Dissertation Title

"Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's perception"

A Dissertation Proposal for

Post-Graduate Diploma in Health and Hospital Management

By

Dr. Shruti Mehta

Roll No. PG/10/044

International Institute of Health Management Research

New Delhi -110075

April 2012

"Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's perception"

A dissertation submitted in partial fulfillment of the requirements

for the award of

Post-Graduate Diploma in Health and Hospital Management

By

Dr. Shruti Mehta

Roll No. PG/10/044

International Institute of Health Management Research

New Delhi -110075

April 2012

"Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's perception"

A dissertation submitted in partial fulfillment of the requirements

for the award of

Post-Graduate Diploma in Health and Hospital Management

By

Dr. Shruti Mehta

Roll No. PG/10/044

International Institute of Health Management Research

New Delhi -110075

April 2012

pwc

May 4, 2012

To Whomsoever It May Concern

This is to certify that **Ms. Shruti Mehta (Emp Id: 713431)** has undergone her training with the **Advisory** division of **PricewaterhouseCoopers Pvt. Ltd.**, Gurgaon from **February 13, 2012** to **May 4, 2012**. She was associated with the **Advisory Corporate - Healthcare** SBU.

She has exhibited a keen interest in learning and has a positive attitude. She is sincere and hardworking. The efforts put in by her for the project and the analysis of the subject carried out during the training was outstanding.

We wish **Shruti,** the best in her future endeavors.

For **PricewaterhouseCoopers Pvt. Ltd.,**

Kavita Sinha

Kavita Sinha
Human Capital

PricewaterhouseCoopers Pvt. Ltd., Building 8, 7th & 8th Floor, Tower - B, DLF Cyber City, Gurgaon - 122 002
T: +91 (124) 4620000, 3060000, F: +91 (124) 4620620, www.pwc.com/india

Registered Office : Plot No. Y-14, Block EP, Sector V, Salt Lake, Kolkata 700 091

Certificate of Internship Completion

Date: 2/5/12

TO WHOM IT MAY CONCERN

This is to certify that Dr.Shruti Mehta has successfully completed her 3 months internship in our organization from February 13th 2012 to May 5th 2012. During this intern she has worked on assigned work ....(task performed) under my guidance at PricewaterhouseCoppers.

....(any positive/negative comment)

We wish ~~him~~/her good luck for ~~his~~/her future assignments

Rana Mehta

(Signature)

__________________(Name)

Executive Director
Leader Healthcare practice Designation
PwC India

Prof. (Dr.) T. Muthukumar
Professor - IT
T. Muthukumar 2/5/12
(Mentor).

Certificate of Approval

The following dissertation titled **"Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's perception"** is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

Name	Signature
Prof. Dr. S. V. Mani	
Prof. I. Bhattacharya	
Dr. Anandi Ramachandra	

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Shruti Mehta**, a participant of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. He/She is submitting this dissertation titled **"Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's perception"** in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management**.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Rana Mehta

Dr. Rana Mehta
Executive Director
Leader Healthcare Practice
PricewaterhouseCoopers
India
Date:

T. Mutthukumar

Prof. (Dr.) T.Mutthukumar
Professor Healthcare IT
IIHMR, New Delhi

Date: 2/5/12

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Shruti Mehta**, a participant of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. He/She is submitting this dissertation titled **"Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's perception"** in partial fulfillment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management**.

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Rana Mehta

Dr. Rana Mehta
Executive Director
Leader Healthcare Practice
PricewaterhouseCoopers
India
Date:

T. Mutthukumar

Prof. (Dr.) T.Mutthukumar
Professor Healthcare IT
IIHMR, New Delhi

Date: 2/5/12

Acknowledgement

I hereby take this opportunity to thank, Dr.Rana Mehta, Executive Director, Leader Healthcare services, PricewaterhouseCoopers for the valuable guidance and advice. He inspired me greatly to work in this project. His willingness to motivate me contributed tremendously to my project.

My special thanks to Ankur Bharti, Senior Consultant and Mithu Saha, Assistant Manager Healthcare Advisory for their guidance, support, interest, involvement and encouragement. They have left no stone unturned in updating me regarding the subject.

I wish to express my deep sense of gratitude to Saurabh Gupta, Senior Manager, for giving me the opportunity to do my Internship and Dissertation at DELL Services. He was very kind enough to spare his valuable time and provided several important suggestions at every stage of my study.

Besides, I would also like to thank the entire Healthcare Advisory team for their encouragement and cooperation in carrying out the project work.

My sincere acknowledgement goes to Professor (Dr.) T.Mutthukumar and Professor Indrajit Bhattacharya for their kind assistance and support throughout my dissertation.

Finally, an honorable mention goes to my family and friends for their understanding and support on me in completing this project.

Thank You

Dr. Shruti Mehta

List of Figures:

List of Tables:

Abbreviations

SMS	Short Message Service
USSD	Unstructured Supplementary Service Data
IVR	Interactive Voice Response
mHealth	Mobile Devices based Health Services

Internship Report

PricewaterhouseCoopers Profile

PwC firms help organisations and individuals create the value they're looking for. A network of firms in 158 countries with close to 169,000 people who are committed to delivering quality in assurance, tax and advisory services.

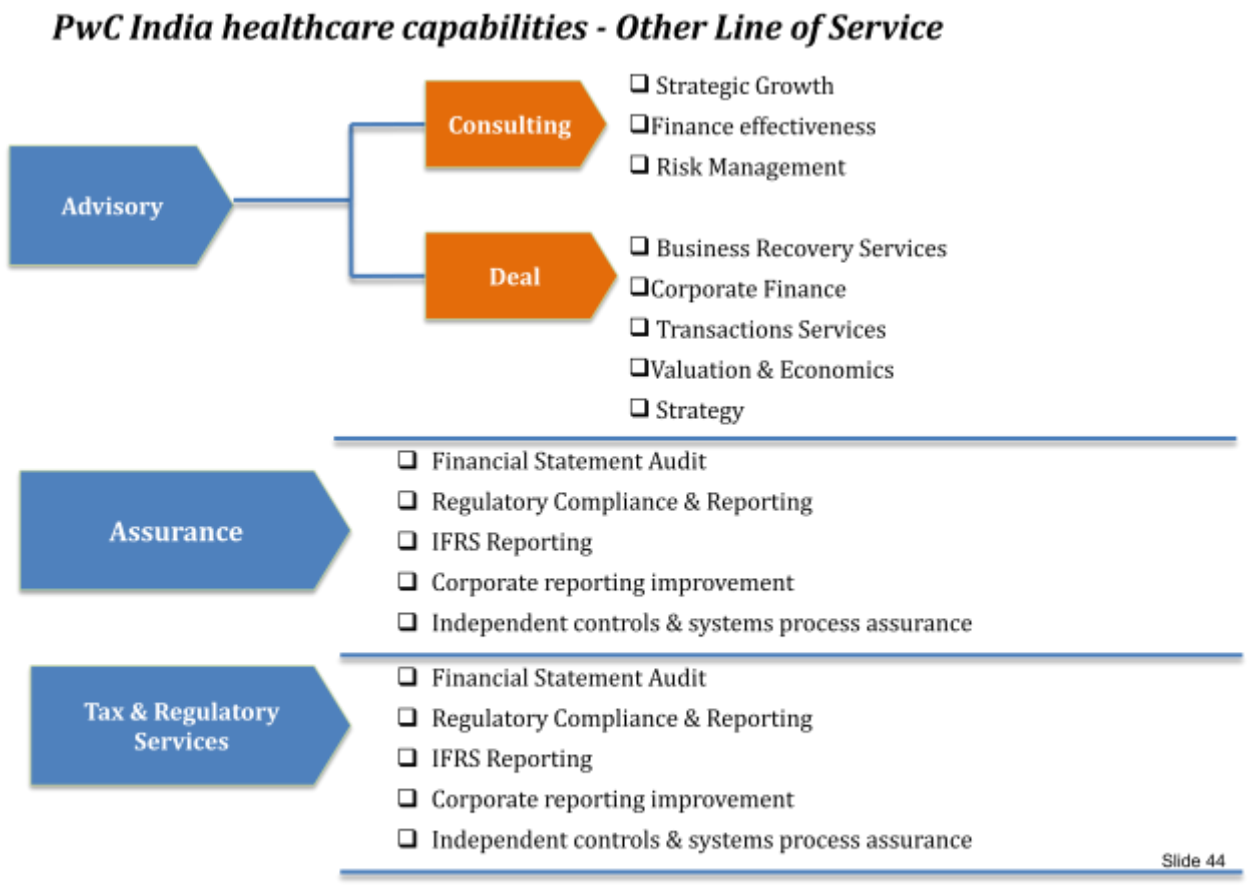
In India, PwC offers a comprehensive portfolio of Advisory and Tax & Regulatory services; each, in turn, presents a basket of finely defined deliverables. Network firms of PwC in India also provide services in Assurance as per the relevant rules and regulations in India.

Providing organisations with the advice they need, wherever they may be located, the highly qualified, experienced professionals, who have sound knowledge of the Indian business environment, listen to different points of view to help organisations solve their business issues and identify and maximise the opportunities they seek. Its industry specialisation allows it to help co-create solutions with the clients for their sector of interest.

Its located in the cities: Ahemdabad, Bangalore, Bhubaneshwar, Chennai, Delhi NCR, Hyderabad, Kolkata, Mumbai and Pune.

The healthcare advisory is a part of the Advisory line of service, and it provides expertise to a long list of clients in wide area like:

- Education & Research
- Medical Equipment Management
- Enterprise Strategy & Business Development
- Information Technology
- Manpower Rationalization
- Transaction Services
- Operational Optimization
- Facility Management



Tasks involved in:

- Prepared report on global healthcare IT consulting needs.
  Evaluation of the healthcare IT industry across the globe. Need analysis of consulting in IT and what are the various ways it could be provided. Emergence of the consulting industry and its future.

- Report on criteria for ranking of institutes-in US and India.
  Evaluation of the ranking criteria in US, identification of the 3 most common systems. Doing the same research with respect to Indian market. Comparison of the two and formulating the most relevant criteria in respect to the Indian market.

- Medical education in private hospitals-report on challenges faced and issues.
  The number of post graduation seats in various medical colleges. The specialty for which they provide degree. The number of colleges across the country which have that department and seat.

- Involved in mobile health project in the firm, research on such projects across the country.
  Secondary research on the mhealth projects available in the NCR region. The profile of the companies involved in it and what projects are going on all across the country.

- Interviewing Himmat Rana, leader mhealth initiative of Airtel to know about the servies they provide in this sector.
  In relation to the research as well as the mhealth initiative by the firm. To know what is going on, on the provider side of the service.

- Preparing proposals for different organizations.
  Was involved in preparing the proposals for the different organizations ranging from, investment companies to hospitals to government.

- Doing market research for a super speciality hospital in metropolitan city of India.
  Starting from no of hospitals, facilities offered, departments, number of doctors and qualification of doctors.

Reviewing and presenting latest reports like:

- The global HIT practice- statement of qualification FY2012 by PwC
- Touching the lives through mobile health and understanding the global healthcare scenario by PwC.
- Annual report 2010-11 by ministry of health and family welfare and read about the organization and infrastructure.
- Report by Harvard School of Public Health on global economic burden of non communicable diseases.
- WHO world statistics report.
- Profitable growth strategy for the global emerging middle by PwC.

Trainings undergone:

- Usage of the Core Consulting Curriculum portal.
  Use of how the available data on PwC internal site could be used to provide better consulting to the clients.

