EXPLORING THE POSSIBLE FACTORS INFLUENCING THE ADOPTION OF M-HEALTH AMONG WOMEN IN CONTEXT BANGLADESH

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SUPERVISOR'S APPROVAL

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DECLARATION

This is to certify that the work presented in this thesis paper, titled, "EXPLORING THE POSSIBLE FACTORS INFLUENCING THE ADOPTION OF M-HEALTH AMONG WOMEN IN CONTEXT BANGLADESH", is the outcome of the investigation and research carried out by the following students under the supervision of Colonel Md Mahboob Karim,psc, Senior Instructor, Faculty of Electrical & Computer Engineering, Military Institute of Science and Technology.

It is also declared that neither this thesis paper nor any part thereof has been submitted anywhere else for the award of any degree, diploma or other qualifications.

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SUMMARY

mHealth refers to the use of various mobile devices for health care services. It is rapidly flourishing in Bangladesh. However, the adoption of mHealth is not upto par. Women of all backgrounds have become more involved in the use of technology but most of them are not adopting the mHealth services. The thesis focuses on exploring the possible reasons that play a part in women's adoption of mHealth in their daily lives. The user acceptance model chosen for this was Unified Theory of Acceptance and Use of Technology (UTAUT) model along with which few additional factors have been added.

Initially along with UTAUT model, the additional independent variables that were proposed are Technology Anxiety, Habit, Trust, Privacy, Price Value, Resistance Towards Change, Personal Innovativeness in IT. The moderating variables that were proposed along with the existing age and experience were education and experience. 495 women were surveyed with the prepared questionnaire and the testing and analysis was conducted basing on the accumulated data. The analysis showed that Performance Expectancy, Habit, Personal Innovativeness in IT, Price Value, Social Influence have effect on the Behavioral Intention whereas Facilitating Condition and Behavioral Intention affect the Use Behavior. All of these relations were proved to be moderated by Age, Experience, Voluntariness of Use and Education. The obtained outcomes will help in designing applications that will be more likely to be adopted by women.

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CHAPTER 1
INTRODUCTION

1.1 What is mHealth?

1.1.1 Definition

The Global Observatory for e-Health [1] defined mHealth as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs) and other wireless devices. Mobile phones provide services with the help of text messages and mobile applications. In Bangladesh, the mHealth was initiated with SMS and became prevalent. However with the infiltration of smart phones, the usage of mobile applications for the purpose of health was started but did not gain too much fame. The overall quality of care and health care facilities are improved by the collaboration of people involved in providing services i.e patients can have better access to health-care personnel like physicians and nurses [2]. It allows users to be not be constrained by time or location by providing them with the ability to interact with the users with great flexibility and at a higher rate [3]. Users can access personalized and interactive health services due to their mobility, portability and ubiquity [4].

1.1.2 Classification of mHealth

There are various categories of mHealth services basing on the type of intervention being provided. The services being provided and labeled as mHealth services are not limited to mobile health applications only. mHealth resources can be obtained in various forms, be it in the form of mobile application, telemedicine, sms services, portable and wearable devices etc. Some of the classification of the mHealth services in low and middle income countries [5] are given below:

1. **Health Information Delivery**: Educational information are being sent out to various groups of people who are often the group leaders as part of complex change in intervention. Different types of sms such as health education promotion tailored information basing on some diseases etc. The information was predominantly sent out with the help of text messages before the proliferation of smart phones occurred. However, with the increase of smart phone users, the health information delivery is also conducted with the help of mobile applications.

2. **Reminder Based Services**: Reminders are extremely important for patients who are required to take medication consistently and regularly. Reminder applications help the patient by helping them keep track of the intake of the medicines along with dosages required at a particular time which reduces the hassle of the patients to a great extent. Another form of reminder is the personalized appointment which can be in the form of text as well as a feature of the application being used.

3. **Patient with Health-care Provider**: This type of mHealth service helps the patient to have one on one communication with the doctor. The patient can easily provide information regarding the symptoms they have noticed and ask for the doctors advice. Depending on the severity of the condition, the doctor can either prescribe the required medication or tell the patient to visit the nearest clinic. This service is very helpful for the primary stage of care.

4. **Support Group** : These are socially mediated services where continuous peer support via cell phone is available. Group-mediated socio-cultural intervention by voice messaging as well as sms is also available.

5. **Therapeutic**: Mental health is a taboo in countries like Bangladesh. This makes it hard for people with mental disorders to go to the doctor or any psychologist. At present there are many helplines that provide services catering to various mental needs. These services are not meant to provide actual treatment, rather it gives a platform for people to talk when they are going through a mental breakdown.

1.2 Advantages of mHealth

1. **Ubiquitousness**: In countries like Bangladesh, the health-care services are not easily accessible in all parts of the country. People living in remote areas will have to travel quite a bit in order to receive treatment which creates a huge problem in case of any emergency situation. But mhealth has paved the way to faster and ubiquitous treatment since it can be accessed from anywhere at all. Primary treatment can be received through phone call or video conferencing with certified health-care providers.

