Review of Related Literature
CHAPTER II

REVIEW OF RELATED LITERATURE

With the penetration of Mobile technology in various socio-economic activities around the world, research studies on the impact of mobile technology in healthcare system also have gained momentum. Research on Technology has its base on theories including Technology Acceptance Model (TAM), Diffusion of Innovation theory (DFT), Technology of Reasoned Action (TRA), Theory of Planned Behaviour (TPB). The Unified Theory of Acceptance and Use of Technology (UTAUT), consolidates several features from the above mentioned theories. For this reason, the present study has adapted the various constructs of the theory to study the attitude of the expectant mothers towards using mobile phones for health services.

With due consideration to the prevailing conditions of the Indian society, healthcare system and the ICT adoption system, the factors identified to influence the attitude of the expectant mothers were Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Behavioral Intention, Self Efficacy and Attitude. The following section is a discussion on the review of available literature on m Health and its effect on society.

2.1.1 Demography – Age

Among the socio-demographic profile of the respondents, age is considered to be one of the major determinants in the study of Social Sciences. Though the use of mobile phones is considered to be prevalent among almost every person, the frequency of usage, confidence in usage differs with the age group they belong to.

It is a known phenomenon that the need for a healthcare system which is more easily accessible is high among the people in the older age. At the same time, the younger age group people are found to be handling mobile phones more efficiently and effectively. Thus an inverse relationship between health care needs and technical efficacy in mobile phones with regard to age can be witnessed in any society. The findings in the review of studies also established that the younger age people are accessing m Health with more proficiency (Gow & Waidyanatha, 2010; Miller & Himenchoch, 2013) and
openness (Jager & Belle, 2014). Similarly, the preference (Palazuelos, 2013) and adherence to m Health (Huang et al., 2013) is also found to be higher among the younger age people, whereas these qualities are more essential for the older age people.

The younger age group people tend to find it easy to adopt concepts, behavior and also create a positive attitude towards new technological advancements and that is evidenced through the study of Cornelius et al. (2013). Most of the studies reviewed reflected similar views of younger age group being more positive in accepting and adhering to m Health. However, it cannot be denied that health status is a vital element in the lives of everyone irrespective of their age. When m Health is capable of creating significant developments in the healthcare, the influence of age factor should be also be duly addressed.

2.1.2 Demography -Education

In the modern and technological society, education becomes one of the basic necessities of the mankind. It applies to the implementation of m health initiatives across different parts of the world. The people residing in a developed or a developing nation will require a certain level of education to participate in various activities of the society. The level of education of a person has a great influence in recognizing the importance of healthcare information, comprehending the messages sent and also creating the desired health behavior.

Mobile phones are identified as the most simple and easily operated technology of today. In spite of this, education level is found to be leveraging differing influences in most of the m Health initiatives. As most of the literates are employed, forgetfulness in medication was found predominantly among them. And hence this may be the reason for their preference for mobile phone text reminders. It should be noted that along with their forgetfulness, literacy has made them realize the need and potential of text reminders in promoting medication adherence. De Souza et al. (2014), in his study exploring the acceptability of healthcare information among mobile phone users in India found that users with English literacy, showed a higher preference for medication reminders.

Accessing health information through mobile phones is the first step and next is the comprehension of messages. Proper comprehension of the text messages and internalizing
the behavior basically depends on the level of education of an individual. Studies show that higher level of education influences comprehension of messages (Evans et al., 2012) and on a larger scale create the desired behavior change (Lund et al., 2012). It is certain from the above findings that higher level of education facilitates in better capacity to process the information and thereby make informed decisions.

When there is a transfer of information at the most basic level or at a more advanced level through ICTs like mobile phones, literacy plays an important role. Literate people are found to be able to comprehend the benefits of adherence to specific health behavior and thereby exhibit acceptability of desired behavioral change. In any case, m Health interventions should consider the education level of the beneficiaries whilst designing the intervention.

2.2. Dissemination of Healthcare Knowledge

In most of the developing nations, the major impedance in the existence of universal and quality healthcare is the lack of health awareness and information. Improvement in the health status and behavior can be brought at a faster rate through the use of mobile technology. Increase in knowledge of health issues among the people, effective management of health situations, handling emergencies and complications, addressing the myths and beliefs of people, behavior modification are witnessed as a result of m Health initiatives in various parts of the world.

At the first instance, increase in knowledge about health issues and relevant information associated with it will definitely enable a healthy lifestyle. The text messages or the IVR calls through mobile phones deliver relevant health information and result in the desired behavior among the beneficiaries, may it be the patients, health workers also.

It is evident that the knowledge level of the people as well as the health workers are at a minimal level in the developing countries. Dissemination of relevant information to them through the low cost and available mobile phone technology increases their knowledge and brings a change in their outlook on health. Mobile text messages enabled an increase in knowledge of maternal and child health care among the pregnant women (Datta SS, et al., 2014) and a mobile application resulted in the improvement in the access of health services among women in Afghanistan (Mendoza et al., 2014).
In addition with the usage of mobile phones in their work routine, the health workers found an increase in their knowledge level (Qualcomm.com 2016) and also their capability in handling mobile applications (Praveen et al. 2014) which helped them in the delivering of information and services to the beneficiaries.

Equal and quality access to healthcare has become one of the basic necessities. With mobile phones having created more or less an equalitarian society, it is more sensible to leverage this capacity towards establishing access and availability of healthcare services through dissemination of essential knowledge amongst all segments of the society.

2.3 Major Factors Influencing the Attitude of People towards Using Mobile Phones for Health Services

2.3.1 Performance Expectancy

To establish an equalitarian healthcare system across the globe, efforts have been taken to implement m Health initiatives based on the socio-economic, cultural situations prevailing in the country. The review of related studies on the factor Performance Expectancy can be discussed in terms of Effectiveness, Improved Performance, Timeliness and Quality.

2.3.1a Performance Expectancy – Effectiveness

Achieving the intended results of improved access to healthcare, adherence to health behavior and the resultant healthy state is what we define as effectiveness in m Health initiatives. Effectiveness can be described as the state of achievement and can be looked at and from the perspective of the various stakeholders like the health department, providers, field staff and the patients.