- Global Independence Training 2011.
  The various privacy policies to be followed in an organization, and the consecuences for violating the same.

- Core consulting skills: Issue based problem solving.
  To develop the skills to provide better consulting opportunities to the customers, and maximizing the benefit.

- Online anti money laundering training program.
  Keeping the financial aspect in mind, all the measures that are to be taken by an organization to prevent money laundering.

- Describe network of e-learning programs

- Anti-trust or competition laws e-learning program.
  The anti trust and competition laws that are to be followed.

- Authorization for service training program.
- Annual Compliance Confirmation e-learning program.
- Making better use of AFS program.

Dissertation Report

Abstract

Scope and Acceptance of Mobile Healthcare Services in Urban India: Stakeholder's Perception

Introduction: Delivering health care services on mobile phones is likely to be a promising technology. India has the world's second-largest mobile phone users with over 903 million as of January 2012. It has the world's third-largest Internet users with over 121 million as of December 2011. India has become the world's most competitive and one of the fastest growing telecom markets. The industry is expected to reach a size of ₹ 344,921 crore (US$68.81 billion) by 2012 at a growth rate of over 26 per cent, and generate employment opportunities for about 10 million people during the same period.

Thus, providing an opportunity to the health organizations to reach many more consumers using current telecom boom in the country. Mobile phones can be a cost effective medium to reach out to informed groups to urban areas in the country with variety of services including: consultation, videoconferencing, diagnostics etc. in a variety of formats, types, uses, and communication – such as medical records, instructions, contact details, health test results, social support, medical knowledge, appointment details, and much more. For instance consumers might collect health measurements on their mobile and then send this data for review by a medical team.

Objective: This research examines health consumers' latent needs and perceptions on the mobile phone health services and their intentions to use the technology. This study focuses on three key stakeholders: (1) consumers, (2) healthcare organizations and (3) telecom service providers. The objective is two-fold: (1) to understand the latent needs of the consumers that can be addressed with this technology and its acceptance, (2) and to bring out the perspective of healthcare firms and telecom services providers to invest and collaborate to bring out cost-effective solutions/services in the healthcare space.

Methodology: The assessment was based on secondary research and also primary interactions with key stakeholders. The secondary research was carried out using information available in

the public domain, newsletter, research papers etc to understand the basic services that can be provided.

In the second stage, a more focused survey was carried out using a structured questionnaire approach with multiple stakeholders. A survey of 52 individuals residing in urban area was carried out. The survey results were then analyzed using quantitative tools coupled with qualitative inputs to strengthen the results.

Conclusion: The study will help us to understand the mhealth scenario both from the consumer as well as the providers' point of view. And ultimately help us formulate mhealth services based on the demand of the users.

Chapter 1: Introduction

Mobile phones have the potential to support health care. Health organizations could reach many consumers with this computing device. As of December 2008, 270.3 million people in the United States are mobile phone subscribers – representing 87% of the population – and they used their phones for 2.2 trillion minutes that year with one trillion text messages sent[1]. Additionally, one of every five US households (20.2%, 2008 estimate) relies solely on mobile phones for telephone communication[2],[52].

As in Africa, most of the current mobile health deployments in the Asia-Pacific region (APAC) focus on improving the efficiency of healthcare workforce and systems. Solutions that help spread prevention and awareness messages have also been widely deployed and comprise about 20% of the mobile health deployments in the region [3]. India has witnessed significant activity in the mobile health space with launches of different types of solutions although a majority of initiatives are focused on spreading prevention and awareness messages. India has the world's second-largest mobile phone users with over 903 million as of January 2012[4]. It has the world's third-largest Internet users with over 121 million as of December 2011 [5]. India has become the world's most competitive and one of the fastest growing telecom markets [6],[7]. The industry is expected to reach a size of ₹ 344,921 crore (US$68.81 billion) by 2012 at a growth rate of over 26 per cent, and generate employment opportunities for about 10 million people during the same period.

Furthermore, there is evidence that computer technologies may increase the skills, motivation, and self-efficacy for health activities [8], so medical applications on mobile phones might drive healthy behaviors among consumers. Consequently, this technology has the potential to save resources, increase outreach, and improve health outcomes [9]. Mobile phones have the potential to support health care [10]. As portable computers, they can process complex health information through voice, text, photo, audio, and video modes. The technology is also a familiar one. Many consumers already use mobile phones – and for services beyond the telephone call, such as scheduling with calendar applications or searching for entertainment like music, video, and games. Its mobility offers convenience for contacting health services wherever mobile networks exist. Because of their popularity and computing capacity, mobile phones could be valuable for delivering health care services to the general public.

In spite of the advancements in medical technologies and a general increase in income levels, healthcare continues to pose challenges of affordability, complexity and access across the world. In developed markets, per capita healthcare expenditures have risen faster than both income levels and inflation rates over the past decade due to rising incidence of lifestyle driven chronic diseases and ageing populations. Yet, there have been no corresponding improvements in the quality of healthcare delivery in many countries. In contrast, developing countries primarily face the challenge of providing healthcare access to their citizens. Mobile is poised to play a significant role in healthcare.

In contrast to healthcare access, mobile access is becoming almost ubiquitous worldwide. Almost all developed markets already have mobile penetration greater than 100%. Mobile penetrations in Africa, Asia-Pacific and Latin America are also expected to increase to 82%, 98% and 119% respectively in 2014[3]. Also, the increasing penetration of smartphones as well as the 3G and 4G networks will provide a significant boost to the use of the mobile platform for providing healthcare services. Thus, the feasibility of mobile devices supporting healthcare is greater than ever before. Mobile health - the use of mobile communication and devices for providing healthcare services or achieving health outcomes - stands at a significant inflection point.

The global Mobile Health market has started taking shape. Mobile health services can be categorized into two broad areas:
Solutions across the Patient Pathway and Healthcare Systems Strengthening. Solutions across the Patient Pathway - Wellness, Prevention, Diagnosis, Treatment and Monitoring, entail direct touch-points with patients. Healthcare Systems Strengthening solutions - Emergency Response, Healthcare Practitioner Support, Healthcare Surveillance and Healthcare Administration, do not involve direct interactions with patients, but are primarily aimed at improving the efficiency of healthcare providers in delivering patient care. In addition to delivering social benefits, Mobile Health is expected to garner revenue of US$ 23 billion in 2017. The worldwide mobile health revenue1 is expected to reach about US$ 23 billion across all stakeholders – mobile operators, device vendors, healthcare providers and content/application players - by 2017.

By 2017, the largest markets for mobile health services will be Europe and Asia- Pacific (APAC) with 30% market share each, followed by the developed markets of North America (USA and Canada) with 28% share. Latin America and Africa will comprise 7% and 5% share respectively [3].

Literature Review

Delivering health care services on mobile phones is a promising technology. As portable computers, they can process complex health information through voice, text, photo, audio, and video modes [11],[53]. The technology is also a familiar one. Many consumers already use mobile phones – and for services beyond the telephone call, such as scheduling with calendar applications or searching for entertainment like music, video, and games [12]. Its mobility offers convenience for contacting health services wherever mobile networks exist. Because of their popularity and computing capacity, mobile phones could be valuable for delivering health care services to the general public [13].

There are mobile phone services for health communication and promoting healthy behaviors. They facilitate interactions with health care professionals, assist with health actions, deliver health information, and manage health care services [14].

Table 1.1 Mobile phone health services in India

Service	Example of project
health surveillance	CommCare
home-based health care	CareHQ
Data collection	Community Accessible and Sustainable Health System (Ca:sh)
to access their lab tests and medical history reports.	Mobile Care, Support and Treatment Manager (MCST)
health videos	mDhil Health Information on Mobiles
Disease and Epidemic Outbreak Tracking	an Acute Encephalitis Syndrome Surveillance Information Management System (AESSIMS)
	Tamil Nadu Health Watch
tele-triage service	Aircel Apollo Mobile Healthcare
	Mediphone by Airtel
health awareness listen-in audio service	Sparsh by Tata Docomo
interactive voice response service	Jeeyo Healthy by Spice

screening high-risk individuals using smart phones with camera	Screening for oral cancer
Health education	Jaalaka
Mobile phone application	CycleTel: Family Planning via Mobile Phones
SMS based	SMS alert for infant vaccination
Remote Data collection	Media Lab Asia – Shared Resource for Rural Health
Diagnostic and Treatment Support	Ericsson and Apollo Hospitals Initiative

Mobile phones can help health consumers interact with medical professionals remotely. Patients might collect health measurements on their mobile and then send this data for review by a medical team. For instance, asthma patients can measure airflow from their lungs using a peak flow meter that is attached to the phone [15]. A software application then generates graphs from these measurements to monitor the condition, and this data can also be sent to the medical office through mobile networks. Additionally, patients are able to send complex health information to help physicians with diagnosis.

As a portable computer, the mobile phone can guide consumers to take health actions. For promoting healthy lifestyles, there is an Internet service to schedule exercise activities – and when the time comes, a reminder of this commitment is sent to the phone [16]. Another application helps with weight control. Diary software on mobile phones lets health consumers record food intake and exercise activity – and then it calculates whether targets for calorie consumption are being met [17]. Then there are automated phone reminders that help patients adhere to a medication schedule and follow through with medical procedures. In brief, mobile phone computing enables digital services that assist with health actions.

Mobile phones may also manage health care services. Appointment scheduling is one example. Patients can text a clinic to request an appointment and then receive an automated response of available times [19]. Afterwards, the patient responds with a preferred

appointment. A text message reminder is delivered as the date approaches. In another time-saving service, medical test results may be delivered to mobile phones, which could avoid delays in letter mail delivery. A sexual health testing clinic has successfully deployed such a program, and it resulted in patients being diagnosed and receiving medical attention sooner. Overall, the mobile phone is capable of administering health care services [20].

Acceptance of Technology

There are several definitions for technology acceptance, so it is important to describe what will be studied. Some researchers examine the self-reported intention to use technology [21], while others measure actual usage [22]. The subject doing the accepting may be the individual [23],[54] or an organizational entity. In health technologies research, acceptance has often focused on hospital environments and the adoption patterns of health care professionals [24].

There are different approaches for studying technology acceptance [25]. The objectivist view examines the fit of an innovation within its organizational environment. The structurationalist perspective focuses on the interactions among technologies, users, and organizations. The individual is another focus for examination. This represents the subjectivist approach, which emphasizes relevance, perceptions, tasks, behavior, and other personal factors.

This study focuses on individual adopters and defines technology acceptance as the intention to use mobile phone health services. There are several reasons for this position. Behavioral intention is a good predictor of actual behavior [26]. Additionally, technology acceptance theories have focused on individuals to explain adoption [21], and many health studies have focused on the individual to understand health behavior [26]. For these reasons, this research takes the position that individual beliefs, attitudes, intentions, cognitions, emotions, and readiness for innovations are important human dimensions to understanding health technologies.

Individual perceptions

Among technology acceptance theories, there are common theoretical themes focusing on behavioral intention and individual reactions [21]. According to one model, actual use of information technology is shaped by individuals' intention to use it and their reactions to the

technology (Figure 1.1). These three variables interact with one another, but not in a linear, sequential pathway. This model focuses on the subjective individual and holds personal relevance, perceptions, and intentions as important determinants of technology acceptance and adoption.