2. **Improved Access to Information**: The initiation of usage of patient online portals and mobile applications has changed the ability to access patient records. Hospitals and patients can better coordinate care and ensure that the important information are shared with the people in need. For this purpose, Electronic Health Record is used which increases the interoperability and is able to provide positive health-care [6]

3. **Compliance with Medication**: Usually medical professionals cannot ensure if the treatment they have prescribed are being followed. Patients often forget to take medications

which worsens their condition and causes them to be readmitted. This problem is solved with the help of reminder messages where patients are reminded of the time of taking medications. They also receive notifications when prescription should be refilled. It often asks patients if they have taken the medication and reports it back to the doctors [7].

4. **Fast Primary Care**: It often requires time for medical help to reach at one's doorstep during an emergency. The best possible solution in these conditions is the adoption of mHealth where contact is made with the professional for primary care.

5. **Easy Appointment System**: Getting doctor appointments is now easier than ever before. People can easily book their appointment to their desired doctors. Along with this, there are available applications that recommends the patients with a possible list of doctors according to their problem which saves them from the hassle of looking for doctors.

1.2.1 Specific Importance of Women's Adoption of mHealth

There are various disagreements regarding which gender is more prone to diseases. Since various factors like the immune system vary from person to person, there is no hard and fast rule about which gender is more likely to be affected with ailments. Women are more prone to cardiovascular disease, osteoporosis and osteoarthritis, cognitive decline, dementia and depression at the onset of menopause [8] whereas men are more likely in general to have cardiovascular disease and increase chances of getting a stroke before women [9].
However women go through hormonal changes almost monthly and child bearing takes a toll on women which is very different from men. This lays a strong ground for women and gives a concrete reasons to be more proactive about their health. Many of the problems can be prevented if women are more aware about their bodies and the constant changes that are taking place and mHealth services can play a very important role by increasing awareness as well by helping women track their health. Some of the common diseases which make women more suited to the usage of mHealth are given below:

1. **Pregnancy**

   - **Developing anaemia:** 50 to 90% of the pregnant women get iron deficiency in Bangladesh, which is mostly seen in the rural areas. It was reported by DHS of 2000 that 13.8% of women developed complications during their last pregnancy, the most common complications being - abdominal pain (25.31%) swelling of leg or body (23.33%), anaemia (19.94%), urinary problems (16.76%) [10].
   - **Maternal Nutrition:** Maternal Nutrition is very important both for the health of the mother and the child. However the lack of knowledge in pregnant women often causes problems during the pregnancy which could be prevented if adequate they

the adequate knowledge required. Lack of information leads to various diseases and complications during pregnancy. Around 45% of women in Bangladesh suffer from a chronic energy deficiency [11] while by 1995-99, the proportion had increased to 81% [12].

- **Getting Immunization Injections:** Tetanus Toxoid or TT injection is very important for pregnant women to get during pregnancy. However, not everyone is aware of its importance. Sometimes women dont get it in adequate amount and at other times they get overdose of the vaccine. These vaccinations are given to pregnant women through immunization centres and satellite clinics, and are therefore often given without a full antenatal visit, leading to the much higher levels of TT compared to antenatal checkups [10].
- **Depression:** Other health conditions are also generally more prevalent in women. For example, depression prevalence amongst women is almost twice that of men with around 21.3% women reporting a lifestyle prevalence of major depressive disorder compared with 12.7% of men. Women in their child-bearing years appear to have the greatest risk, with genetic vulnerability, hormonal fluctuations and psycho social events such as stress, internalization coping style, and disadvantaged social status thought to affect this [13] The prevalence of depression is almost twice for women than for men. 21.3% women report pervasiveness of major depressive disorder compared with 12.7% of men. With the genetic vulnerability and hormonal fluctuations In the child-bearing period, women are more prone to depression [13]. In the rural district of Bangladesh the prevalence of PND was 22 at 6-8 weeks post-partum [14]. This is a largely undetected mental health problem in Bangladesh [15].

2. **Menstruation and Related Problems:** Menstrual health is important for women for maintaining health and hygiene mobility and dignity. Many women use period tracking applications that not only help to track menstruation but also the fertility. These apps can often help to track hormonal changes along with abdominal cramps that women face during the cycles.

1.2.2 Mobile Phone Subscription in Bangladesh

The mobile industry in Bangladesh has scaled rapidly over the last decade to become the fifth largest mobile market in Asia Pacific, with 85 million unique subscribers in 2017 half the population. Women comprise 49.5% of the population in Bangladesh. The literacy rate of male is 76% whereas it is 70% for females [16]. Although there is a gap, it isn't significantly huge. In spite of women not lagging behind by a certain degree, the adoption of mhealth for women is not satisfactory enough. No specific statistic of usage of mobile phones basing on gender was obtained but the aforementioned statistics give a picture of how the mobile subscribers in Bangladesh.