From the perspective of the patients in the developing countries, access to formal healthcare facilities and providers is still considered a luxury. Geographical boundaries, cultural beliefs and socio economic conditions can be the underlying factors for the low access. It is understood that people have been abstaining from accessing healthcare facilities due to hurdles like travelling long distances and the high cost involved. Mobile phones are found to be enabling instant advice from health workers for people for far flung areas (Chib et al., 2012) and also medical consultation through help lines
(Ashraf et al., 2010). People from rural areas are now provided with CVD screening by trained ASHAs (Praveen et al., 2014) and save them the high cost or travel involved. Instant connectivity, low cost and readily available simple technology in mobile phones have eased out many hurdles and made people effectively manage their health status.

It is essential to understand that a big discrepancy exists in the ratio of the demand and availability of healthcare providers in most of the developing countries. Scarcity of medical personnel and health workers is predominant. Mobile phones are now used for filling this gap through various mHealth programmes.

The people in rural areas are solely dependent on the services of health workers for healthcare services. A regular and proper monitoring of these health workers will ensure the quality of healthcare delivery and this is found to be made possible through the mobile phones (Medhi et al., 2012; Mahapatra & Sahoo, 2015 & Lee et al., 2011). On the other hand, health workers who were previously coordinating the referrals to health facilities and the required regular medical supplies with great difficulty are now finding it easier with mobile phones (Mendoza et al., 2014 & Shieshia, et al., 2014).

It is important to note that through regular mobile phone communication, the monitoring and supervision becomes less obvious, communication to higher officials becomes less formal and coordination between different levels of hierarchy becomes simpler. This way, the friction existing in the health administrative system is eased out and at the same time resulting in effective management.

In a different point of view of the health workers, monitoring the treatment or medication adherence of the patients is very crucial, especially in case of chronic diseases. Mobile phones have been found to be effective in monitoring medication adherence for the absenting HIV/AIDS patients in Ghana (Crentsil, 2014); in tracking their patients by the CHWs of Uganda (Chang et al., 2013).

In addition to this, the health workers are involved in the assessment of the health situation in a country which is very essential to design and provide necessary solutions to the people. Mobile phones are used for reporting of diseases and for effective communication among the health officials which will enable efficient management of the health situations. In the third world countries, mobile phones are found to be useful in monitoring the disease
outbreaks and triggering necessary response actions (Mendoza et al., 2014). In addition, a two way communication system between scattered and clinic based staff (Chang et al., 2014) and CHWs and the health system (UNICEF Health Section, 2013) is evidence that the developing countries also have started using technology in bringing a shift in their health outlook.

The people in low resource settings have less exposure in health information and low motivation towards healthy behavior as they are found to be in low economic conditions and with low level of education. Ubiquitous mobile phones are used to address to their health issues within the environment and the available resources. Several studies stand as evidence of how mobile phones are effective in enhancing the health literacy, health management and thereby the health status.

2.3.1b Performance Expectancy – Improved Performance

Most of the developing countries face a common predicament of lower health status among its populace. The lower health status is due to the lack of health awareness, health facilities, medical personnel and medicines. WHO has laid down Millennium Development Goals for these countries and 3 goals are directed towards improvements in the health status and behavior.

Data reporting and management by the health workers is a very important element in the assessment of health situation in a region/country. Better management of health conditions is possible if the data management and the conditions associated therein can be improved.

It is important to note that the health workers consider paper based data management as cumbersome, labour intensive and prone to errors. Using mobile phones for data management makes the process more simplified, give faster results and allow for data validation. Improved data management enables clear and proper assessment of the health conditions. With the usage of mobile phones and appropriate mobile applications, there is a shift in the way data management is done by the health workers that resulted in improvement in their performance such as collection of data (Van Heerden et al., 2013), active registration of patients and follow up (UNICEF Health Section, 2013), reporting rates (Shieshia, et al., 2014), data completeness (Medhi et al., 2012), and accuracy of reports (Mangilima et al., 2010).
Additionally, the most important and critical part of healthcare management is handling emergencies and complications by the patients themselves, health workers and health facilities. It is evident that through several studies that mobile phones facilitate the identification and communication of the health complications and emergencies (Evans et al., 2012) and also result in better handling of emergencies (Chib et al., 2012 & GKC, 2012). Instant connectivity, ubiquitous presence and widespread penetration of mobile phones facilitate for improved communication flow (Mendoza et al., 2014) followed by better management of emergencies and health complications.

For ensuring dissemination of healthcare and bridging the gap between the health providers and patients, field visits by the health workers play a vital role. Across the world various m Health initiatives have established that usage of mobile applications result in an increase in the number of (Mendoza et al., 2014), timeliness in (Chatfield et al., 2014) and length of (Praveen et al. 2014) the field visits. As a consequence there is an improvement in the work efficiency of the health workers.

For health workers, counseling sessions during the field visits yield a great influence in improving the health behavior of the beneficiaries. When health workers are able to provide in depth counseling for a longer duration and more participation the counseling sessions prove to be effective. The habitual counseling sessions of the health workers turns to be effective with the intervention of mobile applications resulting in participation of more family members (Chatfield et al. 2014 & Mohamed et al. 2014) and in depth counseling (Ramachandran et al., 2010). Mobile applications also tend to improve the assessment skills of health workers (Qualcomm.com 2016).

Drug supplies are very crucial part of healthcare management, though not recognized enough. Countries with low resource settings face the deficiency in the supply of essential drugs, especially in the far and remote places. Effective communication flow through mobile phones and applications will improve the drug supply management and thereby improve the health status of the people. Mobile applications again have been found effective in bringing a facelift in the drug supply management (Shieshia et al., 2014) and an increase in the response rate for requests of drugs (Barrington et al., 2010).
In many instances, especially in the developing nations and low resource settings, the geographical factor- long distances to travel, cost and time involved in travelling, etc refrain people from opting to accessing a healthcare facility for their health ailments.