Individual reactions to

- Using information technology
- Intentions to use information technology
- Actual use of information technology

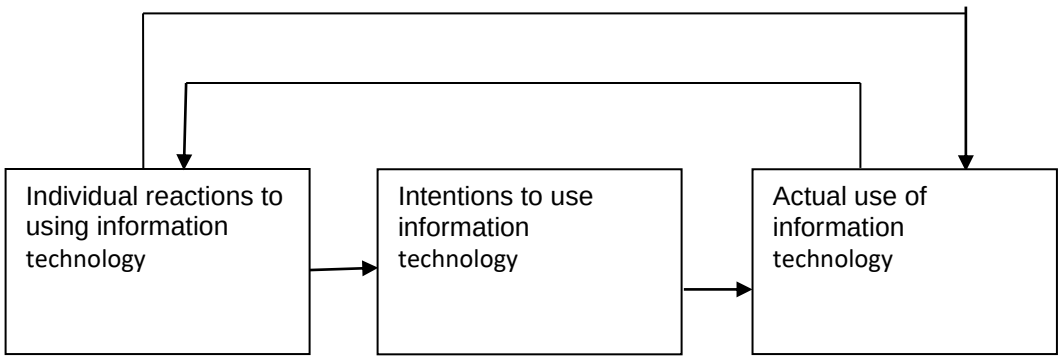


Figure 1.1 Underlying concept in user acceptance models [21]

Three theories support this unified model of technology acceptance: the Theory of Planned Behavior, the Technology Acceptance Model, and the diffusion of innovations theory [27].

An important psychological theory in the health sciences, the Theory of Planned Behavior justifies the focus upon individual perceptions for understanding and predicting health technology acceptance [26]. According to this theory, people are more likely to carry out a behavior when they are motivated to perform the behavior and when they perceive the behavior is easy to perform or not too difficult. These factors of intention and perceived behavioral control can explain variations in people's actual behavior. Personal beliefs are important in this theory because they shape the 11 behavioral determinants in the first place. Important beliefs are the favorable appraisal of the behavior (attitudes), what people important to us think about this behavior (subjective norms), and whether we think we can do it (perceived behavioral control).

The Technology Acceptance Model has two determinants of acceptance: perceived usefulness and perceived ease of use. People are more likely to adopt a technology if they believe it is useful and if they believe it is easy to use [28]. Perceived usefulness is a belief that using the technology will enhance job performance in such ways as speed, productivity, effectiveness, and job ease. On the other hand, perceived ease of use is a belief that technology use will be free of difficulty and immense effort – specifically, the technology is easy to learn, controllable, flexible, clear, and understandable. This model uses subjective terms to measure acceptance and its determinants. It is based on prior research that showed self-prediction of future behavior is one of the most accurate predictors of individual behavior [29],[55]. By focusing on individual intentions and perceptions, this theory supports the study of health technology acceptance along individual and self-perceived terms.

Diffusion of innovations theory also supports a subjective focus in technology acceptance research. This theory has four dimensions: perceptions of innovations, communication channels, time elements – such as the speed at which technology is adopted – and social systems. Of relevance to this study, the theory explains how the rate that innovations are adopted depends on people's subjective perceptions – and not objective measures of the technology. Five key perceptions include relative advantage, compatibility, complexity, trialability, and observability of the innovation – but the theory recognizes that many other perceptions may also control the adoption rate. Disciplines other than sociology have empirically upheld the role of these subjective perceptions in shaping adoption [30] ,including health care innovations research[31],[56].

Many other theories explain technology acceptance. Taken together, they represent diverse perspectives for explaining our communication, our culture and our perceptions, and they propose an interconnection of many dimensions including the individual, the social, and the organizational. This variety raises the question: Which theory do we use in research?

The Unified Theory of Acceptance and Use of Technology respond to this question. The theory is an empirical synthesis of eight influential theories, including the three examined earlier [21]. It proposes that human behavior is influenced by people's intentions and their facilitating 13 conditions. Intentions are shaped by social influence and our expectations of performance and effort. These behavioral determinants are moderated by gender, age,

experience, and voluntariness of use. In developing this theory, it was found that the eight theories underlying the model could explain between 17% and 53% of the variance in user intentions with information technology. Therefore, it may be difficult to select one particular theory from another when many of them are more or less statistically valid in their analytical power.

Overall, many technology acceptance theories highlight the role of individual perceptions in the adoption process. Our attitudes and thoughts shape our intentions to use a technology, and this intention is one of the best predictors of actual use. While there are different approaches for examining technology acceptance, focusing on individual perceptions is one pathway to understanding this complex process.

Health behavior and technology

An important component of well-being is health behavior – the personal traits, personality characteristics, actions, and habits that are connected with health maintenance, restoration, and. Improvement [31]. It is important for preventing and managing chronic health conditions like heart disease, stroke, cancer, asthma, and obesity [32]. Some behaviors that have a significant impact on health are tobacco use, diet and activity patterns, alcohol consumption, illicit drug use, sexual activity, and avoidable injuries [33].

According to theory, three factors may shape our health behavior. First, there are social experiences and forces – where social cues and interactions inform and influence behavior; secondly, there are personality factors and affective dispositions, such as optimism, bias, and anxiety; and finally, there are beliefs and understanding, which are shaped by learning and experiences [36].

Health information may influence health behavior in a number of ways. It can cultivate health understanding [39],[57] elucidate options and choices for health decision making [40] shape emotional states [41] provide social support [42] promote health awareness and self-care[43] motivate and activate good 20 health skills [44],[58], empower the patient [45], and facilitate behavior change pathways[46]. The contribution of health information to self-care is important, especially with an aging population and a growing prevalence in chronic diseases[48].

Health behavior theories recognize subjective perceptions as an important determinant of behavior – much as technology acceptance theories do. The Health Belief Model[38] the Transtheoretical model and the Theory of Planned Behavior all highlight the role of individual perceptions in health behavior. However, the mere availability of information might not lead to a health impact[49]. Rather, patients need to use the information in order to develop preventive and optimal health practices[50],[51].

Objective:

General Objective:

- To understand the latent needs of the consumers that can be addressed with this technology and its acceptance.
- To bring out the perspective of healthcare firms and telecom services providers to invest and collaborate to bring out cost-effective solutions/services in the healthcare space.

Specific Objective:

To determine the kind of mhealth product that will be most successful in the market and will have a wider acceptance among people in urban areas.

Chapter 2: Methodology

Sample and Study Design

This study examines health stakeholder's perceptions of mobile phone health services and their intentions to adopt this technology. First, a semi structured interview of the provider is taken to understand what they feel about this technology (appendix 1, 2). Then the participants completed a questionnaire about their demographic details, mobile phone experiences and acceptance of mobile phone based healthcare services (Appendix 1). There were a lot of variables on which the data was collected. The sample size of 52 was taken from people residing in Delhi and Gurgaon (Haryana) and convenient sampling technique was used for the selection of the consumer based survey. For the qualitative aspect the appointment with the service providers were fixed and data was collected based on face to face interview.

Questionnaire for survey:

A well structured questionnaire in English was used for the purpose of primary data collection. Close ended questions were included in the questionnaire. The questions were related to the demographics and the general perception of the patient towards the use of health technology on the mobile phone. The questionnaire was designed to elicit information on different variables which serve the purpose of the study. The questionnaire was divided into two sections. Three questions on the patient-related variables including socio-demographic variables (gender, age, qualification) and factors-related variables (mobile phone usage, internet usage, services available on mobile phones and cost they can bear etc.) The questionnaire comprised of 11 questions out of which the first 3 questions were related to the demographic characteristics of the patients and the remaining questions were related to the mobile phone based health services by the consumer.

Questionnaire for interview

Technology provider:

A semi structured questionnaire was used for the interview, it comprised of 11 questions, based on the current trends, industry challenges, user acceptance and future scope of the mobile phone healthcare industry.

Healthcare provider:

A semi structured questionnaire comprising of 11 questions was used, the questions enquired about the mobile phone technology industry, user acceptance, co operation by stakeholders as well as services they would like to provide.

Analysis:

Analysis employed quantitative coding. Interview transcripts were carefully read and then segments of the text were labeled with descriptive codes to classify them by topic. Afterwards, each code pattern was reviewed together and analyzed for meaning, themes, and perspectives. Coding of the transcripts was completed and then factor analysis was done using the SPSS software.

Chapter 3: Result & Findings

Input from technology provider:

A meeting was scheduled with the information technology provider and a structured interview was conducted (Annexure 1). The following responses were observed. When asked aout the initiatives taken by Airtel in mobile health sector and the key services it provides. It was told that There are mainly 2 services that Airtel provides in the mobile health sector. One is the SMS alerts and other is Mediphone. The Mediphone services was started 1 and a half years back where as the SMS based alert services was initiated 1 year back. The Mediphone is a tele-triage service in which the consultation is provided on call. Airtel has formed a strategic alliance with Healthfor (a division of Religare technologies Ltd.) to provide this service.
It provides services in acute care through Mediphone and informational tips through SMS alerts. Also, it was pointed out by Himmat that the SMS service has wider acceptance by the users as compared to the Mediphone.

Then to know how the service delivery works a more detailed view of the service delivery was asked, it was told that "It provides immediate care for non acute minor ailments with appropriate advice. The consumer calls on the number and is connected to the qualified nurses. In cases where general consultation is required; the nurse takes the details of the ailments and connects the caller to a doctor. The doctor recommends over the counter drugs through an email/SMS prescription". To understand how the Mediphone service is helpful the duration as well as the ailments for which maximum calls were received was found out and it was seen that, in a day around 1000 calls are received and the average and as the service provides only acute care, so majority of the calls are for respiratory conditions comprising of cold cough etc. The number of calls received for stomach ache or other gastric conditions along with sexual problems were also reported to be high. To understand the geographical and demographic segments it caters this question was raised, and it was seen that "the callers are between the age group of 15-40 years from the middle income group. Though the service is provided in 6 north Indian states along with Karnataka, most of the calls are received from the metropolitan cities".

As we know there are still a lot of challenges in adoption of mobile health services so to know about the challenges that Airtel faces are:

- Preventive Care- Since the mindset of the people is such that they do not go for a healthcare advice till the time some serious problem has developed.
- Credibility- The customers do not rely on these services as they are not sure of the credibility of the consultant.
- Interactive Voice response-Most of the Indian population is not very comfortable in using the IVR which poses a great problem. Also, the callers feel that they are being charged for the IVR and do not

This was from the consumer side, from the provider side it was noticed that "The participation and support of physicians is very encouraging, since it is a win-win situation for them. It provides a bigger patient base, as the patients could be monitored virtually so saves a lot of time"

Then I asked him about the key growth drivers that is driving the mobile health service today. He shared that the wide penetration of the mobile phones across the different economic strata in the country. The convenience of getting consultation without standing in que or waiting for appointments and the wide acceptance of technology by 15-40 age group which form bulk of the population of the country. At the end it was asked what are the next areas for which Airtel wants to give its services. These areas are the remote patient monitoring, SMS reminders and drug identifier service.

Inputs from Healthcare Provider:

Healthcare IT head of a 250 bedded hospital was questioned in Delhi about the acceptance of the technology from the point of view of a provider. Initally he was asked about the significance of the development of the mhealth industry. He shared that it has great opportunities ahead and is a very booming sector, but has a lot of challenges associated with it. When asked about the past experiences he has of any mhealth projects in his organization, he said no. Then it was enquired that what kind of services he would like to provide the consumer, it was seen that he was more willing in providing wellness and monitoring services. As these are very important in the over all health of the individual yet take a lot of

time of the provider. So, by using mhealth technology for the same a lot of physician time could be saved as well as relevant information could reach the consumer.

