. Ilavarasan (2008)."ICT for Rural Development: An Inclusive Framework for e-Governance". *e-Governance case studies*, University Press (India) Private Limited, pp 216-226

[16] Diatha Krishna Sundar and Shashank Garg (2005). "M-Governance: A Framework for Indian Urban Local Bodies". *Proceeding of the First European Conference on Mobile Government (EURO mGOV 2005), UK, pp 395-402*

[17] Kushchu, I. and Borucki, C. (2003). "A Mobility Response Model for Government". *Proceeding of European conference on E-Governemnt (ECEG 2003), Trinity College, Dublin*.

[18] Dr. Mishra D.C, IAS (Retd.) (2009). "Make M-Government an Integral Part of e-Government: An Agenda for Action". *Proceedings of TRAI Conference on Mobile Applications for Inclusive Growth and Sustainable Development*, pp 78-86

[19] Corien Prins (2007). "E-government: A Comparative Study of the Multiple Dimensions of Required Regulatory Change" *Electronic Journal of Comparative Law*, vol. 11.3 (December 2007)

[20] Dr. Sita Vanka, Mr. K. Sriram Dr. Ashok Agarwal (2007). "Critical Issues in e-governance". *Proceedings of ICEG 2007, 5th International Conference on e-Governance.*

[21] Michael Knopp (2007). “Mobile Government in Germany: Legal Aspects and Demands on Mobilizing the Administration”. *Proceeding of the First European Conference on Mobile Government (EURO mGOV 2005), UK*, pp 275-28

[22] Swaran Lata , Somnath Chandra , Prashant Verma (2010). “Issues & Challenges for Enabling Mobile web in Indian Languages” *Proceedings of the TRAI conference on Mobile Applications for Inclusive Growth and Sustainable Development, 2010*

[23] Al-khamayseh Shadi, Lawrence Elaine and Zmijewska Agnieszka (2006). *Towards Understanding Success Factors in Interactive Mobile Government*. [Online]. Available : www.mgovernment.org/resurces/euromgvo2006/.../2_Al-Khamayseh.pdf

[24] Geoffrey A Sandy and Stuart Mcmillan (2005). “A success factor model for m-government” *Proceeding of the First European Conference on Mobile Government (EURO mGOV 2005), UK,* pp 349-358

[25] Dimitris Gouscos, Dimitris Drossos and Giannis F. Marias (2005). *A Proposed Architecture for Mobile Government Transactions [Online]* Available: www.mgovernment.org/resurces/euromgov2005/PDF/23_R353DD.pdf

[26] Ronan de Kervenoael, D. Selcen O. Aykac, Enes Eryarsoy, Nihat Kasap (2008). “Categorizing 'Intention to Use' E-Government Services through Mobile Phone: The Importance of Front Loading Activities”. *Proceedings of the International Conference on Information Resources Management (Conf-IRM), Niagara Falls, Ontario, Canada*, May 18-20, 2008

[27] Parasuraman, A., Valarie A. Zeithaml, & Leonard L. Berry (1988). “SERVQUAL: A multiple item scale for measuring consumer perceptions of service quality” *Journal of Retailing*, 64 (1), 12-40.

[28] Parasuraman, A., Berry, L.L., Zeithaml, V. A. (1991). “Refinement & Reassessment of the SERVQUAL Scale”. *Journal of Retailing*. 67, (4), 420-50.

[29] Parasuraman, A., Valarie A. Zeithaml, Arvind Malhotra (2005). “E-S-QUAL: A Multiple-Item Scale for Assessing Electronic Service Quality”. *Journal of Service Research*, 7, (3), 213-233.

[30] Cronin, J. Joseph., & Steven, A, Taylor. (1992). "Measuring service quality: A re-examination & extension", *Journal of Marketing*, 56 (July). 55-68.

[31] Li, Hongxiu, Liu, Yong and Suomi, Reima (2009). "Measurement of e-service quality: an empirical study on online travel service". *Proceedings of the 17th European conference on information systems*. pp 1-13

[32] Dabholkar, P.A. D.I. Thorpe, & J. O. Rentz (1996). "A measure of Service Quality for Retailing Stores: Scale Development & Validation". *Journal of the Academy of Marketing Science*, 24 (1), 3-16.

[33] Kaynama, S.A. & Black, C.I. (2000). "A Proposal to Assess the Service Quality of Online Travel Agencies", *Journal of Professional Services Marketing*, 21, (1), 63-68.

[34] Zeithaml V. A. (2002). "Service Excellence in Electronic Channels", *Managing Service Quality*, 12(3), pp 135-39

[35] Liljander Veronica, van Riel A.C.R. & Minna Pura (2001). "Customer Satisfaction with E-Services: The Case of an Online Recruitment Portal, In Bruhn," M. & B. Stauss, Eds. Yearbook of Services Management - 2002-E-Services.