1.3 State of mHealth in Bangladesh

Bangladesh has been identified as one of the 57 countries who have shortage in health-care workforce (doctors, nurses and midwives number below 2.28 per 1000 population) (in 2012) [17]. In 2015, the density of nursing and midwifery personnel per 1000 population was 0.267 [18]. Providing affordable health-care due to poor infrastructure and high population has also proved to be a great challenge [19]. These problems have been the motivating factor behind the governments initiative towards health-care. The e-Health initiative in Bangladesh began in 1998 when the Ministry of Health Family Welfare(MOHFW) undertook the Health & Population Sector programs (HPSP) to enhance efficiency of program implementation [20].

1.3.1 Government Initiatives

The Government of Bangladesh has a wide range of specific programs to gradually improve the infrastructure of mHealth. Currently, health service through mobile phone, telemedicine service, pregnancy care advice through sms are made available [21]. SMS-based complaints-suggestions box has been initiated in about 800 public hospitals to send complaints or suggestions by SMS for improving service [22]. The Access to Information (A2I) under the Prime Ministers Office operates Union Information and Service Centers (UISCs) in 4,536 unions of Bangladesh. The A2I provided computer, printer, digital camera, scanner and Internet modem to the centers. In 22 of the UISCs, telemedicine service using Skype has been started on pilot basis. Doctors, sitting at the MIS office, are giving medical consultation, every working day. The rural people are really welcoming the service and now the telemedicine service is one of the most popular value added services in the respective UISCs [23].

1.3.2 Non-Government Initiatives

Till March 2012, private initiatives that were taken by some organizations include Medinova Telemedicine, eClinic24, Grameen Phone, Teletalk, AMCARE by TRCL, MJiVita by JSPH CRP , MAMA by DNet, BRAC mHealth [24]. MAMA provides information to expecting mothers as well as new mothers regarding various topics like breastfeeding, ovulation calendar, vaccination etc. Other organizations have services for neonatal health care, telemedicine, call center helpline etc. There are helplines for mental health awareness as well of which Kaan Pete Roi is a famous helpline for suicide prevention.

1.3.3 Mobile Health Applications

Apart from international applications that are available for use in all countries, there are many mHealth applications that are developed solely for Bangladesh. The cluster of mHealth applications include: applications providing health-care information, fitness and wellness applications,applications with information regarding nutrition. Some of the other applications are disease specific, contain doctors information or are made for pregnant women and children. 64% of the general users are mainly ofund to use these applications followed by patients and moms and kids [25].

1.4 Motivation for the Research Work

It has been previously established how important health related concerns are for women. Various aspects of womans life make them more susceptible to various ailments which require preventive measures. It has also been seen that the health-care system in our country is not upto par which is why more people should be inclined towards using mHealth because of its ubiquitousness. Resources such as mobile phones are also easily available and women are not lagging behind by a lot in its usage. Even then, mHealth is not welcomed in the way it should be. The research focuses on finding out the factors that might play an important role in the reluctance in accepting mHealth services. If satisfactory results are obtained then it might be possible to design mHealth services in such a way that more women are keen on using it.

1.5 Approach Towards Research Work

The research will be initiated by figuring out which model will best suit our chosen topic. There exists many famous user acceptance models which can help in this regard. The user acceptance models are based on various reasonings behind the adoption of certain technologies. These models take into account many possible factors that have impact on the decision making of an individual. The models also help to explain the relation between the decision making and the intention of use. Components such as perceived usefulness, perceived ease of use, attitudes, behaviors, personal beliefs, effect of subjective norm will be studied in depth. The model that will be best at explaining the factors that are plausible to describe the reasons of adoption of mHealth services will be chosen. Although the topic of the research was initially obtained from reviewing the existing literature on mHealth, further rigorous study will be needed to be able to discover the reasons which are in the realms of possibility behind the lack of acceptance of mHealth in women. Since the literature will be strictly based on mHealth in some form, it can usher new ideas about factors since many of them will be based on other geographical regions in the world.

After choosing the model in conjunction to which our proposed model will be built, the new factors have to be finalized to be kept in the proposed model. The categorization has to be done basing on their dependence and independence since most of the user acceptance model have variables like this. The proposed model will be built by adding in new factors along with the existing model. After the proposed model is illustrated, the hypotheses will be declared. In the final stage, this hypotheses will be tested. If the hypotheses are proved to be true then they will be kept, else they will be discarded. Since, the research will need respondents in order to reach to conclusion, a questionnaire has to be prepared. Each of the pre-existing factors as well as the new factors will need to have associated questions along with them. The answers to these questions will help to prove the validity of the factors at hand. The questions are to be based on previous research work and some can be conceived. The size of the sample population that will be required for conducting the survey and getting the required results will have to be measured out at first. Medium of data collection, whether online or offline has to be chosen, in preparation for collection of data. Online method that utilizes survey tool is better in this regard since it gives the flexibility to distribute large amount of survey forms to a large mass in a short amount of time. Another advantage is that, it usually calculates the statistics of the answers to individual questions given by the respondents. In order to get started with the mathematical calculation, the answers need to be numbered. Since, the questions will not be open ended, each of the answers can be quantified with the help of the Likert Scale. The data analysis approach that will be used is PLS-SEM. In this method, the relationships between the variables can be measured easily. The SmartPLS tool is very useful in this regard. Plugging in the values from the excel sheet can be done very easily, which sets the stage for further calculation. The significance of the indicators of each construct has to be calculated in order to find out which has more impact. The analysis of the path coefficients will prove to be more useful in determining which factors have more significance over others. The less significant ones will be discarded which will finally produce the final updated model.