Healthcare practitioner support as well as administrative services were shown to be more beneficial and as a healthcare provider these services he would like to provide on a long run. Talking about the physician support, he feels there could be some challenges with the doctors who are senior in age as compared to the fresh graduates who are well versed with the technology. When asked about the telecom providers if they are willing to participate in the study, he shared that telecom providers are willing to participate and co operate as they also feel that it will be profitable venture. IVR and videoconferencing were the most widely used and these are the services he would like to invest a a healthcare technology provider.

When asked about the challenges he anticipates, he shared that there could be administrative challenges as it is a new technology, behavioral change could also be a problem since people are reluctant to change but according to him the most challenging part will be privacy and confidentiality as there are no government policies also for it. He was more inclined towards providing body vital trackers, information tips and reminders to the consumer.

The mobile technology vision that he had was to fulfill the objective of reducing the time of the physician so that care could be provided to the ones who need it more.

The survey population of consumers:

Demographic Details

All the research participants are from the urban area, more females participated in the study. Around 53.8 percent females and 46.2 percent males participated. The participant's age group varied from below 18 to above the age of 60. There were senior citizens involved. The number of people in the age group is the maximum in 18-24 years (48.1%) having 29 people and the minimum in the range of 50-59 years having 3 people (5.8%).

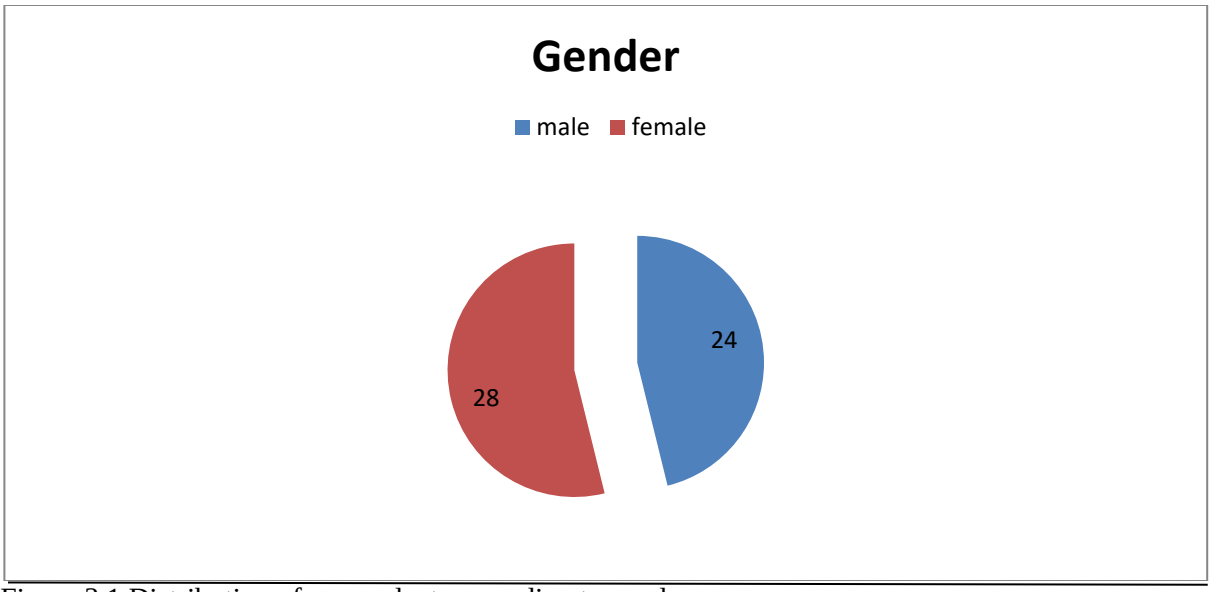


Figure 3.1 Distribution of respondents according to gender.

So we can see all the age groups participated in the study and 7 people were from less than 18 years age group and senior citizens view point was also observed and there were 4 people in this category, making it (7.7%).

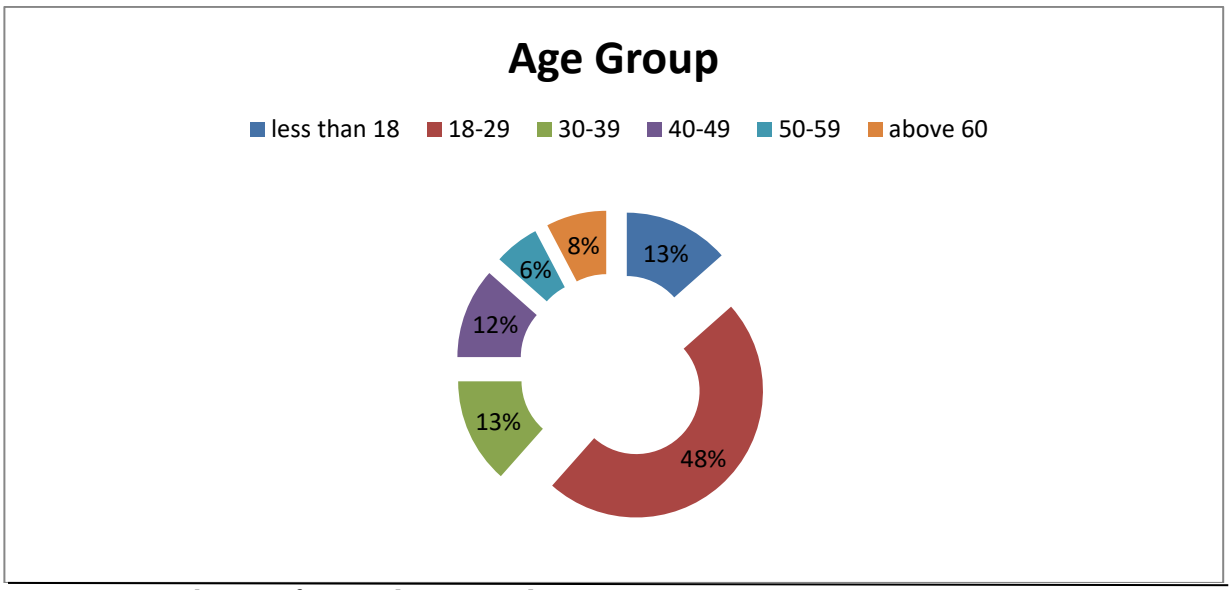


Figure 3.2 Distribution of respondents according to age group.

Qualification

Among the study population 51.9% people were post graduates, whereas 2 uneducated people also participated. 13 graduates took part in the study and 4 people were less than high school

and 6 have done high school.

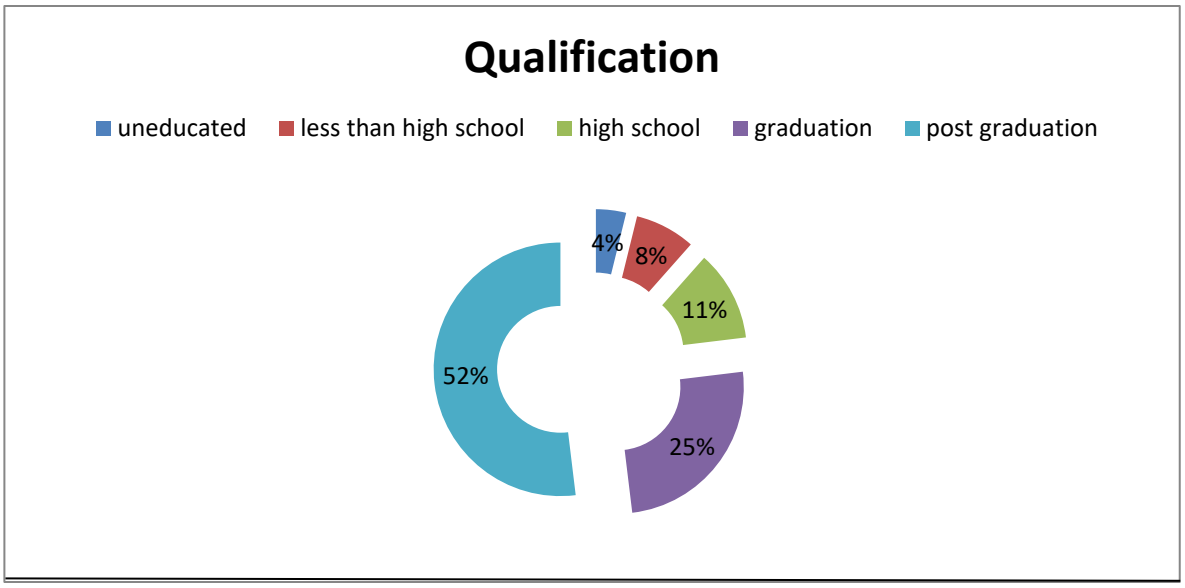


Figure 3.3 Distribution of respondents according to qualification.

Mobile phone use

Out of 52 people surveyed, only one person was there who did not use a mobile phone rest 51 people were using cell phones.

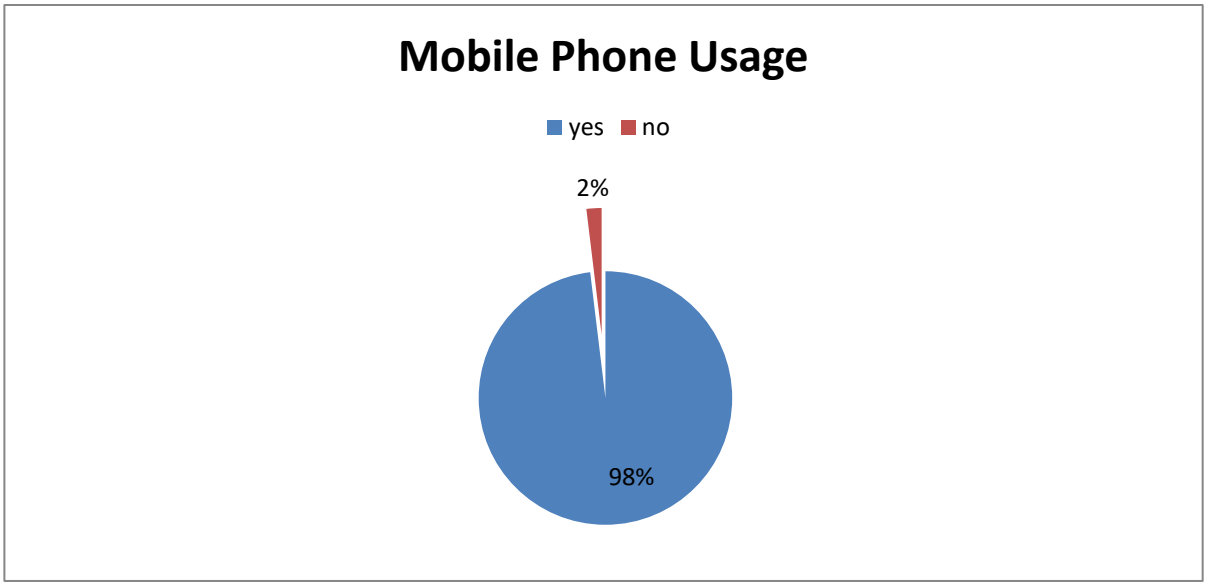


Figure 3.4 Distribution of respondents according to usage of mobile phones

No of years of mobile phone use

The no of years for which the respondent is using mobile phone was also recorded and it ranged from 0.2 years to 16 years showing a wide range of the years of cell phone usage. Around 22 people have used cell phones for over 10 years and 1 person has mobile phone for 16 years. Around 13 people out of 52 have been using a cell phone from a period of 5 years or less.