[36] Zeithaml, V.A., Parasuraman, A., & Malhotra, A. (2002). "Service quality delivery through web sites: A critical review of extant knowledge," *Journal of the Academy of Marketing Science*, 30(4), 362–375Quality, 12, 3, 135-139.

[37] Yoo, Boonghee & Naveen, Donthu. (2001). "Developing a Scale to Measure the Perceived Quality of Internet Shoing Sites (SITEQUAL)," *Quarterly Journal of Electronic Commerce*, 2 (1). 31-47.

[38] Agrawal A., Shah P. and Wadhwa V. (2007). "EGOSQ - Users' Assessment of e-Governance Online-Services", *A Quality Measurement Instrumentation*, GIFT Publications

[39] M. Chae, J. Kim, H. Kim and H. Ryu (2002). "Information quality for wireless internet services", *Electronic Markets*, vol. 12 no. 1, pp.38-46,

[40] Emmanouil Stiakakis and Christos K. Georgiadis (2011). "A Model to Identify the Dimensions of Mobile Service Quality" *Proceedings of the 10th International Conference on Mobile Business*, IEEE, pp 195-204

[41] Anita Seth, Hari Mohan Gupta and Kirankumar Momaya (2007). "Quality of service parameters in cellular mobile communication", *International Journal of Mobile Communications*, Volume 5 Issue 1, January 2007, Pages 68-93

[42] Y. Lu, L. Zhang and B. Wang (2009). "A multidimensional and hierarchical model of mobile service quality", *Electronic Commerce Research and Applications*, vol. 8, pp. 228-240, 2009.

[43] S.L. Gupta and Hitesh Gupta (2011). *"SPSS 17 for Researchers"*. International Book House, II Ed. 2011

[44] Jayanth Kola (2013). *India Smartphone and Tablet Outlook (2014)*. [online]. Available: http://www.linkedin.com/today/post/article/20140320153252-23070479-india-smartphone-and-tablet-outlook-for-2014

[45] Ashok Agarwal(2008). *eGovernance Case Studies*. Universities Press (india) Private Limited.

[46] Bhatnagar, S. (2002). "E-government: lessons from implementation in developing countries", Proceedings of the *Regional Development Dialogue*, UNCRD, (24), 2002, pp. 1-9.

[47] Bhatnagar, S. (2003a). "Transparency and Corruption: does e-government help?" *Draft paper prepared for the compilation of CHRI 2003 Report OPEN SESAME: looking for the Right to Information in the Commonwealth, Commonwealth Human Rights Initiative*, 1-9.

[48] Bhatnagar, S. (2003b). "Public Service Delivery: does e-government help?" *Proceedings of the Annual bank conference on development economics*, 11-20.

[49] Farshid Ghyasi and Ibrahim Kushchu (2004), "m-Government: Cases of Developing Countries", *Media Government Lab, Japan*

[50] Crossroads Copenhagen (2005). '*The Hip hop project'*[Online]. Available: www.crossroadscopenhagen.com

[51] Dossani, R., Jhaveri, R. & Misra, D. C. (2005). "Report on Enabling ICT for Rural India". Asia-Pacific Research Center, Stanford University and National Informatics Center, Government of India, pp 1- 75.

[52] Deloitte University Press (2013), *"Gov on the Go, Boosting Public Sector Productivity by Going Mobile"* [Online]. Available: http://cdn.dupress.com/wp-content/uploads/2013/02/DUP223_Gov-on-the-Go_vFINAL_2.18.pdf?44e4ee

[53] El-KikI, Tarek and Lawrence Elaine (2007). "Enabling Mobile Government Services: Strategies for Success". *Proceedings of the 20th Bled e-Conference*, pp 776-788.

[54] Heeks, R. and Lallana, E. (2004). "*M-government benefits and challenges*" [Online]. Available: http://www.e-devexchange.org/eGov/mgovprocon.htm

[55] Jeffrey Roy (2005). "Security, Sovereignty and Continental Interoperability" *Social Science Computer Review*, Vol.23, Issue 4, pp 463-479

[56] KPMG (2009). "The Indian Telecom Success Story". *Proceedings of Indian Telecom 2009: Telecom for Inclusive Growth*, pp 1-53

[57] Kumar R., Agrawal R., Sharma V. (2013). "e-Applications in Indian Agri-Food Supply Chain: Relationship among Enablers", *Global Business Review*, 14(4), 711-727

[58] Kushchu, Ibrahim and M. Halid Kuscu (2004). "From E-government to M-government: Facing the Inevitable". [Online]. Available: http://www.mgovservice.ru/upload/uploadfiles/From%20eGov%20to%20mGov.pdf

[59] Lociacono, Eleanor, Watson, Richard T., Goodhue, Dale, L. (2002). "WebQual: a measure of Web site quality", *Working paper*, Terry College of Business.