In the following chapters the Theoretical Background has been discussed, which is followed by the Literature Study. The fourth chapter consists of the Theoretical Framework and Hypotheses which contain the reason behind choosing the base model and the main hypotheses of the proposed model, the fifth chapter is Methodology which discusses the entire process to be followed and chapter six which is Test and Analysis, goes in depth of the calculations that have been done and the last chapter ends with conclusion which summarizes all the previous chapters.

CHAPTER 2
THEORETICAL BACKGROUND

In this chapter we will briefly discuss about some most related acceptance model. Their findings and lackings are also summarized. And last of all why we picked UTAUT above all other acceptance model will be briefly discussed.

2.1 User Acceptance Models

2.1.1 Theory of Reasoned Action

Drawn from social psychology, TRA is one of the most fundamental and influential theories of human behavior. It has been used to predict a wide range of behaviors. It has two constructs: i) attitude towards an act or behavior and the ii) subjective practice. The TRA model proposes that a persons behavior is determined by several intended motives that are in line with the attitude of the person concerning behavior and subjective practices. The theory assumed that an individual takes into consideration the consequences of behavior before they do it. As a result, intention is the most important factor in determining the change of the behavior which will evolve according to the individuals expectations about a positive or negative attitude from society.

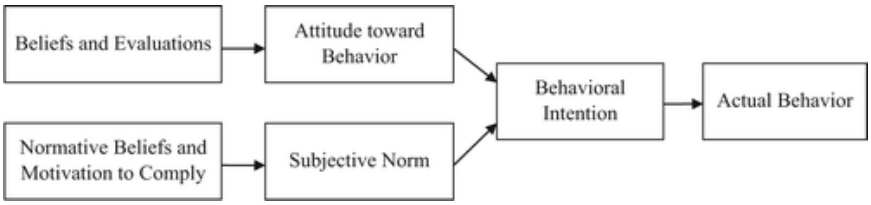

Figure 2.1: Theory of Reasoned Action

2.1.2 Technology Acceptance Model

TAM was established by Davis in 1989 and is tailored to IS contexts and was designed to predict information technology acceptance and usage on the job. Unlike TRA, the final conceptualization of TRA of TAM excludes the attitude construct in order to better explain intention [26]. Davis stated the features that could enhance the system usage included i) the supposed usefulness, regarding increasing the efficiency in performance and the ii) expected ease of adopting the technology.

The TAM model basically tells that the attitude towards using a technology is driven by the perceived usefulness and perceived ease of use.

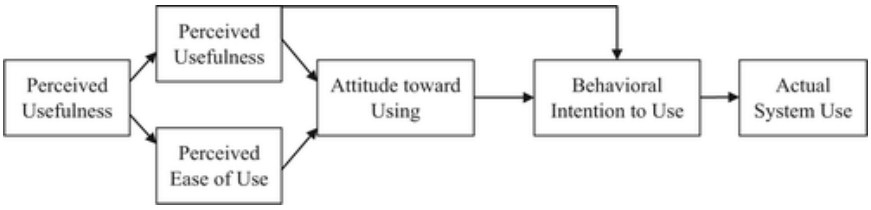

Figure 2.2: Technology Acceptance Model

2.1.3 Theory of Planned Behaviour

TPB extended TRA by adding the construct of perceived behavioral control. In TPB, perceived behavioural control is theorized to be an additional determinant of intention and behavior. Ajzen [27] presented a review of several studies that successfully used TPB to predict intention and behavior in a wide variety of settings. TPB has been successfully applied to the understanding of individual acceptance and usage of many different technologies.
The constructs here are : i) attitude towards behavior ii) subjective norm and iii) perceived behavioral control.