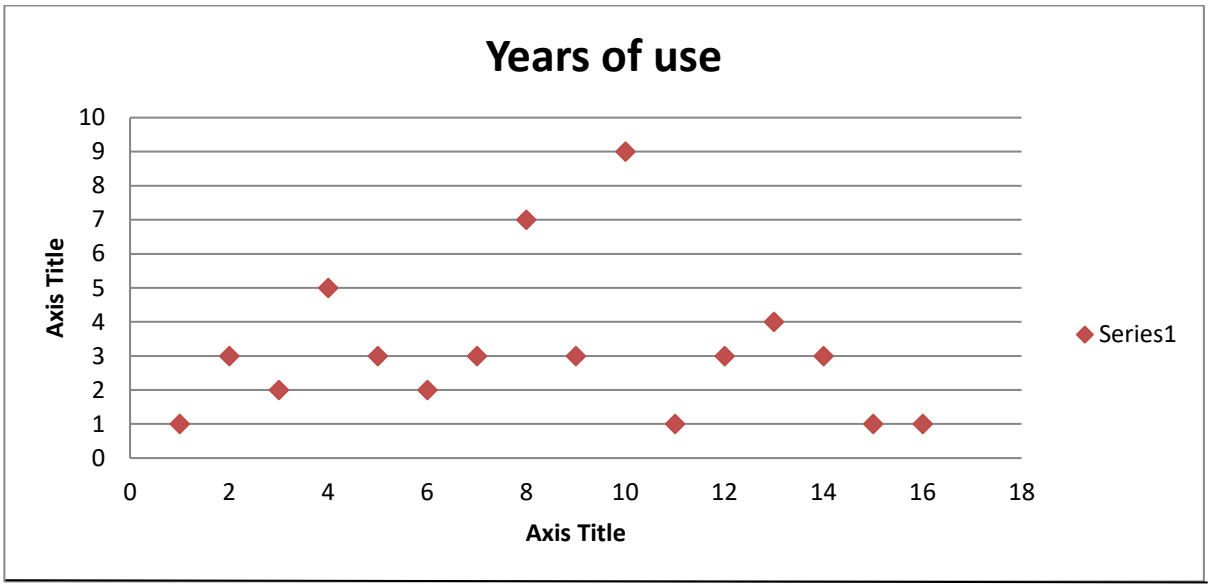


Figure 3.5 Distribution of respondents according to number of years they have been using a mobile phone.

Frequency of mobile phone use

The respondents were given 6 options, multiple times a day, 1-2 times a day, several times a week, several times a month, several times an year and never. It was noticed that 48 respondents i.e. 92.3% people use mobile phones several times a day. There was not a single person who hav\s used mobile phone several times a week or several times a year or never.

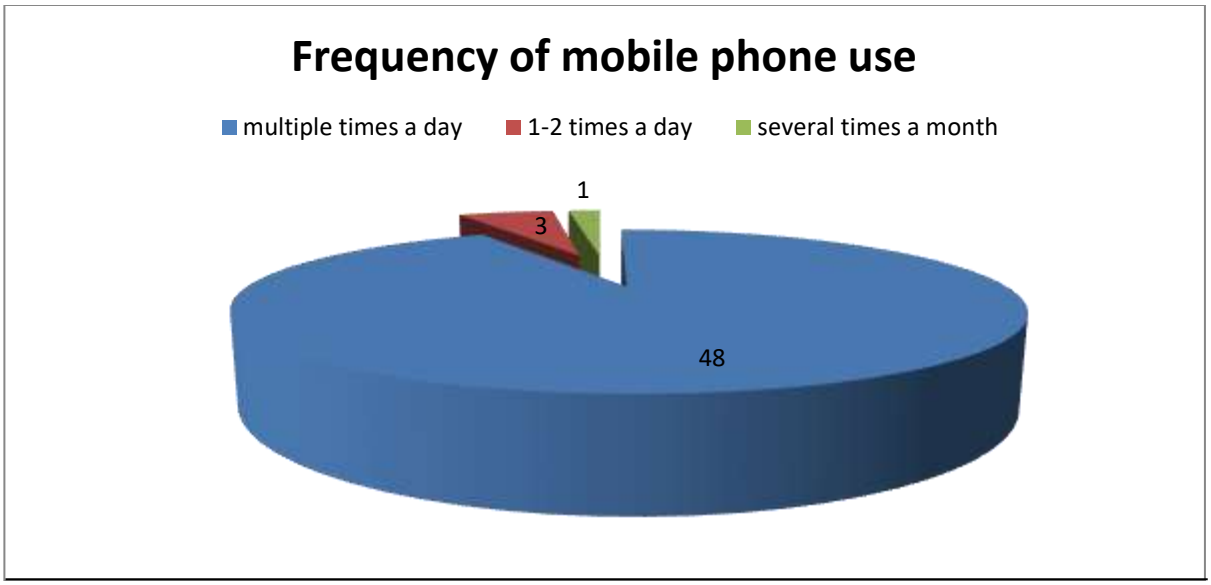


Figure 3.6 Distribution of respondents according to frequency of use

Internet usage on the mobile phone

27 respondents (51.9%) of the total population have used mobile phones multiple times a day for using internet. Also, 15 respondents have never used a mobile phone for the purpose of internet usage. This could pose a big problem for the internet based mobile phone health services.

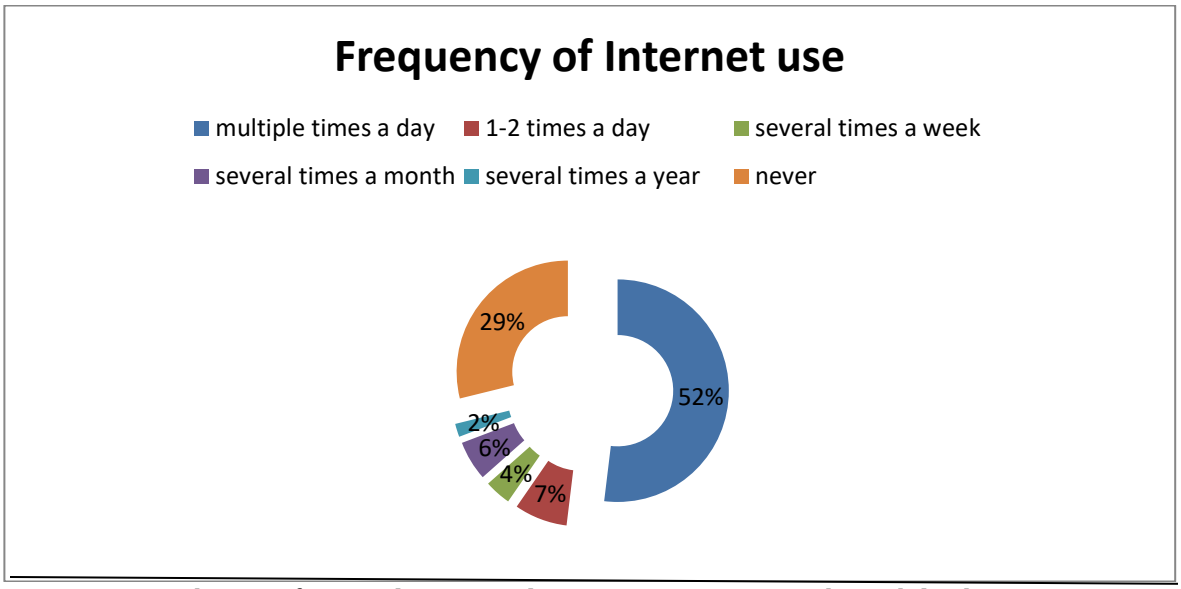


Figure 3.7 Distribution of respondents according to internet usage on the mobile phone

Mobile Health Services

Wellness health services has wider acceptance among all the other services indicated; like treatment, monitoring, prevention and diagnosis. Wellness services had an acceptance of 28% as compared to just 12% for the diagnostic services. This shows that respondents are comfortable in using the wellness services on the mobile phone but still have some inhibitions about using the diagnosis as well as the treatment services. The preventive services rank second with 25% acceptance and 21% with monitoring services.

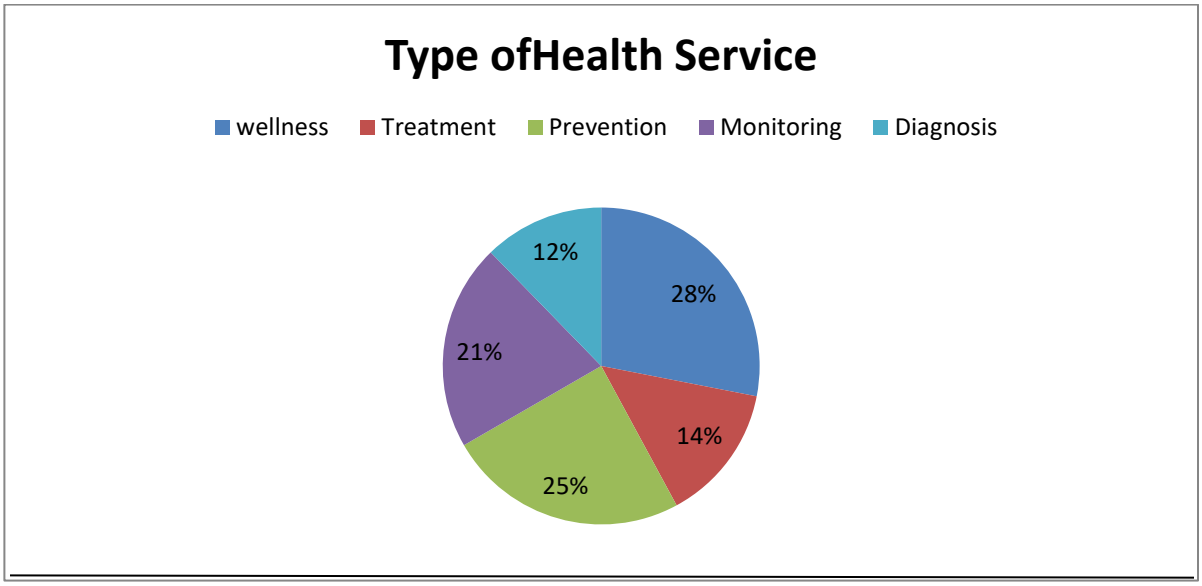


Figure 3.8 Popularity of type of mobile phone based health service

The point to note here is that the people in the age group 18-29 have a significant role to play as they form majority of the respondents. They have shown inclination towards the use of mobile phone application or else they do not want to use these services. Also the people in the age group 50-59 also preferred mobile phone based applications above all the other modes of communication. The 40-49 years age group feels that mobile phone application, SMS and interactive voice response equally useful in disseminating information. The internet based services are most popular in the age group less than 18 and 18-29. So this shows that the youngsters are more comfortable in using these services than any other age group people.