Several reports and studies reveal that that availability of a formal healthcare facility is very lean in these places and that includes the availability of medical personnel too. It should be noted that the ubiquitous presence of mobile phones will fill the vacuum and bring connectivity between the beneficiaries and the suppliers.

People in many developing countries have little or no medical facility within their locality and need to travel long distances to access a formal health facility. Several m Health interventions enabled Cardio Vascular Disease (CVD) screening for rural people by trained ASHAs (Praveen et al., 2014) as well as communicating and counseling to the patients in remote areas (Creentsil, 2014 & Huq et al., 2014) and sending vaccination reminders to rural parents (Wakadha et al., 2013) and thereby reducing the distance barriers and the transport barriers to reach out to a health facility. It is worthy to note that mobile phones act as a disease management tool, a communication tool and also a transaction tool. This multi tasking capability of mobile phones brings a new hope in the lives of people living in distant and remote areas as their apprehension of travel and money and time for the sake of healthcare is very much appeased.

Geographical barriers are felt not only by the patients but also by the health workers. Health workers need to cover long distances to serve the people in rural and remote areas. With the use of mobile phones, health workers are able to track the patients (Elangovan & Arulchelvan, 2013), and counsel them for treatment adherence (Huq et al., 2014). In the case of use of toll free communication, maternal health management is made possible for the pregnant mothers in remote areas (Huq et al., 2014). Health workers are the major resource of formal healthcare for the people living in rural and remote areas. With the use of mobile phones, the health workers need to travel less, be assured of connectivity with the patients, higher officials, health facilities and referral places. This will encourage them to do their services more willingly and cheerfully.

In contrary to the common opinion that people avoid utilizing health facility for the very fact that they are located in long distances, the results of a study in rural Madhya
Pradesh reveal that people do travel long distances to reach the health facilities (Diwan et al., 2015). Though this finding is just a singled out prevalence, this may be also an indicator of a change in the mindsets of the people, to take the trouble for ensuring quality health facility.

Accessibility to healthcare depends sometimes on the distance to be travelled to reach the health facility. Bridging the geographical distance is an influential factor which can make m Health more favourable for the patients as well as the health providers including the health workers.

Improvements in the existing level of behavior and performance point towards an enhanced healthcare system. Above all, it indicates a better living condition for all segments of society.

With mobile phones used in the appropriate way aiming at the required improvements in the behaviour and performance of the beneficiaries, m Health definitely can create transformation in the healthcare industry.

2.3.1c Performance Expectancy - Timeliness

Low and Middle Income Countries (LMIC) face a lot of constraints in bringing universal healthcare to their population. Timely medical assistance for the health complications and diseases of the people who have long been deprived of quality health care brings rays of hopes in their lives. For the health workers, who have been serving more than their capacity, timeliness means lots of saving in ways of effort and assistance. For the government it brings in immediate access to data on health status and also definite improvements in the healthcare care graph.

Evidence on time efficiency in healthcare activities through the usage of mobile phones is available in various studies in India and across globe. Queries and complications in health conditions arise at unforeseen circumstances. Availability of medical personnel is not always possible; hence their advice at any point of time through mobile phones can suffice in the management of the health issues as can be evidenced in the studies of Bali & Singh (2006) & Huq et al. (2014).
There is little need to reiterate that a little delay in handling emergencies will result in great losses and this can be avoided through prompt and immediate referrals and attending to the situation. It is important to note that the emergencies in the developing countries have less chances of being attended immediately due to shortage of medical personnel and long and far situated health facility. Mobile phones facilitates instant connectivity to the experts or the health facility and receive advice which reduces the response time and enables better handling of emergencies and complications as can be seen in the studies of Wilson (2013), Daniel et al. (2014), Mendoza et al. (2014) and Elangovan & Arulchelvan (2013).

A major point of concern for most of the rural people to access formal healthcare facilities is that they need to travel long distances to reach there. With the mobile phones facilitating for contacting the health workers/doctor/health facilities, there is a savings in the travelling time spent on traveling is saved (Crentsil, 2014) as well as the waiting time to meet the doctor by checking their availability (Chib et al., 2012). For health workers in Ghana, usage of mobile phones saves time in travelling long distances, as they could give counseling for minor health issues over mobile phones (Crentsil, 2014).

Delay in conveying results of medical test will bring a big gap in providing proper treatment to the patients. Again for the reason of travelling and waiting for a long time to get the results will discourage the patients from continuing the treatment. It was found that communication through mobile phones is enabling in the reduction of time delay in conveying test results (Lemaire, 2013) and also in transferring test results for emergency consultation (Thapa et al. 2013). The time and effort to travel to get the Conditional Cash Transfer (CCT) for immunization is saved through the mobile application m Pesa (Wakhadha et al., 2013). Time is a currency for the workforce in the developing countries. Being daily wage labourers, they cannot afford to spare time to attend to their health needs. They care more for their livelihood than their health condition resulting in high negligence. Through mobile phone communication the deprived health care comes to their doorsteps without spending much time to travel or wait. This brings an improvement in their health status.
Health workers are the link between the health facilities/providers and the patients. Enhancements in the workflow of the health workers indicate a greater efficiency in the provision of healthcare. It was found that with the mobile phones there exists a timely communication between ASHAs and FHWs about delivery and birth notification (Murthy & Vijayaraman, 2012) and also an instant follow up of the patients who missed the doses for TB treatment (Batra et al., 2011). As the patients are able to view the CVD screening results on the mobile phones itself, doctors take less time to elaborate on their health condition (Praveen et al., 2014). The health workers need to be trained on the programmes they are going to deliver to the public. Amidst the various duties they need to perform to a scattered and a large segment of people, the health workers consider the time and travel for the training to be burdensome. It was found that the Comm Care mobile application reduced their training time and traveling time (Sukra, 2013).