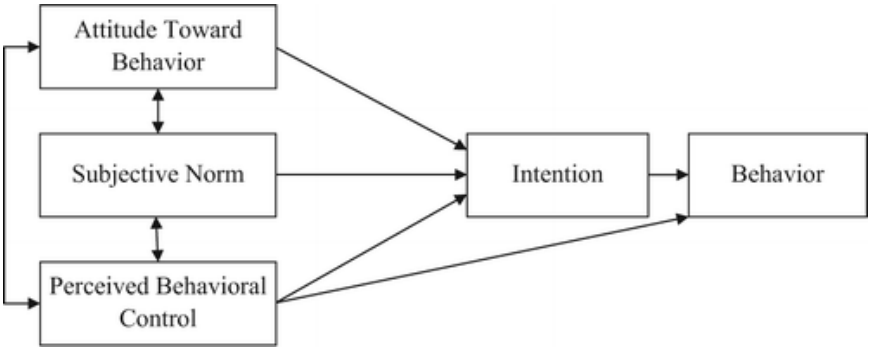

Figure 2.3: Theory of Planned Behaviour

2.1.4 Unified Theory of Acceptance and Use of Technology

Venkatesh et al. [26] established the Unified Theory of Acceptance and Use of Technology (UTAUT) model. The UTAUT model consists of four predictors: i) Performance Expectancy, ii) Effort Expectancy iii) Social Influence and iv) Facilitating Conditions. The two expected outcomes are i) Behavioral Intention and ii) Use Behavior etc. The four moderating variables are: i) Gender ii) Age iii)Experience and iv) Voluntariness of Use. The UTAUT combines eight behavioral models of technology adoption: i) Theory of Reasoned Action (TRA)
ii) Technology Acceptance Model (TAM)
iii) Motivational Model (MM)
iv) Theory of Planned Behavior (TPB)

v) Combined TAM and TPB (C-TAM-TPB)
vi) Model of PC Utilization (MPCU)
vii) Innovation Diffusion Theory (IDT)
viii) Social Cognitve Theory (SCT)

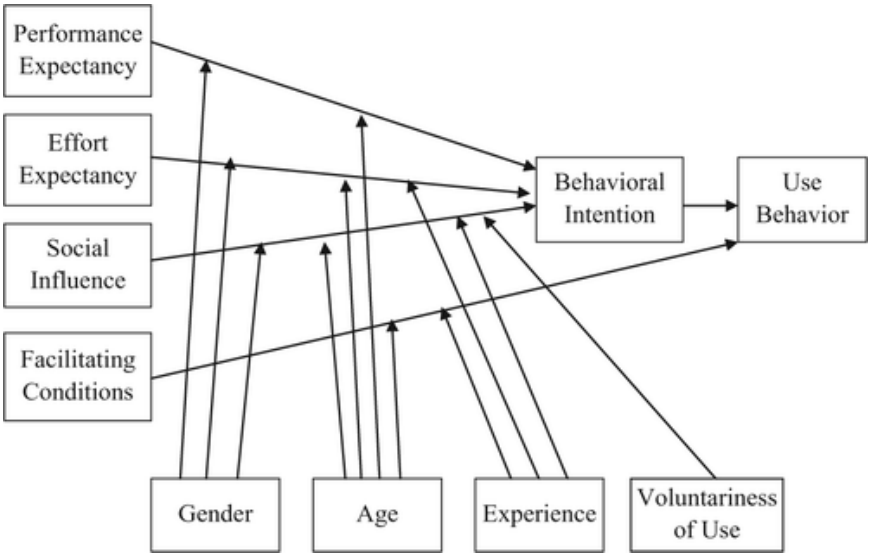

Figure 2.4: Unified Theory of Acceptance and Use of Technology

CHAPTER 3
LITERATURE STUDY

Keeping the developing countries in mind, a paper by Shahriar Akhter et al [28]. relates the perceived quality of service of mobile health with the intention of future use and user satisfaction. The paper argues that the perception of quality will influence the utilization of available m-health services. Their conceptual model proposed the users perception of the available service will be dependent on the condition of the mobile network, quality of interaction between the patient and the doctor and the quality of the result achieved after getting the treatment.

A paper by S Akhter et al. [29] discussed about the overall reach and importance of mHealth. It stated that mHealth is viable because of it's low cost and high reach solution. Awareness regarding various communicable as well non-communicable diseases can be achieved with the help of m-health applications. It was mentioned that in some settings in developing countries, the ultimate platform for diagnostic as treatment support was achieved with the help of m-health services. Various success factors like affordability, acceptability, availability were mentioned in the paper that made the m-health services sustainable than other solutions.

Md. Rakibul Hoque et al. [30] added factors such as hedonic motivation, price value, habit along with the usual UTAUT factors to find out the roles of the added factors in elderly people adopting mHealth.
In a paper by Zuhal Hussein et al. [31] it was shown that the attitude towards usage of mHealth directly affected the intention to use. It showed that if a consumer does not believe in the accuracy of the data provided by the mHealth applications, then they would not be prone towards the adoption of mHealth services. The attitude of the consumers plays a huge role in spreading the mHealth services. The usage will increase if they think that access to mHealth application would be more helpful in managing their own health.

The intention of use of mHealth was dependent on perceived usefulness and perceived ease of use. Along with the TAM variables, the results obtained by Md Rakibul Hoque et al. [32] there was a strong relationship between the purpose of use of mHealth and the perceived social pressure that people face in not performing a behavior.