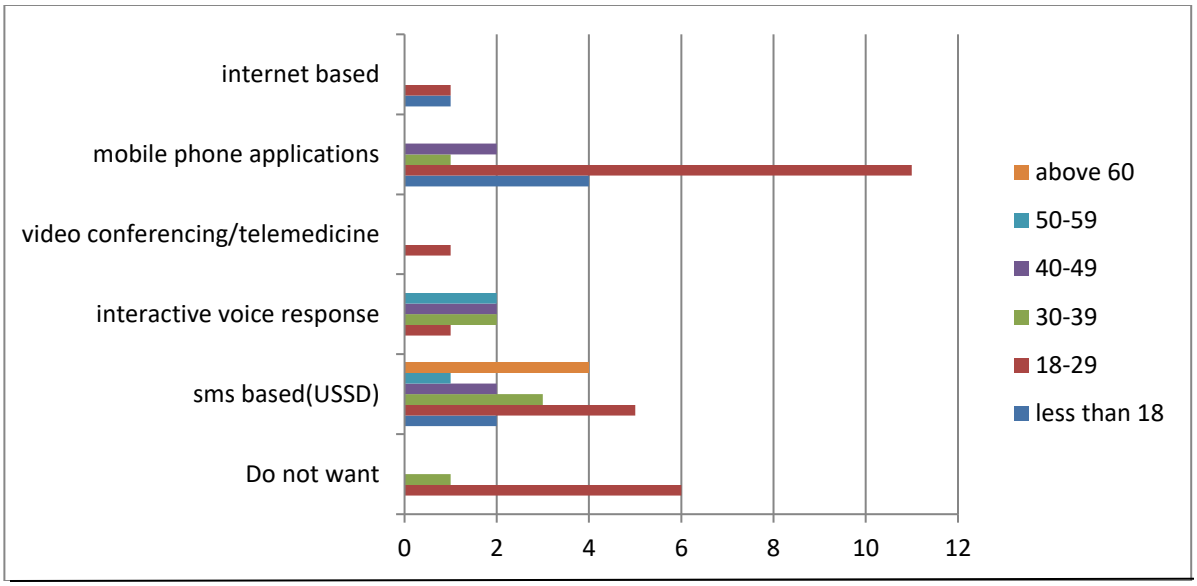


Figure 3.9 Age and mode of communication wise acceptance of wellness mobile health service.

Type of content

The reminders based content is most widely accepted by the users, they have a wide acceptance for that and it accounts for 20% of the total users. The least accepted is the one dealing with the body vitals, only 12% of the users are comfortable in using that kind of a content. Information about health accounts for 19% of the users, with consulting accounts for 16% of the healthcare content. The content dealing with data entry accounts for just 15%.

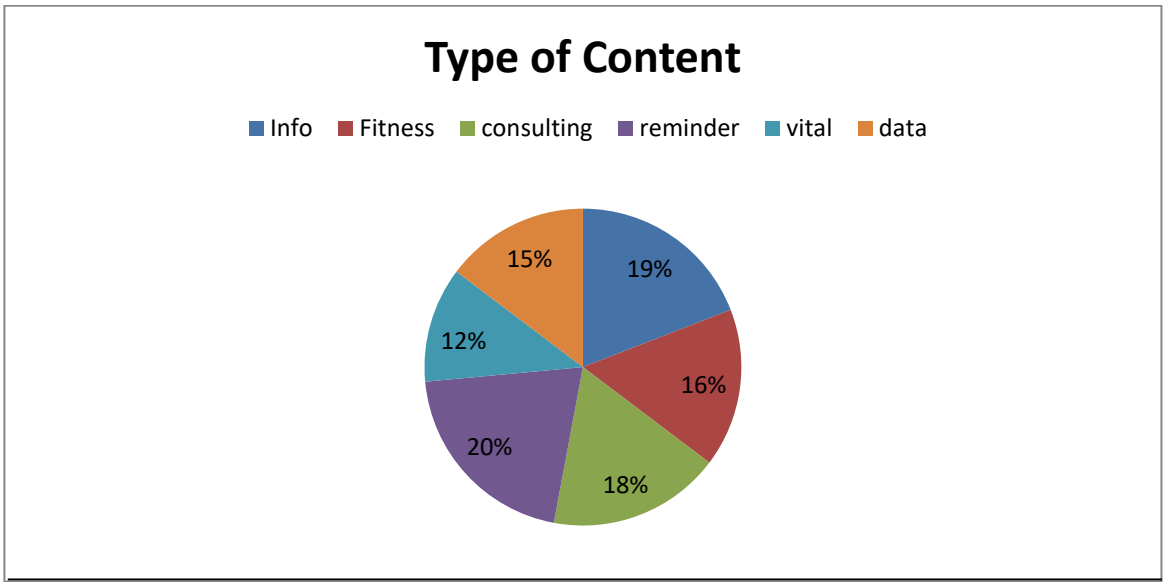


Figure 3.10 Acceptance of type of content of mobile health service.

The mobile phone application is the most popular mode of communication in the most educated class, where as the interactive voice response if found to be most popular among the uneducated class. Among people with education less than high school and graduates also prefer mobile phone applications. So the mobile phone applications are the most popular among all the classes. The least popular is the internet based and is preferred by more educated class, the post graduates and the graduates.

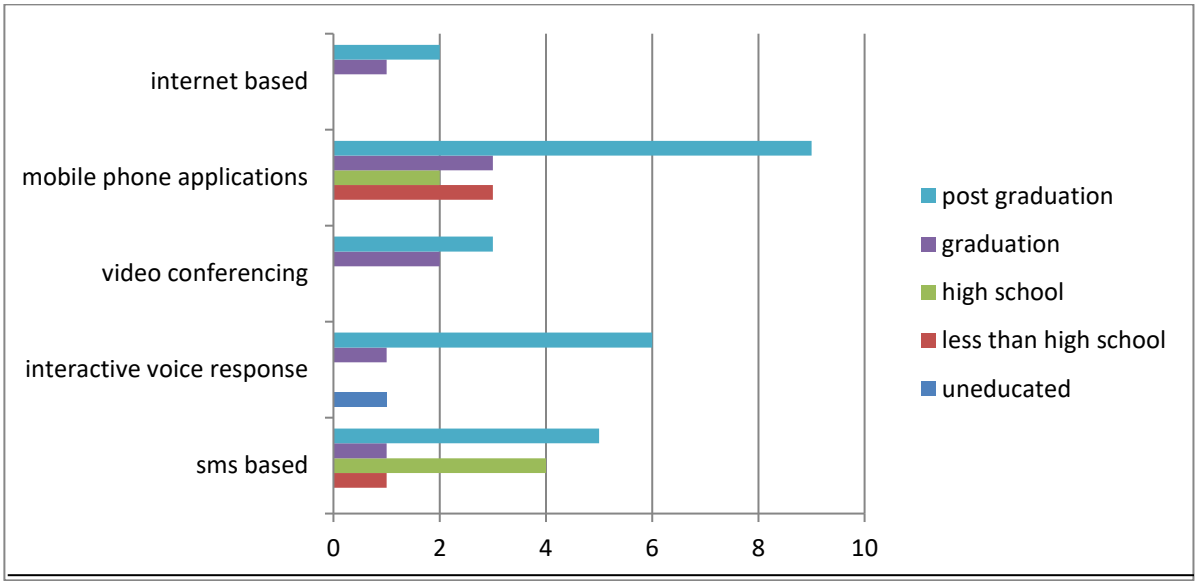


Figure 3.11 Qualification and mode of communication wise acceptance of mobile health service.

Mode of communication

The mode of communication option available to the user is SMS service, interactive voice response, telemedicine, internet based and mobile phone application. The most widely accepted is the mobile phone application 31% and SMS based service which has 27% acceptance among the respondents. The least accepted are internet based (10%) and interactive voice response (15%). The video conferencing has acceptance by 17% of the respondents.

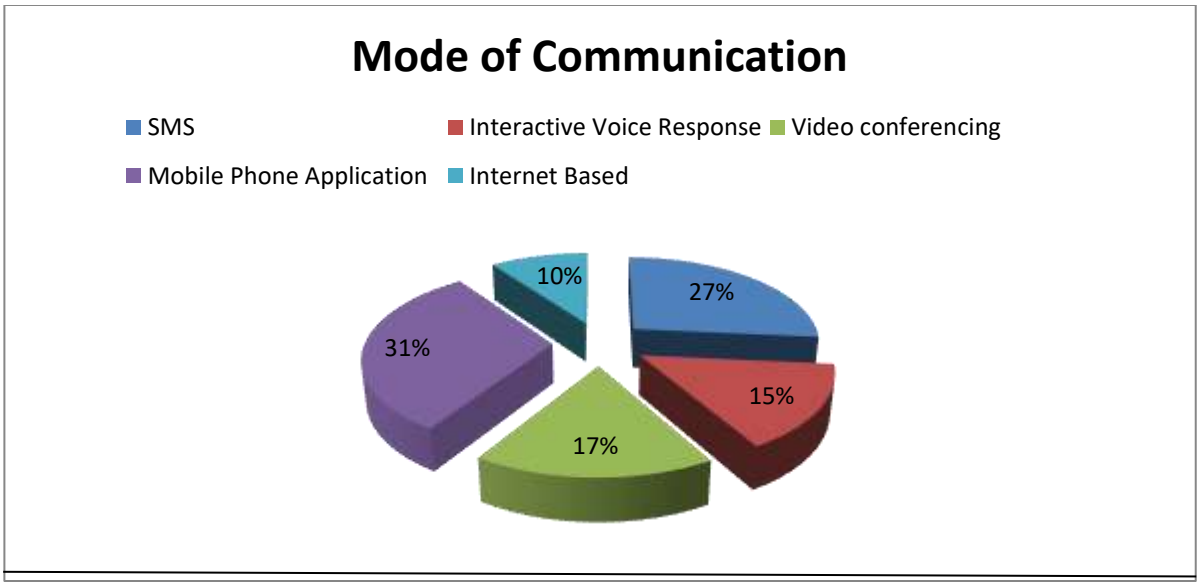


Figure 3.12 Most popular mode of communication for mobile health service.

Expenditure on mobile Healthcare services

Most of the people want to spend less than Rs. 50 per month on the mobile healthcare services. People in the age group 30-39 are most willing to spend Rs. 500 and above per month for utilization of mobile health services. People in the age group less than 18 and 18-29 are most willing to spend 100 or less.

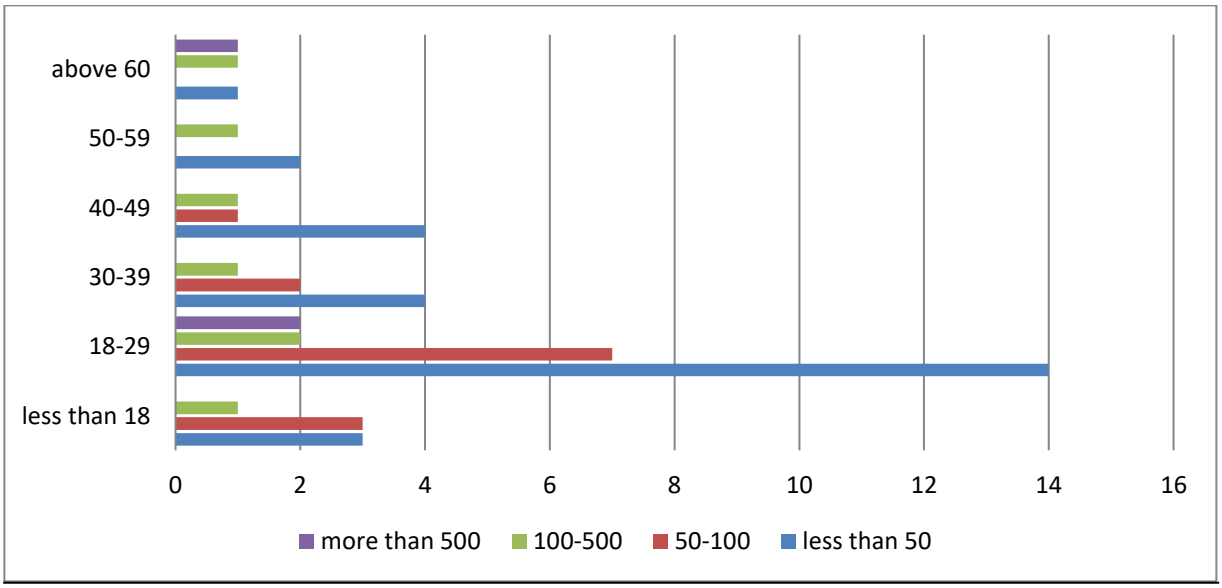


Figure 3.15 Age wise willingness for spending money on mobile health service.