[60] M P Gupta, Prabhat Kumar, Jaijit Bhattacharya (2004). "*Government Online – Opportunities and Challenges*" Tata Mcgraw Hill Publishing Company Limited.

[61] Mamta Sareen, Lovneesh Chanana and Devendra Kumar Punia (2013). "Exploring success factors for mobile government in India", *Problems and Perspectives in Management*, Volume 11, Issue 4, 2013, pp 45-52

[62] Nikam, K., Ganesh, A. C. & Tamizhchelvan, M. (2004). "The changing face of India. Part I: bridging the digital divide". *Library Review*, 53(4), 213-219.

[63] Okenfeld, M. (2002). "Digital Signature Applications for E-Government" *ECRIM News*, 48 (January)

[64] Rameesh Kailasam (2010). "m-Governance Leveraging Mobile Technology to extend the reach of e-Governance". *Proceedings of the TRAI conference on Mobile Applications for Inclusive Growth and Sustainable Development*, 2010

[65] Rekola,K and Pohjanpalo, P (2002) Finland. "Developing regulation for the IT regime," *International Financial Law Review*, 69-77

[66] Saxena, K. B. C. (2005). "Towards excellence in e-governance". *International Journal of Public Sector Management*, 18(6), 498-513.

[67] Sharma, Sushil, & Gupta, Jatinder (2004). "Web services architecture for mGovernment: Issues and challenges". *Electronic Government*, 1(4), pp 462−474.

[68] Singh, S. P. (2005). "The role of technology in emergence of the information society in India," *The electronic Library*, 23(6), 678-690.

[69] Syed Jafar Naqvi and Hafedh Al-Shihi(2009). "M-Government Services Initiatives in Oman", *Issues in Informing Science and Information Technology*, Volume 6, 2009

[70] United Nations (2008). "From e-Government to Connected Governance". *United Nations e-Government Survey* 2008

[71] Vinay Kumar Nangia, Devendra Kumar Punia and Lovneesh Chanana (2014). "Prioritization of sectors for mobile government**",** *International Journal of Management*, Vol. 2, No.1, 2014**,** pp 1-13.

[72] Welch, E. and Wong, W, (2001). "Global information technology pressure and government accountability: The mediating effect of domestic context on Website openness", *Journal of Public Administration Research and Theory*, 11(4): 509-538

[73] Zálešák, M. (2003) "*Overview and opportunities of mobile government*" [online]. Available: http://www.developmentgateway.org/download/218309/mGov.doc

BIBLIOGRPAHY

[1] Department of Electronics and Information Technology, Government of India. "*Mobile Governance framework*" [online]. Available: http://www.deity.gov.in/content/framework-mobile-governance

[2] Department of Administrative Reforms and Public Grievances. "*12th Report of the Administrative Reforms Commission of India*". [Online]. Available: http://arc.gov.in/arc_12th_report/arc_12th_Report.htm

[3] Department of Administrative Reforms and Public Grievances. "*Sevottam Model*". [Online]. Available: http://darpg.gov.in/darpgwebsite_cms/Document/file/**Sevottam**_Model.pdf

[4] NASSCOM. "Nasscom e-governance study". [Online]. Available: http://egovreach.in/index.php/pages/national.html

[5] Department of Electronics and Information Technology, Government of India. "Mobile Sewa". [Online}. Available: www.mgov.gov.in

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

CURRICULUM VITAE

CURRICULUM VITAE OF RESEARCHER

LOVNEESH CHANANA

- **Summary of qualifications and experience**

The researcher has more than 19 years of working experience (including 13 years of working in a Government organization) and is currently working with IBM India Private Limited as Associate Partner. At IBM, he is responsible for managing IBM's consulting and IT services business in Public Sector in India. Prior to IBM, he has worked with KPMG, Ernst& Young, Tata Consultancy Services and National Productivity Council of India.

The researcher's areas of expertise include:

- Consultancy in e-governance: The researcher has handled large consulting projects like e-district, Crime and Criminal Tracking Network and Systems (CCTNS), National Population Register, National e-governance awards, e-governance standards etc.
- Capacity Building and Training: The researcher is also an expert trainer on management of IT in Government and has designed developed and conducted more than 100 training programmes for Government officials in India. He was a member of advisory committee on the design of e-governance Program for Executives by National Institute of Smart Government (NISG). He is a regular speaker at conferences and seminars.
- ICT implementation in Government: He has also worked on implementation of large projects like MCA21, Passport Sewa etc.