Data management is the biggest task that takes much of the time of the health workers. An effective time management in data collection and reporting will give the health workers a big relief. The time latency in reporting the data to the health department drastically reduced through mobile phones (Medhi et al., 2012; Waidyanatha et al., 2010 & Hila et al., 2009). Through mobile applications, real time data submission (Mangilima et al., 2010) and reduction in time for field based data collection and reporting (Mahapatra & Sahoo, 2015) was feasible. With the availability of real time data through mobile phones, monitoring of the data (Mangilima, 2010), remote tracking of programme indicators (Medhi et al. 2012) and ensuring data quality was possible (Ganesan et al. 2011). It is evident that paper based data management has taken much of the time of the health workers making them less available for other responsibilities. With mobile phone applications making their data management job easy and fast, they will be more than willing to pay attention in delivery of healthcare to the public.

At a wider perspective, supply of data on disease outbreaks and other health statistics is essential in the delivery of quality healthcare. The presence of mobile phone application is found to be a great support for information and communication of disease outbreaks and other health statistics (Mangilima, et al., 2010, Ganesan, 2010 & Waidyanatha et al., 2010 and Lemaire) and also for a reduction in response time in the supply of essential medicines (Shieshia et al., 2014). It should be noted that when disease
outbreaks happens in the developing countries, a large amount of people fall victims to such diseases. Notification of prevalence of such diseases takes a longer time to come to the attention of health officials and provide response actions. With the advent of mobile phone applications, it is found that handling such disease outbreaks becomes simpler.

Time is a very crucial factor in handling health issues. Timely access to medical care saves lives and thereby provide effective healthcare to the poor and needy. The instantaneous, ubiquitous mobile phones can make the difference in the lives of many and provide them with the timely and life saving health care. Especially in a country like India, where the availability of health facility and the medical doctors are scarce at most of the places, timely healthcare is a blessing.

2.3.1d Performance Expectancy - Quality

Quality in healthcare is a subjective term and it varies with people, countries and the conditions prevailing there. However, based on the review of various studies, for our purposes, we can qualify low error rates in data reporting, expert consultation, low treatment default rate and so on to be services with quality.

The crucial element in the diagnosis and for the treatment thereon for the various health issues and diseases is the occurrence of low error rate in data reporting which also implies accuracy in data. When mobile phones are used for data collection and management, there are little chances for the occurrences of errors.

Mobile applications are considered to be a good support tool in the field of m Health. Comm Care is a mobile application prevalently used in many countries and has shown positive impact in the delivery of healthcare. Several studies have shown proven results for the low error rate in data reporting and management including data entry (Mangilima, et al., 2010), transfer of data (Medhi et al., 2012) and preparation of monthly reports (m Hila et al., 2009). This may be due to the fact that while using Comm care, the data was entered directly in the mobile phones and linked to the central server without any intermittent processing involved in the paper based system. The process of data entry was also found to be very simple.
Van Heerden et al., 2013, in his study, found it was feasible to track and link the data of the HIV patients between long periods of 10 to 14 months with the help of mobile phones. When mobile phones are deployed, the digital entry enables availability of all the data regarding the patients at all points of time and ensures effective treatment for these patients.

In the same way, the mobile phone interface in e Mahtari system required the CHWs to fill all the mandatory fields of the registration forms which were directly linked to the head quarters. In comparison to the paper based system, omission of data or any other misappropriation was avoided and the health authorities felt it increased the integrity of data (Mahapatra & Sahoo, 2015).

A similar mobile application m Health Survey was also found to result in a significant reduction in loss of data as the collected data was directly uploaded from the mobile phones to the central server (Ganesan et al., 2011). It should be noted there is every chance of missing data entries while transferring the paper data onto the digital entry, given the low technical literacy of health workers.

Batra et al. (2011) found that the TB patients in South Delhi could be monitored for their medication adherence through biometric attendance. In case of missed doses, the health workers were given alerts through the mobile phones and the patients were contacted with the drugs. This process brought down the drug default rate to 1%.

Text messaging is another basic and common feature of mobile phones for health care delivery. A regular user of mobile phones with basic literacy will be able to use this feature more comfortably. Based on these assumptions, Ngabo et al. (2012) found that the CHWs were able to compose text messages with low error rates, and it resulted in a higher level of communication ensuring quality maternal healthcare. A similar condition was found to be prevalent in the communication of stock count data for drug supply management (Barrington et al., 2010).

It was found that with the usage of mobile phones, there is an increase in the communication flow within the health infrastructure, viz the health authorities, health experts, health workers and the patients. This enabled a regular monitoring of the field visits of the CHWs and resulted in a higher quality work from them (Chang et al., 2014).
Additionally expert consultation from the SLGs (Senior Level Gynaecologist) was available for the patients through the health workers (Huq et al. 2014). The instant connectivity and omnipresence of mobile phones ensures regular supervision and monitoring of health workers. This makes them more alert of their responsibilities resulting in a better delivery of healthcare.

At all levels, long term sustenance of m Health depends on the quality of healthcare that can be delivered through mobile phones. In a developing country like India, where the access and availability of healthcare itself is a luxury, ensuring quality in the provision of such health services is happening through the use of mobile phones.

2.3.2 Effort Expectancy

The penetration of Information and Communication Technologies depends on how adaptable and easy the technology is to operate. The theories of technological acceptance have emphasized ease of use in various ways. Technical literacy becomes essential to operate certain mobile applications and devices used for health communication.

At the primary level, the language of text in which the mobile phone operates plays a significant role for its usage. The CHWs in India found it easy to use and practice data management with Hindi language text in their phones (Medhi et al. 2012). In another setting, the participants with low level of education in Northern Uganda were not able to understand the SMS quizzes for HIV given to them in English (Apunyu, 2011). It is evident that the mobile phone users find it more easy to use the mobile applications as well as comprehend the messages in their native language. Hence the providers should identify the language preferences of the users before implementation of any m Health interventions.

It should also be noted that data management is a major area of responsibility of the health worker. In spite of their limited language literacy and technical efficacy, health workers found it easy to collect data and report through mobile phones. It was found that only a couple of hours of training were needed to handle a smart phone for entering and submitting disease surveillance data (Diwan et al., 2015). Ease of Use was expressed by the health workers in using mobile applications for compiling monthly reports (Udedi, 2014), interviewing pregnant women (Van Heerden et al., 2013), for data
reporting (Mendoza et al., 2014) and also in disease notification (Mendoza et al., 2014). Additionally, the FLWs of India found it easy to use mobile phones for real time data submission (Gow & Waidyanatha, 2010). Proper guidance and training, continuous usage of mobile applications and in some cases the need of the situation are found to bring in an ease of use among the health workers. However through regular feedback from the health workers the m Health system can be enhanced to improve their performance.