Chapter 4: Discussion

Health information can contribute to our wellbeing. It may help patients to cope with their health problems. For instance, people may work through challenging health experiences while gathering information – and as patients learn about their condition, it prepares them to communicate with their health care providers and to make treatment decisions[60]. The healthcare industry, conventionally, is recognized as having lagged behind other industries in the use and adoption of new information technologies (IT) and information systems[59]. However, this situation is shifting at a fast pace. As the study result shows the acceptance of mobile health technology is very high and 90% of the respondents want to use the technology in the future. Also it was seen that the key stakeholders involved had different perception in use of this technology. Till the time a the needs of the consumers are not met and the providers do not understand what exactly is the consumer looking for there will a lot of challenges. Besides developing useful and easy to use healthcare systems, mobile IT/IS designers should also pay more attention to user requirements analysis to determine their expectations and requirements for mobile healthcare application content. The relevant materials and functions can then be incorporated into the systems. Only when participants have higher perceptions in compatibility with their previous or current practice they will be able to accept it[61].

Also, there was a significant variance in the mode of communication that the consumer would like to use. The IVR was considered to be the most widely accepted form to communicate. But it was brought out in the study that the consumers of today are becoming more comfortable with the SMS and the mobile phone based application[62]. It was also seen that most of the consumers are willing to spend less than Rs. 50 on the mhealth services, but a major challenge is that they do not even maintain that much of a balance in their account. So even if they are willing to use the service they are not able to use it because of the behavioral factor of not having sufficient balance.

The most widely accepted service that most of the consumers would like to use is wellness[3]. This category primarily includes self help services that encourage people to adopt or avoid

certain behaviors and practices to maintain or improve their general wellness and fitness level. So it is evident that distinct segments have started to emerge in mobile health. It has been reported that diagnostic services offer the maximum opportunity contrary to the fact that there is minimum acceptance by the consumer for the adoption of this service.

The mobile penetration In developing markets have risen steadily over the last few years, its penetration in Asia-Pacific is expected to reach 98% in 2014. It is estimated that smart phones are likely to account for more than half the global sales for handsets by 2015[3].With these statistics there are no two ways about mobile technology being the future. And the need of the hour is to formulate such health services that could be integrated into it and could provide maximum benefits to the consumer.

Chapter 5: Conclusion & Recommendations

The age and qualification play a major role in determining the acceptance of any mobile based health care service.

- Even though the usage of mobile is very high, still there are a lot of gap between use of mobile phones and using internet on the phones.
- Most common choice of service for which they would like to use the mobile is for wellness services and the least accepted is for diagnosis. The people are still reluctant to use it for treatment and diagnostic facility.
- The mobile phone application and SMS based are the most widely accepted for these services by the younger people.
- Irrespective of the qualification of the individual, they would like to use mobile phone based application and SMS based as the most common.
- There is a gap between what the need of the consumer and what the provider wants to provide.

Based on the above results and conclusion there are some recommendations:

- Since all stakeholders have different prospective, so while implementing any mhealth technology it should be taken care to involve all of them.
- There is a dire need of government regulatory policy for maintaining privacy and confidentiality of the data shared through the use of mobile technology. As it is posing a hindrance to its wide scale adoption.
- There is no one shoe fit all policy, there is wide acceptance of mhaelth among the users but for different kind of services they would like to use different mode of communication.
- The awareness level of the consumers is very low and most of them could not understand what role mhealth could play in providing health services.

Limitation of the study

This research has several limitations:

- Many of the participants were recruited from urban areas whereas it also includes some of the migrants who have spent most of the time in rural areas. This may introduce educational and geographic bias that could reduce the generalizability of the findings.
- Also, the way in which mobile phones could be used to prevent healthcare services Is not mentioned and is not explained. So, the user may have some misconceptions about it. Some participants see voice communication as the only purpose for mobile phones, so they did not adopt web, text, and multimedia functionalities.
- The audio recording was not carried out for the interviews, so there could be some points which were missed during that discussion.
- To have a better understanding an interview based approach could have been followed for taking the consumers response.

Future Scope

The study was focused on healthcare services on the mobile phones, where as other mobile devices and there utilization was not studied. So in the future, perception and acceptance of other mobile devices like kiosks, PDA, etc could also be evaluated.

References:

1. CTIA. 2008, 2008-last update, *Wireless quick facts*. Available: http://www.ctia.org/media/industry_info/index.cfm/AID/10323 [2009, 6/18].

2. Blumberg, S.J. & Luke, J.V. 2009, 6/17-last update, *Wireless substitution: early release of estimates from the National Health Interview Survey, July-December 2008*. Available:http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200905.htm [2009, 6/18].

3. PwC report "Touching lives through mobile health- assessment of the global market opportunity" February 2012.

4. "Highlights of Telecom Subscription Data as on 31st December, 2011". *TRAI*. 8 October 2011.

5. "Internet Usage in Asia". *International Telecommunications Unit: Asian Internet Users*. ITU. Retrieved 10 January 2011.

6. Dharmakumar, Rohin (19 October 2011). "India Telcos: Battle of the Titans". *Forbes*. Retrieved 19 August 2011.

7. Kannan, Shilpa (7 April 2010). "India's 3G licence bidders bank on big changes". *BBC News*.

8. Suggs, L.S. 2006, "A 10-year retrospective of research in new technologies for health communication", *Journal of health communication,* vol. 11, no. 1, pp. 61-74.

9. McCann, L., Maguire, R., Miller, M. & Kearney, N. 2009, "Patients' perceptions and experiences of using a mobile phone-based advanced symptom management system (ASyMS) to monitor and manage chemotherapy related toxicity", European journal of cancer care, vol. 18, no. 2, pp. 156-164.

10. Boland, P. 2007, "The emerging role of cell phone technology in ambulatory care", *Journal of ambulatory care management,* vol. 30, no. 2, pp. 126-133.

11. (Cleland, J., Caldow, J. & Ryan, D. 2007, "A qualitative study of the attitudes of patients and staff to the use of mobile phone technology for recording and gathering asthma data", *Journal of telemedicine and telecare,* vol. 13, no. 2, pp. 85-89.

12. Hurling, R., Catt, M., Boni, M.D., Fairley, B.W., Hurst, T., Murray, P., Richardson, A. & Sodhi, J.S. 2007, "Using internet and mobile phone technology to deliver an automated physical activity program: randomized controlled trial", *Journal of medical Internet research,* vol. 9, no. 2, p. e7.

13. Nugent, C., Finlay, D., Davies, R., Mulvenna, M., Wallace, J., Paggetti, C., Tamburini, E. & Black, N. 2007, "The next generation of mobile medication management solutions", *International journal of electronic healthcare,* vol. 3, no. 1, pp. 7-31. 2004).

14. Gammon, D., Arsand, E., Walseth, O.A., Andersson, N., Jenssen, M. & Taylor, T. 2005, "Parent-child interaction using a mobile and wireless system for blood glucose monitoring", *Journal of medical Internet research,* vol. 7, no. 5, p. e57.

15. Lim, M.S., Hocking, J.S., Hellard, M.E. & Aitken, C.K. 2008, "SMS STI: a review of the uses of mobile phone text messaging in sexual health", *International journal of STD & AIDS,* vol. 19, no. 5, pp. 287-290.

16. Hurling, R., Catt, M., Boni, M.D., Fairley, B.W., Hurst, T., Murray, P., Richardson, A. & Sodhi, J.S. 2007, "Using internet and mobile phone technology to deliver an automated physical activity program: randomized controlled trial", *Journal of medical Internet research,* vol. 9, no. 2, p. e7.

17. Fjeldsoe, B.S., Marshall, A.L. & Miller, Y.D. 2009, "Behavior change interventions delivered by mobile telephone short-message service", *American journal of preventive medicine,* vol. 36, no. 2, pp. 165-173.

18. Boland, P. 2007, "The emerging role of cell phone technology in ambulatory care", *Journal of ambulatory care management,* vol. 30, no. 2, pp. 126-133.

19. Nokia. 2005, 2005-last update, *Value of mobility in healthcare*. Available:http://www.bookit.net/news/en_GB/healtcarebynokia/_files/74230686356736204/default/Nokia%20Healtcare%20Success%20Stories.pdf [2009, 9/1].

20. Menon-Johansson, A.S., McNaught, F., Mandalia, S. & Sullivan, A.K. 2006, "Texting decreases the time to treatment for genital *Chlamydia trachomatis* infection", *Sexually transmitted infections,*vol. 82, no. 1, pp. 49-51.

21. Venkatesh, V., Morris, M.G., Davis, G.B. & Davis, F.D. 2003, "User acceptance of information technology: Toward a unified view", *MIS Quarterly,* vol. 27, no. 3, pp. 425-478.

22. An, J.Y., Hayman, L.L., Panniers, T. & Carty, B. 2007, "Theory development in nursing and healthcare informatics: a model explaining and predicting information and communication technology acceptance by healthcare consumers", *Advances in nursing science,* vol. 30, no. 3, pp. E37-49.

23. Compeau, D.R. & Higgins, C.A. 1995, "Computer self-efficacy - Development of a measure and initial test", *MIS quarterly,* vol. 19, no. 2, pp. 189-211.

24. Fonkych, K., Taylor, R. & Rand Corporation 2005, *The state and pattern of health information technology adoption*, Rand Corporation, Santa Monica, California.

25. Bouwman, H. 2005, *Information and communication technology in organizations: adoption, implementation, use and effects*, Sage, Thousand Oaks, California.

26. Ajzen, I. 1991, "The Theory of Planned Behavior", *Organizational behavior and human decision processes*, vol. 50, no. 2, pp. 179-211.

27. Spil, T.A.M. 2006, "User acceptance and diffusion of innovations summarized" in *E-health systems diffusion and use: the innovation, the user and the Use IT model*, eds. T.A.M. Spil & R. Schuring, Idea Group Publishing, Hershey, Pennsylvania, pp. 1-12.

28. Sheppard, B.H., Hartwick, J. & Warshaw, P.R. 1988, "The Theory of Reasoned Action: a meta-analysis of past research with recommendations for modifications and future research", *Journal of consumer research*, vol. 15, no. 3, pp. 325-343

29. Skinner, C.S. & Kreuter, M.W. 1997, "Using theories in planning interactive computer programs" in *Health promotion and interactive technology: theoretical applications and future directions*, eds. R.L. Street, W.R. Gold & T. Manning, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 39-65.

30. Rogers, E.M. 2003, *Diffusion of innovations*, 5th edn, Free Press, New York.

31. Rogers, E.M. & Scott, K.L. 2007, 2007/6/5-last update, *The diffusion of innovations model and outreach from the National Network of Libraries of Medicine to Native American communities*. Available:http://nnlm.gov/evaluation/pub/rogers/ [2009, 3/18]. 32 (Gochman, 1997).