- **Educational qualifications**
    - Bachelor of Engineering (Industrial Engineering) from Thapar Institute of Engineering & Technology (Gold Medallist); 1991
    - Post Graduate Diploma in Industrial Engineering from National Productivity Council, New Delhi; 1995
    - Diploma in Training and Development form Indian Society for Training and Development; 1995

- **Work experience**
    - Since June 2013 with IBM India Private Limited as Associate Partner – Public Sector – responsible for services business in Public Sector including consultancy in Government.
    - From October – 2012 to May 2013 with KPMG as Director (e-governance advisory).
    - From April 2011 – October 2012 with Ernst & Young as Associate Director – Government Advisory – responsible for developing and handling Government advisory business
    - From October 2006 to April 2011 with IBM India Private Limited– General Manager (Application Services) - Global Business Services; responsible for Identification of potential opportunities through long term engagements with Government customers, Handling the sales process for opportunities, Engagements with influencers like National Institute for Smart Government (NISG), NIC etc., Engagement with

partners for technology and services related business engagements and contributing white papers and solutioning support from the Government domain requirements

- From May 2006 – October 2006 with Tata Consultancy Services as Associate Consultant with the Government Industry Practice – involved in business development and delivery of projects viz., MCA21 and VAT computerization.
- From Oct. 93 – April 2006 with National Productivity Council (A training and management consultancy organization) New Delhi as Deputy Director. Responsible for consultancy assignments in e-governance including the entire project management from proposal to final report acceptance including client relationship management, Project Team management, Resource allocation, management and tracking of milestones, Post completion follow-up etc. Also handled the design and organization of training programmes (both national and international), seminars and workshops etc. for NPC and other companies.

- **Academic Experience**
  - Visiting faculty to Indian Institute of Management, Indore handling the subject on "Consulting in e-governance projects".
  - Visiting faculty to Department of Management Studies, Indian Institute of Technology, Roorkee since 2005. Handling full subjects for MBA students on Management Information Systems, e-commerce and e-governance, Information Technology Project Management etc.

- Member of the Board of Studies for IMS University, Dehradun.
- Member of the academic curriculum committee for design of MBA syllabus at Malviya National Institute of Technology, Jaipur and University of Petroleum and Energy Studies, Dehradun.
- Member of the curriculum design committee for the PG Diploma in e-governance course by National Institute of Smart Government, Hyderabad.
- Visiting faculty to capacity building programmes by the National Institute of Smart Government, Hyderabad.

- **Papers published**
  - Mamta Sareen, Lovneesh Chanana and Devendra Kumar Punia (2013). "Exploring success factors for mobile government in India", Problems and Perspectives in Management, Volume 11, Issue 4, 2013, pp 45-52.
  - Vinay Kumar Nangia, Devendra Kumar Punia and Lovneesh Chanana (2014). "Prioritization of sectors for mobile government**",** International Journal of Management, Vol. 2, No.1, 2014**,** pp 1-13.
  - Lovneesh Chanana (2007), "Outsourcing of G2E Applications – The Next Potential Wave for Public Private Partnership Initiatives in India", Foundations of E-government, proceedings of the fifth International conference on e-governance 2007, pp 116-121
  - Lovneesh Chanana, Rajat Agarwal and Devendra Kumar Punia (2014), "Service Quality Parameters for mobile government services in India",

submitted in April 2014 to Global Business Review, International Management Institute, New Delhi.

- **Conferences and seminars**

  - Represented India on three international seminars viz., Information Technology for Future Business, Japan (1999), "Strengthening IT capabilities of NPOs", Malaysia (2002) and "Innovation for higher value and Growth", Singapore, 2004.

  - Invited as a resource person for the seminar on 'Strengthening IT Capabilities of NPOs" at Nepal during December 2005.

  - Speaker at:

    - National conference on e-governance by Department of Administrative Reforms and Public Grievances, Government of India

    - International conference on e-governance (ICEG) organized by Indian Institute of Information Technology, Allahabad

    - Civil Services Day 2013 organized by the Department of Administrative Reforms and Public Grievances, Government of India

Harnessing Energy through Knowledge

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

APPENDICES

APPENDICES

Appendix – 1: Questionnaire for Expert Survey to identify factors and service quality parameters for mobile government in India

Factors affecting mobile government.

Appendix – 2: Questionnaire for Delphi Survey for prioritization of sectors for mobile government in India


Delphi Survey.pdf

Appendix– 3: Questionnaire for study of relationship between mobile government service quality parameters and factors affecting use of mobile government in India.