Arul Chib [33] discussed about the theoretical, methodological and sustainability issues and how value can be added to the field of m-health in developing countries. It drew attention over prior work that showed that accessibility of mobile phones was greater in remote population which resulted in enhanced communication. This can result to better health care and monitoring services. But in order to attract the healthcare providers towards m-health, the sustainability needs to be established at first. For the scope perspective, m-health is required for the vulnerable sections of the population. A combination of application of conceptual theories, evaluation of the health metrices and involvement of the practitioners in the technological design would lead to sustainable mHealth services.

Emmanuel Eze et al. [34] talks about how the interactions between various stakeholders of mHealth services are not given much importance. It delved into the relations between the system developers, patients and the healthcare workers and it was found that there was inadequate study in these fields.

Vani Aggarwal et al. [35] has talked about the flourishing field of mHealth in India along with the various impediments that decrease the use of mHealth. Various causes like ownership of phone based on gender, cost of phone services, the network, lack of electricity were listed as some of the causes of obstruction towards usage of mHealth.

In a paper by Beratarrechea et al. [36] there were studies conducted on the usage of mHealth services in low and middle income countries for chronic diseases. It showed that in most cases, use of sms as a means of mHealth service was more effective than the internet based solution. It also showed that the health related quality of life was improved for congestive heart failure but had no significant changes in case of asthma patients.

A paper by Rebecca Schnall [37] showed the importance of design methods that are user-centered and involves participatory design sessions which also involve end user feedback. A rigorous process was followed to provide the users with a mobile application truly catered to their needs.The Information Systems Research(ISR) framework was used to design an m-health application that included the design preferences of the user.

In a paper by Daniel R Bateman [38], a systematic review was carried out which measured how effective the mHealth interventions were along with the health outcomes obtained as a result of it. This was primarily conducted for people with MCI, Alzheimer's Disease and dementia. It was found that inspite of how they were advertised, the studies were of low quality and the health outcomes were found to be inconsistent among the studies.

A study was conducted in Malawi [39] for design of healthcare intervention. Basing on the opinions of the participants and their ease, an SMS intervention was designed that was targeted for adolescents in order to improve the knowledge and awareness regarding contraception.

In a paper by Fatema Khatun et al. [40] the differences in gender in owning a mobile phone and its corresponding effects that lead to inability to opt for mHealth services was discussed. It showed that women were lagging behind in the ownership of mobile phones as well as the knowledge of mHealth services.

In study conducted by Liezel Cilliers et al. [41] the students' use of mobile phone use to seek health information in Africa was conducted. The UTAUT model along with additional factors was used and it was found out that perceived usefulness was the main factor behind conducting the searches for health information which was followed by mobile experience, social influence and attitude towards technology.

In the paper by Arul Chib [33] different issues in mHealth research were discussed and suggestions on how to use mobile communication in this field was discussed. Further emphasis was given on establishment of proper healthcare metrices.

An exploratory study was conducted [42] which examined the attitudes and readiness of older women in adopting a phone based intervention system. It was found that technological anxiety did not have any direct relation with the intention of using a technology and also the usefulness perceived by the women.

In the research work by Alayne M Adams et al. [43], it was found that in order to provide universal health coverage a second generation of health-system innovations is required. There needs to be development in the long-term national human resources policy and action plan. Some of the actions mentioned in the plan include development of national human resource policy, establishing national insurance system, building an interoperable electronic health information system etc.

In order to meet the growing needs of patients with chronic diseases, moving the healthcare to ones home is essential. It has been found that, to apply this model in practice, a professional IT healthcare is needed for both healthcare providers as well as the patients. Since a large amount of data needs to be dealt with, it has become necessary to use cloud based systems [44].

Fatma Zubaydi et al. [45] describes the various security concerns regarding mHealth. The vulnerability of mHealth in regards to security threats is a huge issue. The security requirements

of mHealth include confidentiality, vulnerability and availability. Some of the threats mentioned in the paper include malware infections, absence of appropriate measures in data security, unauthorized usage and personal theft etc. Some guidelines were mentioned that could help with the decrement of security concerns in the future.

It has been stated by Jahan et al. [46] that Bangladesh cannot provide minimal health services since the number of health care professionals are inadequate. In these circumstances, e-health might be the most economically viable option to serve maximum number of patients. Some of the key findings were that majority of the patients though that the systems should be developed in hospitals. The accuracy of health records, confidentiality of the data and access to the health records were some of the main concerns of the patients.

In the paper by Khatun et al. [47], ”readiness” was described as ”a crucial prerequisite to the successful implementation of telehealth programs”. In Bangladesh, systematic assessment showed that the readiness was lacking. Readiness included three categories: technological,motivational and resource. After conducting survey in a rural sub-district in Bangladesh, it was found that although technological readiness was present among 45% of the respondents, they did not have the technological capabilities and human resource readiness required for using the m-health programs.

From the background studies, the importance of mHealth, the reach of mHealth and various impediments in the proliferation of mHealth has been found out. Various factors have been found out from the prior researches that may affect one’s adoption of mHealth. It has also been seen although gender differential in use of mHealth has been studied in the rural area of Bangladesh, the standalone factors behind women’s acceptance and adoption of mHealth has not been found out. Our motivation behind the thesis work is to ascertain the possible factors that play role in this regard.