Apart from data management, ease of use of mobile applications was also experienced by the health workers in the usage of medicine dosing tool (Paulozuelos et al. 2013), drug supply management (Barrington et al. 2010) and health computing system (Sittig et al., 2013). The respondents of the edutainment mobile games for fighting HIV /AIDS in India found it easy to learn and play the games (Gow & Waidyanatha, 2010). It is worthy to note that the ease of use is a resultant of perceived usefulness and to a certain extent the usability.

In some instances, there is an existence of interaction between the providers and the users of the m Health system. Ease of use should be experienced by both the parties for a balanced and successful implementation of the intervention. The health workers and the patient found it easy to navigate and use the eCompliance system used for TB treatment adherence (Batra et al., 2011). The IVR technology used for recording and responding to the participants was found to be easy to operate by the participants of ART treatment (Rodrigues et al., 2012) and the participants of Doc Talk in India (Ramakrishnan et al., 2013). It is evident that a certain level of coordination and commitment to the usage of the system should be present among the users and the providers. This sense of belongingness will emulate the perception of ease of use in them.

Healthcare management, by nature, is an area which demands compliance and acceptance. This demand can be met only if the users perceive ease of use in the system. Hence effective healthcare management is possible through mobile phones with the existence of ease of use among its users.

2.3.3. Social Influence

A society is bound by so many intricate and complex structures. An individual is bound by these structures and they influence the way he thinks, reacts and behaves.
A clear and proper recognition of their actions will make an individual consider himself more worthy of his existence. Social respect is what every individual is craving for, inwardly. The CNEs of Madhya Pradesh (Medhi et al., 2012), HSAs in Malawi (Udedi, 2014), and CHWs of India (Mendoza et al., 2014) and the counselors of TB DOTS treatment (Bhatnagar et al., 2012) earned more respect in the society and among the patients through the usage of mobile phones in their work routine.

It was found that with the usage of mobile phones there was a higher credibility and status for the front line health workers (MacPherson & Chamberlain, 2013), for the CHWs of Afghanistan and the CHVs of Mozambique (Mendoza et al., 2014).

Being a social entity, there are people who influence every aspects of an individual’s life. The mothers in laws were found to be influential in the important aspects of ANC behavior like immunization (Mohamed et al., 2014). The participants of the study to promote mental health messages among young women in an urban slum in Bangalore were allowed to participate only after their parents had verified the credibility of the study (Chandra et al. 2014). Majority of the respondents considered Doctors to be the most trusted source of health information and parents to be next dependable source (Skaria, 2012 and Priyaa et al. 2014). The respondents of a study felt that the credibility of the messages improved if it comes from nutrition experts (Hingle et al., 2013).

At an another perspective, as the usage of mobile phones were more personal, the participants of an m Health initiative to combat HIV/AIDS felt they were able to avoid the shame and the stigma associated in being identified as AIDS patients (Crentsil, 2014).

The role of family and friends in every aspect of the life of an individual is the benchmark of an Indian society. And it is no surprise to witness their influence in most of the health related practices. And any m Health intervention to reach its momentum has to take into consideration how the societal roles exist and to what levels they are influential.

2.3. 4. Facilitating Conditions

Facilitating Conditions can be looked at two perspectives based on the review of literature – compatibility for the potential adopter and availability of technology.
2.3.4a Compatibility

Bridging the information gap through the Information and Communication Technologies (ICTs) like mobile phones becomes possible only when the content or the technology itself is compatible to the recipients of the m Health initiatives. Thus, the information will become a currency of knowledge only if it can address to the needs and requirements of the individual or the society. In fact, the success of many of the m Health initiatives depends on how well the content, scheduling, the usage of technology etc are considered fitting into the lives of the people receiving it.

Compatibility is defined as, “the degree to which an innovation is perceived as being consistent with the values, needs and experiences of the potential adopters” (Moore & Benbasat, 1991). As the needs, expectations, lifestyle and various other socio-demographic components vary from place to place, it is difficult to generalize the results of an intervention to projects in another part of the world. However, it becomes necessary to consolidate the factors that affect the compatibility component of the various m Health initiatives to identify the appropriate technique of delivery.

In the field of healthcare, the needs are totally unique and differ from one individual to another. An analysis of various m Health initiatives reveal that the message content plays an influential role in the acceptability of the projects. The women participants of the mobile web application in Singapore expressed that the content they received were not specific to their needs and the medical terms were too technical to comprehend (Lim et al. 2011). It is important to note here that using a web application requires minimal technical efficacy, and when such people consider it difficult to comprehend information with too technical terms, the technicality of the information in the message becomes a point of concern. In another setting, when the youth in U.S.A. were exposed to lifestyle health messages, they showed preference for messages which recommended clear, specific and achievable behavior. More importantly they wanted the messages to be presented in active voice (Hingle et al., 2013). At the same time in a pilot study among diabetes patients in India they wanted the messages to talk about nutrition, general health and physical activity (Shetty et al., 2011). It is evident that the expectations on what and how the messages should be presented differ with the people we are addressing to and the environment they are in.
In today’s world, everyone is filled with information and communication from various quarters of the society resulting in mental fatigue. For the information to create the intended change in the minds/behavior of people the messages should be tailored to the preferred timing and schedule of the recipients. Various m Health interventions were found to have several expressions on timing of the reminders like sending the reminders on the day before or on the day of the appointment (Albino et al., 2014), closer to the time of medication (Da Costa et al., 2012) and in concordance with the convenience of the people receiving it (Strandbygaard et al., 2010). Reminder messages aim at adherence or change in behavior and this categorically should be presented to the convenience of the recipients. It should be noted that the timing of the messages should enhance the privacy and reduce the intrusion of the participants.