33. McGinnis, J.M. & Foege, W.H. 1993, "Actual causes of death in the United States", *JAMA*, vol. 270, no. 18, pp. 2207-2212.

34. DiClemente, C.C., Marinilli, A.S., Singh, M. & Bellino, L.E. 2001, "The role of feedback in the process of health behavior change", *American journal of health behavior*, vol. 25, no. 3, pp. 217-227.

35. Koop, E.C. 1996, "Foreword" in *Health promotion and disease prevention in clinical practice*, eds. R.S. Lawrence, S.H. Woolf & S. Jonas, Williams & Wilkins, Baltimore, pp. vii-ix.

36. National Cancer Institute. 2008, 4/28/2008-last update, *Health behavior constructs: theory, measurement & research*. Available:http://cancercontrol.cancer.gov/brp/constructs/index.html [2009, 7/15].

37. Kirscht, J.P. & Rosenstock, I.M. 1979, "Patient's problems in following recommendations of health experts" in *Health psychology*, eds. G.C. Stone, F. Cohen & N.E. Adler, 1st edn, Jossey-Bass, San Francisco, pp. 189-215.

38. Prochaska, J.O. & DiClemente, C.C. 1983, "Stages and processes of self-change of smoking: toward an integrative model of change", *Journal of consulting and clinical psychology*, vol. 51, no. 3, pp. 390-395.

39. Severtson, D.J., Baumann, L.C. & Brown, R.L. 2006, "Applying a health behavior theory to explore the influence of information and experience on arsenic risk representations, policy beliefs, and protective behavior", *Risk analysis*, vol. 26, no. 2, pp. 353-368.

40. Rudd, J. & Glanz, K. 1990, "How individuals use information for health action: consumer information processing" in *Health behavior and health education: theory, research, and practice*, eds. K. Glanz, F.M. Lewis & B.K. Rimer, Jossey-Bass, San Francisco, pp. 115-139.

41. Miller, S.M. 1987, "Monitoring and blunting: validation of a questionnaire to assess styles of information seeking under threat", *Journal of personality and social psychology*, vol. 52, no. 2, pp. 345-353.

42. Heaney, C.A. & Israel, B.A. 2002, "Social networks and social support" in *Health behavior and health education: theory, research, and practice*, eds. K. Glanz, B.K. Rimer & F.M. Lewis, 3rd edn, Jossey-Bass, San Francisco, pp. 185-209.

43. Fox, C.J. 1983, *Information and misinformation: an investigation of the notions of information, misinformation, informing, and misinforming*, Greenwood Press, Westport, Connecticut.

44. Carpenter, M.J., Strange, C., Jones, Y., Dickson, M.M., Carter, C., Moseley, M.A. & Gilbert, G.E. 2007, "Does genetic testing result in behavioral health change? Changes in smoking behavior following testing for alpha-1 antitrypsin deficiency", *Annals of behavioral medicine*, vol. 33, no. 1, pp. 22-28.

45. Kivits, J. 2004, "Researching the 'Informed Patient': the case of online health information seekers", *Information, communication & society*, vol. 7, no. 4, pp. 510-530.

46. Rimer, B.K. & Kreuter, M.W. 2006, "Advancing tailored health communication: a persuasion and message effects perspective", *Journal of communication*, vol. 56 Supplement, pp. S184-S201.

47. Kreuter, M.W. & Skinner, C.S. 2000, "Tailoring: what's in a name?", *Health education research*, vol. 15, no. 1, pp. 1-4. 48 (Science Panel on Interactive Communication and Health, 1999).

49. Joinson, A.N. 2001, "Self-disclosure in computer-mediated communication: The role of self-awareness and visual anonymity", *European journal of social psychology*, vol. 31, no. 2, pp. 177-192.

50. Rudd, J. & Glanz, K. 1990, "How individuals use information for health action: consumer information processing" in *Health behavior and health education: theory, research, and practice*, eds. K. Glanz, F.M. Lewis & B.K. Rimer, Jossey-Bass, San Francisco, pp. 115-139

51. Ramanadhan, S. & Viswanath, K. 2006, "Health and the information nonseeker: a profile", *Health communication*, vol. 20, no. 2, pp. 131-139.

52. Vilella, A., Bayas, J.M., Diaz, M.T., Guinovart, C., Diez, C., Simo, D., Munoz, A. & Cerezo, J. 2004, "The role of mobile phones in improving vaccination rates in travelers", *Preventive medicine*, vol. 38, no. 4, pp. 503-509.

53. Luker, K.A., Beaver, K., Leinster, S.J., Owens, R.G., Degner, L.F. & Sloan, J.A. 1995, "The information needs of women newly diagnosed with breast cancer", *Journal of advanced nursing*, vol. 22, no. 1, pp. 134-141.

54. Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. 1989, "User acceptance of computer technology: a comparison of 2 theoretical models", *Management science*, vol. 35, no. 8, pp. 982-1003.

55. Warshaw, P.R. & Davis, F.D. 1985, "Disentangling behavioral intention and behavioral expectation", *Journal of experimental social psychology*, vol. 21, no. 3, pp. 213-228.

56. Greenhalgh, T. 2005, *Diffusion of innovations in health service organisations: a systematic literature review*, BMJ Books/Blackwell Publishing, Malden, Massachusetts.

57. Janz, N.K. & Becker, M.H. 1984, "The Health Belief Model - a decade later", *Health education quarterly*, vol. 11, no. 1, pp. 1-47.

58. Fisher, J.D., Fisher, W.A., Williams, S.S. & Malloy, T.E. 1994, "Empirical tests of an information-motivation-behavioral skills model of AIDS-preventive behavior with gay men and heterosexual university students", *Health psychology*, vol. 13, no. 3, pp. 238-250.

59. A.T.S. Chan, WWW+ smart card: towards a mobile healthcare management system, Int. J. Med. Inform. 57 (2000) 127–137.

60. N. Hikmet, S.K. Chen, An investigation into low mail survey response rates of information technology users in health care organizations, Int. J. Med. Inform. 72 (2003) 29–34.

61. M. Linhoff, Mobile computing in medical and healthcare industry (http://www.mocomed.com/workshop2002/ beitraege/Linhoff.pdf, last accessed March 24, 2006).

62. "Mobile health apps gain acceptance in developing nations" BUSINESS DAILYMONDAY April 30, 2012.

Appendices:

Appendix 1: Interview questionnaire for technology provider

1. Give a background of the study.
2. What are the key types / categories of mHealth services/applications launched/being launched by Airtel
    a. Wellness
    b. Prevention
    c. Diagnosis
    d. Treatment
    e. Monitoring
    f. Administration
    g. Any other, please specify_____
3. What is the service delivery chain for Mediphone
4. Does Mediphone categorize calls in to types? Are there certain disease/cases for which higher calls are received
5. Which are the geographical/demographic segments from which Calls are generally received? (Keep the question open. In case the interviewee needs help with Rural/Semi Rural/Urban/Semi-Urban)
6. What is the average call duration
7. What has been the response so far, in terms of uptake/adoption? Try for numbers initially. (No of calls/day, No of consultations, Payment issues) How does the growth outlook seem over the next 2-3 years.

	High	Medium	Low
Affordability			
Availability			
Acceptability			

8. What are the 2-3 customer behavioral aspects which are impacting adoption
9. What are the key barriers to adoption? How can they be mitigated? What support is required from regulators / governments / industry bodies?
10. What are the key growth drivers and key success factors to successfully tap into the various mHealth services markets?
11. What are the next areas in mHealth which Airtel is considering launching services into.
    - Web based support
    - Mobile Telemedicine
    - Device based monitoring

Appendix 2: Interview questionnaire for healthcare provider

Q.1 How do you see mobile/telecom technology helping the healthcare industry?

Q.2 Any past experience of mhealth projects?

Q.3 What kind of services you think can be provided using mobile/ telecom technology?

- Wellness
- Prevention
- Diagnosis
- Treatment
- Monitoring
- Administration
- Any other, please specify_____

And what could be the possible challenges:

	Administrative	Economical	Behavioral	Technological	Privacy/confidentiality
Emergency response					
Healthcare surveillance					
Healthcare administration					
Healthcare practitioner support					

Any other, please specify_____

Q.4 For which healthcare system strengthening service you would like to adopt mhealth?

- Emergency response
- Healthcare practitioner support
- Healthcare surveillance
- Healthcare administration
- Any Other, please specify_____

And what could be the possible challenge:

	Administrative	Economical	Behavioral	Technological	Privacy/confidentiality
Emergency response					
Healthcare surveillance					
Healthcare administration					
Healthcare practitioner support					

Any other, please specify_____

Q.5 What do you think about the participation and support of physicians for such services?

Q.6 Are telecom providers interested in partnering for mHealth services?

Q.7 What kind of government regulations or policies do you think will facilitate the spread and adoption of mhealth services?

Q.8 What do you think about the user acceptance in terms of:

	High	Medium	Low
Affordability			
Availability			
Acceptability			

Q.9 What kind of service will be more fruitful in the India context.

- SMS based (USSD)
- Interactive Voice response
- Telemedicine
- Remote monitoring kiosks
- Internet based
- Mobile phone applications

And what could be the possible challenge:

	Administrative	Economical	Behavioral	Technological	Privacy/confidentiality
SMS based (USSD)					
Interactive Voice response					
Telemedicine					
Remote monitoring kiosks					
Internet based					
Mobile phone applications					

Any other, please specify_____

Q.10 What are the possible type of content you would like to utilize the mhealth services for?

- Information tips
- Fitness monitoring
- Interactive consultation
- Reminders/Compliance trackers
- Body Vital trackers
- Data collection and reporting services

Q.11 What are the possible usage of Mobile health technology you envision in coming years?

Appendix 3: Questionnaire for the consumers

Q.1 Age (in years)

Less than 18 ☐ 18-2☐ 30-39☐

40-49 ☐ 50-5☐ Abo☐

Q.2 Sex

Male ☐ femal☐ othe☐

Q.3 Qualification

Uneducated ☐ Less than high school ☐ High Scho☐

Graduation ☐ Post graduation & highe☐

Q.4 Do you own a cell phone?

Yes ☐ No ☐

Q.5 How many years have you being using a cell phone?

Approximate no of years_____

Q.6 How often do you use your mobile phone?

Multiple times a day ☐ 1-2 times a day ☐ Several times a week ☐

Several times a month ☐ Several times a year ☐ Never ☐

Q.7 How often do you use internet on your mobile phone?

Multiple times a day ☐ 1-2 times a day ☐ Several times a week ☐

Several times a month ☐ Several times a year ☐ Neve ☐

Q.8 Would you like to use health service on your mobile phone?

Yes ☐ No ☐

Q.9 What kind of healthcare services you would like to use, using mobile/ telecom technology? And which mode you would like to use for the same?

	SMS based (USSD)	Interactive Voice response	Telemedicine	Mobile phone applications	Internet based
Wellness					
Treatment					

Prevention					
Monitoring					
Diagnosis					

Any other, please specify_____

Q.10 What are the possible type of content, for which you would like to utilize the mobile health services and through which mode?

	SMS based (USSD)	Interactive Voice response	Telemedicine	Mobile phone applications	Internet based
Information tips					
Fitness monitor					
Consultation					
Reminders					
Body Vital trackers					
Data collection and reporting					

Any other, please specify_____

Q.11 How much are you willing to pay for any mobile phone based health service? (Rs/month)

Less than Rs.50 ☐ 50-100 ☐

100-500 ☐ More than 500 ☐