CHAPTER 4
THEORETICAL FRAMEWORK AND HYPOTHESIS

Our main aim is to find out which factors influence women of Bangladesh to adopt mHealth applications. UTAUT model is one of the most appreciated models to explain user intention for accepting a technology. So, according to our topic,we have developed a model that is based on UTAUT model, for showing the relationship between factors that influence the adoption of mHealth among women in Bangladesh. This model indicates which factors are directly affecting the intention to use mHealth among women which ultimately affects the actual use.

4.1 Why UTAUT is Chosen as Base Model?

In this paper [26], empirical comparison of 8 models were done which explained between 17% and 53% of the variance of user intentions in usage of information technology. A unified model, UTAUT was then formulated that gave results of 70% variance of user intentions. The UTAUT model has been chosen because UTAUT explains 70 % of the variance in intention which is much higher than the competing models like TAM (Technology Acceptance Model), TRA (Theory of Reasoned Action),TPB (Theory of Planned Behaviour), IDT (Innovation Diffusion Theory) etc [26]. UTAUT also combines core constructs from other models and so this model in more inclusive than other standalone models.

4.2 Basic Model and Hypothesis

The basic UTAUT model is in figure 4.1 In the base UTAUT, dependent variables are behavioural intention & perceived use. Independent variables are Performance Expectancy, Effort Expectancy, Social Influence & Facilitating Conditions. These variables affect the Behavioral intention of users which eventually affects the actual use. Moderating variables are gender, age, experience and voluntariness of use. These moderating factors affects the relationship between independent variables and factors.

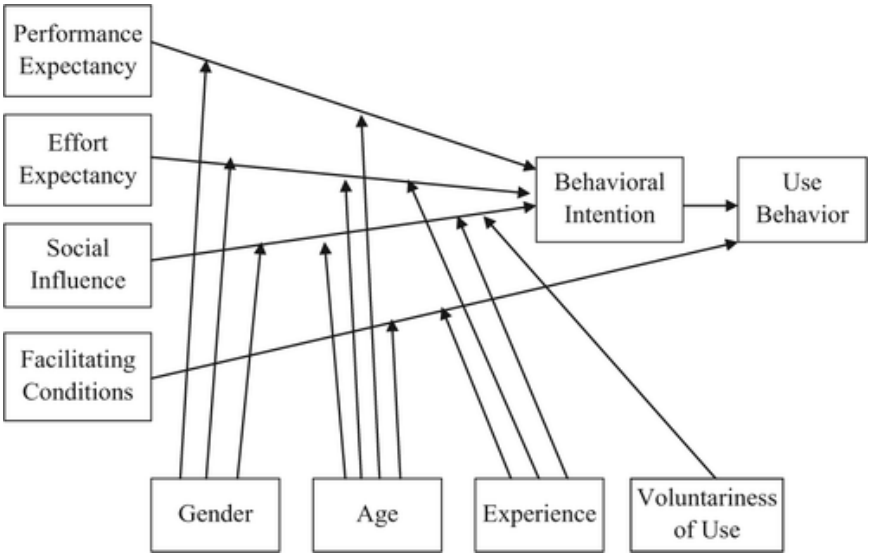

Figure 4.1: Unified Theory of Acceptance and Use of Technology

According to Venkatesh [26], these hypotheses are represented

Hl: The influence of performance expectancy on behavioral intention will be moderated by gender and age.

H2:The influence of effort expectancy on behavioral intention will be moderated by gender, age, and experience.

H3: The influence of social influence on behavioral intention will be moderated by gender, age, voluntariness, and experience.

H4a: Facilitating conditions will not have a significant influence on behavioral intention.

H4b: The influence of facilitating conditions on usage will be moderated by age and experience.

After analyzing the factors that can be beneficial for the adoption of mHealth among women in Bangladesh,a new model based on UTAUT is proposed in next section.

4.3 Proposed Model

So, using these hypothesis and variables,this study proposes a new model with having eleven constructs.These are Performance Expectancy(PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Condition (FC), Technology anxiety(TA), Habit(HB), Trust(TR), Personal innovativeness in IT (PIT), Privacy(P), Price Value(PV), Resistant towards change(R).

Figure 6.2 describes our proposed research model.
These constructs affects the behavioral intention and actual use of mHealth among women in Bangladesh. Our aim is to determine the relationship between these constructs and dependent variables to find out the most significant constructs that affect positively or negatively the intention of women to use mHealth.
So these are the proposed variables,

Dependent Variable : Behavioral Intention(BI), Use Behavior (UB).

Independent Variable :Performance Expectancy(PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Condition (FC),Technology anxiety(TA), Habit(HB), Trust(TR),Personal innovativeness in IT (PIT), Privacy(P), Price Value(PV), Resistant towards change(R)

Moderating Variable: Age, Education, Voluntariness of use, Experience.