Similar to the timing of the messages, there requires an emphasis on the frequency and number of exposures to be given for the health messages. Results of various studies bring out the preference of the people on this aspect. Willingness to receive messages once a week was found among the participants of a study among pregnant women in Argentina, (Cormick et al., 2012) and among the HIV patients in rural Kenya (Pop-Eleches et al., 2011) and India (Rodrigues et al., 2012). The type 2 diabetic patients in India preferred to receive two messages in a week (Shetty et al., 2011). It is interesting to note that people who require continuous care prefer to have less and at the same time regular exposure to messages as too frequent messages may create a boredom, intrusion and sometimes negligence towards the messages. Whereas a study among youth participants reveals that the youth were willing to receive messages on lifestyle on a daily basis. This clearly shows that the youth who have continuous exposure to text messaging do find daily messages more acceptable and do not consider it as interference.

People tend to pay attention to messages and initiatives which they find familiar and nearer to their needs, liking and requirements. More so, acceptance of those initiatives like m Health will be possible only if the participants/users are able to find a certain level of compatibility with it.
2.3.4b Facilitating Conditions - Technology

Adoption of technology depends on various factors like cost of the technology, operational complexity, infrastructure facilities, government policies, security etc. Several ICTs including internet have not gained expected popularity due to constraints faced in the above mentioned factors. At the same time, these factors have favored the unprecedented popularity of the mobile phones among the populace of the lesser developed countries also.

Reliable and proper infrastructure like network connectivity is essential for the omnipresence and ubiquity of mobile phones. In a study, *Combating Rural Child Malnutrition through Inexpensive Mobile Phones* (Medhi et al., 2012), network connectivity was sufficiently available for the CNEs to transfer the completed forms to the central server. Similarly, technical infrastructure in rural Central India worked sufficiently well for transferring the syndromic disease surveillance data (Diwan et al., 2015). The above findings prove that availability of required network connectivity makes mobile phones a viable solution for the delivery of quality healthcare even in low resource settings. In addition to this, the technology team of e-Mahtari programme in India stated that the successful implementation of this programme can be attributed to the requirement of low technical infrastructure for the functioning of the mobile phones (Mahapatra & Sahoo).

At the same time, a contrasting finding was witnessed by the participants of the HIV/AIDS disease management programme in Northern Uganda. Poor GSM signal coverage and absence of electricity for charging the mobile phones impede the usage of mobile phones for their healthcare (Apunyu, 2011). Before implementing any m Health programme, the essential conditions for the basic operation of the technology should be strengthened to reap the real benefits of the intervention.

Mobile phones have become a ubiquitous technology for the reasons that it is available at a low cost, portable and easy to use. Features of mobile phones influence their usage for the purposes of m Health. The CNEs felt it was easy to charge to mobile phones fully within a short span of time (Medhi et al., 2012). The mobile phones and the multimedia images were found attractive during counseling (Mohamed et al., 2014). It should be noted that when technology becomes a facilitator, these features should be capitalized and used for achieving the intended results.
At the same time we find usage of mobile phones considered as burdensome in some situations. Limitations of limited battery life, was found hindered the usage of mobile phones for HIV awareness (Apunyu, 2011) and usage of tablets for CVD screening along with screen damage and inaccurate rendering of local language (Praveen et al., 2014). The small screen size was found to be a disadvantage in using mobile web health application for a longer period of time by the women in Singapore (Lim et al., 2011). The inherent features of mobile phones sometimes will abstain from using it as desired by most people. In that case, the other way to make it more appealing is through the content delivered or through the operating software.

In spite of the fact mobile phones are simple and easy to use, specific training and support is essential when mobile applications are used for various m Health purposes. Training was found to be helping people gain more confidence in the usage of Swasthya Slate mobile computing device for primary health care practice (Sittig et al., 2013), Mobile Phone Assisted Personal Interview (MPAPI) survey platform (Van Heerden et al., 2013) and mobile application using SMS for data collection (Daniel, 2014). The above findings clearly state that the health workers, the actual users of the applications should be given the required training and guidance as they have limited technical knowhow.

When mobile technology is utilized for health care delivery, there are certain facilitating conditions required for it to really function to the optimum level and produce desired ends. It is also worthy to notice that mere technology is not enough for any change to happen; it should enterprise with the byproducts also.

### 2.3.5 Behavioural Intention

The health status of a person is identified through his behavior towards health. The efforts towards creating awareness, dissemination of information, availability of health services all direct towards a single focal point, a change in the health behavior. And all these efforts made through mobile phones facilitates in the creation of a beneficial health behavior.

From another point of view, the counseling sessions have been successful in creating enhanced maternal health behaviour among the women. It was found that counseling resulted in improvement in the rate of people accessing delivery at health
facility (Ngabo et al., 2012) and improved compliance to MNCH practices and better delivery of healthcare (Mahapatra & Sahoo 2015). It should be noted that most of the developing countries, especially India are bound by several customs, traditions and cultural beliefs that exists in healthcare also. To break through those impediments and create the necessary change in the minds of the people is the ultimate aim of the counseling sessions by the health workers. Mobile phones with their novel applications and their appeal across all age groups enable to create the desired change.

At the same time, there are studies which emphasize on the fact that antenatal visits are a very important component of maternal health care. There was a near to complete compliance in antenatal visits through SMS reminders in Mali (Daniel et al. 2014), in rural Zanzibar (Lund et al., 2014) and through Wired mothers programme and Aponjon programme (GSMA maternal m Health programmes, 2014) and an increase in health seeking behavior among women in Rural Indonesia(Chib, Lwin and Jung, 2009).

The pregnant mothers in rural Odisha were found to be taking iron pills to avoid anemia and saving money for emergency birth preparedness as a result of dialogic messages through mobile phones (Ramachandran et al., 2010). The maternal mortality ratio is very high in the developing countries due to lack of access to formal health facility and a lack of awareness of the health complications. M Health programmes primarily aiming at maternal healthcare improves the rate of women visiting health facilities and their health seeking behavior.

In case of child care, text messages were found to bring in improvement in postnatal care responses among Text 4 Baby subscribers (US Department of Health, 2015); through SMS reminders to the mothers in Madhya Pradesh in India (UNICEF, Health Section, 2013) and response from the mothers in South Africa to bring their infants for HIV testing and treatment (Philbrick et al., 2013). Postnatal care is a long neglected area of maternal healthcare among the women in low resource settings. They fail to realize the importance of immunization and other care aspects post child birth. The health initiatives through mobile phones can make them aware of the need for postnatal care and finally make them adhere to it.
In case of chronic disease patients, behaviour modification is very essential to establish treatment adherence. It was found that the m Health programmes were able to bring in a significant change in diet modification and increase in adequate sleep (Patnaik et al., 2014) and reduction in glycemic levels (Shetty et al., 2011) among the diabetic patients in India; medication adherence and migration to ART treatment (Mendoza et al., 2014); and also reduced ART default rate through e-compliance (Mendoza et al., 2014). An improvement in the medication adherence among asthma patients was found through daily SMS reminders (Strandbygaard et al., 2010). The self reported treatment adherence was found to be more among the Text TB patients in Argentina (Iribarren et al., 2013). An increase in the testing for HIV doubled after SMS reminders in Uganda (Bas & Bonny, 2010) and in the number of calls for health consultation through mobile phones (Bali & Singh, 2006) was found. It should be noted that chronic diseases need continuous monitoring and reminders for adherence to desired behavior. Additionally they need the support and confidence to bring a consistency in behavior change. Text messages at a regular frequency will keep on insisting on the need for behavior change, and boost up their morale in treatment adherence.

In another outlook, effective management of health status of the patients was missing due to lack of awareness and promotion of health behavior. Taking this into consideration most of the mHealth programmes aim at creating behavioural changes that will build a positive health status. These changes are desired from the patients as well as the communicating health workers.

Behavioural changes including women turning up for family planning sensitization (Daniel, 2014), increased turnout to healthcare facility for delivery, post natal visits and immunization (GSMA maternal m Health programmes, 2014) and improvement in the uptake of MNCH activities as well as home based care (Mendoza et al., 2014) was found to be a reality with the help of mobile phone health interventions. It is evident that a certain level of ignorance exists among the women in the developing countries regarding the significance of maternal healthcare. Mobile text messages addressed to the set of ignorance and emphasized the need for a healthy behavior ante partum, partum and post partum. This resulted in achieving effective maternal healthcare management among the women.
Similarly, treatment adherence is found among women HIV/AIDS patients in Brazil (Da Costa et al., 2012) and a rural clinic in Kenya (Pop-Eleches et al., 2011) through regular and continuous mobile text messages. Vaccination and immunization reminders through text based messages are also found to bring in effective results among the parents of rural Kenya (Wakadha et al., 2013) and among text 4 Baby participants (GSMA maternal health programmes, 2014). Text messages were also found effective in bringing an increase in the practice of Breast Self Examination among the women in New Delhi (Khokhaar, 2009). It is worthy to note that text messages have been successful in addressing varied health situations and developing desired health behavior. As the delivery of the content is done in a clear and precise way, directly to the intended individual and more importantly available for referring again on doubts make text messages more appropriate.

As the mobile phones are in the possession of every one, every day, and everywhere to effect the desired behavioural change in health is becoming easier. The only challenge the authorities need to face is the choice of the right m Health tool for delivery of content or services.

2.3.6 Self Efficacy

Even though mobile phones are considered to be the less skillful among the Information and Communication Technologies (ICTs), a basic level of operational capacity is required to access information through the mobile phones. As health communication through the mobile phones are intended to reach the people at grassroots level, discussions on how self efficacy has been influencing in various studies conducted will be greatly helpful.

Self efficacy indicates the ability to perform a function with little or no assistance. In case of m Health interventions, by self efficacy we mean to imply the ability to handle the required function in the mobile phones and in some cases the language literacy too.

Language literacy is the basic level of skill required to operate a mobile phone, as you need to know what buttons to press for what purposes. Limitations in language literacy impedes people to perform some functions in mobile phones like the participants with low knowledge of English (Elangovan & Arulchelvan, 2013) and also resulted in
differential error rates in report submission through mobile phones among the CHWs in India and Sri Lanka (Gow & Waidyanatha, 2010). It is evident that the language literacy more specifically a basic knowledge in English is lacking among most of the populace in the developing countries. This may be one of the reasons why scaling up of m Health is still rudimentary.

Language is the vehicle for communication and basic literacy in the language, influences in how the messages are comprehended and considered acceptable. Language literacy was found to be an essential factor in the receiving and comprehending the health care messages (Oerther et al., 2014 & Elangovan, Arulchelvan, 2013). In contrary to this the HIV/AIDS helpline in Karnataka received calls and interaction in English more than the native language, Kannada (Alexander et al. 2011). Though it can be argued that people will be more comfortable to receive information in their native text, it is very essential to consider how far the recipients are compatible with the language in which the messages are sent.

In addition to language literacy, technical literacy also has to be stressed upon when mobile applications are used for delivering health care. Palazuelos et al. (2013), in his study on “Users perception of m Health medicine dosing tool for the community health workers”, reveals that simplicity in its operation and adaptability to the local needs made the medicine dosing tool highly acceptable among the health workers. Technical compatibility with the m Health tools they are working with gives them a great boost of confidence and encourages them to serve better.

Another outlook is the resultant of the technical efficacy in mobile phones which led to the acceptability of the m Health interventions. Several other studies also found that acceptance and adoption of mobile phones for healthcare was more among people with high self efficacy in mobile phones (Lim et al., 2011, Chib, Lwin & Jung, 2009 and Murthy et al., 2012). Irrespective of whether they are the providers or the beneficiaries, acceptability of the system is brought with the confidence with which they are able to operate the system. And this operational confidence comes as a byproduct of self efficacy.

Text messaging is the cost effective, less skill oriented and asynchronous connectivity tool in mobile communication for the developing nations with low resource
settings in terms of finance, education and technological infrastructure. Text messaging ability among the participants was found to be a positive influence through the BSE reminder messages (Khokhaar, 2009), maternal and child care messages (Datta SS, et al. 2014), TB treatment adherence messages (Iribarren et al. 2013) and medication adherence messages (Christopher, 2013). However, there was an existence of low level of technical efficacy to read and send messages among the participants of a study on adherence of iron supplements in Mumbai (Pai et al. 2013).

It should be noted that when the text messaging ability is absent among the users, though not so cost effective, only voice calls can turn fruitful. The prevalence of this minimal technical efficacy is bound to offer the best m Health solutions and thereby bring in an effective healthcare management.

Technology will become an enabler if the users are able to exhibit self efficacy in its operation. The mobile technology when used in low resource settings, should take into consideration the available skill sets among the users there and device an appropriate tool for delivery of information.

2.3.7. Attitude

Technological innovations are, in principle, accepted by people belonging to all cross-sections of the world’s populace. However, acceptance and continued adaptation demand a very favourable attitude of the user in order to ascertain any semblance of success of a project that is technology driven. Taking into consideration that more odds are stacked against the implementation of socially relevant projects it is important to understand the attitude of the people to know the feasibility of initiatives such as adoption of m Health.

Attitude can be defined as “an individual’s positive or negative feelings (evaluative affect) about performing the target behavior. An overview of m Health studies will help us identify what makes people believe in a system, form a positive perception, find confidence, and thereby make them accept the system of m Health.

Belief is created amongst the people based on the situations they are living in and the novelty of the system. A review of the studies in India amongst pregnant women in
rural Tamil Nadu (Datta et al., 2014) and amongst the TB patients for their treatment adherence (Elangovan & Arulchelvan, 2013) revealed that majority of them held strong belief in the usefulness of the mobile phones for their health purposes. Such a belief may be associated with the fact that in India, where accessibility to quality healthcare for the poor is minimal, they hope to find a feasible solution through an affordable and simple technology.

In a more personal point of view, there are studies in which mobile phones addressed the psychological and social perspectives of a population. The urban youth of a slum in Bangalore showed a favourable attitude for receiving positive mental health messages and opined that they felt receiving the messages was like having someone to share their emotions and feelings with (Chandra et al., 2014). Similarly, the TB patients in Peru felt that apart from the usefulness of health literacy messages, motivational and congratulatory messages will boost up their morale (Albino et al., 2014). In both cases, we can recognize that mobile phones are looked up to as a medium which addresses them more personally and directly, especially their mental well being.

At the same time, it is found that mobile phones are favoured with high confidence and positive outlook as it addresses to the major problems of forgetfulness, negligence and low awareness in treatment adherence through appointment, vaccination and medication reminders. Evidences for this kind of positive perception for receiving text based reminders can be seen among patients of Real Time Medication Monitoring (Vervloet et al., 2012); patients of asthma for medication adherence (Strandbygaard et al., 2010); participants in a weight loss programme (Shaw et al., 2013) and the low income parents for immunization reminders (Ahlers et al., 2011). For issues like vaccination and medication, adherence to timing is very crucial and text messages will be very apt in providing reminders for those purposes.

Addressing one of the Millennium Development Goals of maternal and child healthcare is another facet of m Health. The maternal mortality ratio and child mortality ratio cause a serious concern for most of the developing countries with poor resources. Very low awareness and poor accessibility to quality healthcare along with long held myths and beliefs are some of the reasons for it. Studies of m Health for maternal
healthcare showed that the women were more willing to receive text messages on maternal health (Cormick et al., 2012) and also opined that they felt more confident about becoming new mothers (Evans et al., 2012). This willingness may be due to the fact that mobile phones are anytime and anywhere medium which is very convenient for them, whether they are at home or at work. Moreover they receive information effortlessly about how to care for themselves and their children and reduce their anxiety.

Mobile health care has a strong foothold in a crucial domain such as HIV infected population. High acceptability of mobile phones for their healthcare is visible among the HIV infected patients to receive their laboratory test results, (Siedner et al., 2012) and among the TB patients for supporting their treatment adherence (Iribarren et al., 2013). They had mentioned that the reduced effort and transportation cost is a benefit for them, in the earlier case and getting a feeling of support and being cared for in the latter one. It is important to note that the acceptance of such chronic illness people may be associated with their mental state. Being carriers of the stigma of their disease, patients find mobile phone be more personalized, direct and private, which make it all the more suitable for them.

In another setting Shetty et al. (2011), stated that the diabetes patients in India found the text messages for diabetes management acceptable and influential in creating behavioural changes to lifestyle. For diseases like diabetes which require continuous treatment monitoring, text messages are found viable due to their cost effectiveness, asynchronous timing and availability for reference again.

Having seen the responses from the demand side of m Health, it is certain that the supply side stakeholders also find usefulness in it. The CHWs of rural Mexico and Gautemala felt that the m Health tool used for medicine dosing was very satisfactory and acceptable for their work routine (Palazuelos et al. 2013). With few doctors in the rural areas and long geographic distances acting as a barrier to access the facilities, mobile phones used for medicine dosing has created a good level of confidence in the health workers to prescribe medicines and recommend appropriate dosage.

In contrast to the above findings of favourable attitude towards mobile phones, the participants of a qualitative study in Northern Uganda showed clear preference for traditional media like Radio over mobile phones for receiving HIV/AIDS care
information (Apunyu, 2011). It is interesting to note that radio is still a dominant medium in many parts of the world, as it is considered to be the voice of the marginalized, requires no electricity and can be understood by people with low literacy levels too. Notwithstanding the penchant for radio and other older traditional media across the globe, particularly in the lesser developed nations, the permeation of a new medium like mobile cannot be pre-empted physically and psychologically.

Even technologically driven developed countries have not witnessed scaled up m Health interventions. Researchers are still in the process of identifying the reasons of the success stories and the factors that will enable the scaling up of m Health programmes. Review of the studies revealing factors that affect the feelings, perception or attitude of the people towards the role of m Health in the healthcare delivery will lend a new direction for further studies.