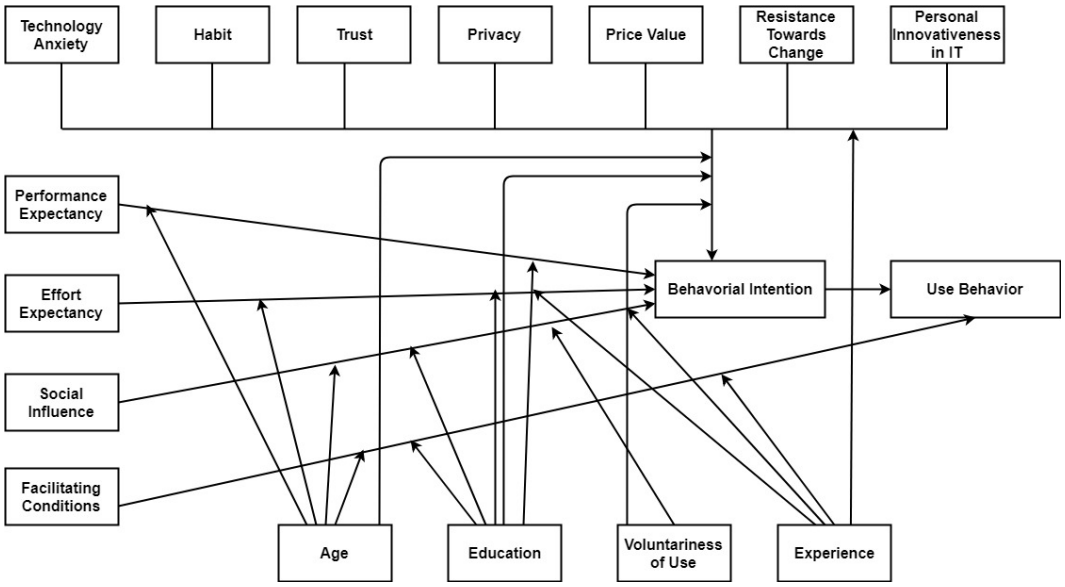

Figure 4.2: Proposed Research Model

4.4 Research Hypothesis

4.4.1 Performance Expectancy

Performance expectancy measures the level to which extend an individual believes that the system will help him to do his job [26]. It is a belief for the individual that using the system will be beneficial for him. It is a trust that the use of a particular technology will be advantageous or performance enhancing to the individual [48].
In Bangladesh, women will use mHealth system if they find it beneficial. So,to predict the adop-

tion of a new technology, performance expectancy will have positive effect. In this paper by Fred D. Davis [49] it is claimed that, if an application is perceived effective to a user, it is more likely to be accepted.
So,this hypothesis can be proclaimed,

H1: Performance Expectancy will have positive impact on women's intention to use mHealth.

4.4.2 Effort Expectancy

Effort Expectancy is the measure of ease associated with the system [26]. If a system is easy to use, Effort Expectancy positively influences the behavioural intention. It is a belief that the use of a particular new technology will be easy and effortless [48]. According to [26] Effort Expectancy affects in behavioral intention stronger for women. So, this hypothesis can be proclaimed,

H2: Effort Expectancy will have positive impact on women's intention to use mHealth.

4.4.3 Social Influence

Social Influence is the change of behavior of a particular person according to the behavioural intention of an influencer. According to Venkatesh et al. [26]. Social Influence related to three constructs: subjective norm (TRA, TAM2, TPB/IDTPB, and C-TAM-TPB), social factors (MPCU), and image (IDT). This paper also states that Social Influence affects strongly for women on behavioral intention. So, his hypothesis can be proclaimed.

H3: Social Influence will have positive influence on behavioral intention to use mHealth for women.

4.4.4 Facilitating condition

Facilitating conditions means degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. This concept consists of three differ-

ent constructs: perceived behavioral control (TPBI DTPB, C-TAM-TPB), facilitating conditions (MPCU), and compatibility (IDT). In the paper by Venkatesh et al [26], it has been proved that Facilitating condition is non significant for behavioral intention due to the effect of intention being captured by effort expectancy.But it affects strongly for use behavior. So, this hypothesis can be proclaimed.

H4: Facilitating condition will have positive influence on use behavior of women for using mHealth.

4.4.5 Behavioral Intention

Behavioral intention (BI) is defined as a person's perceived likelihood or "subjective probability that he or she will engage in a given behavior" [50]. In theory of planned behavior [27], one of the central factors included behavioral intention. Intentions are what motivates a person for a specific behavior. The performance of an action is more likely to happen if the intention of engaging in that behaviour is strengthened. It directly affects the actual use or use behavior [26].
H5: Behavioral intention has a positive impact on the actual use of mHealth.

4.4.6 Technology Anxiety

In the work by Yang et al. [51] it is proved that the technology aspect of facilitating conditions is an important factor to motivate consumers to adopt mobile shopping. So, this can be effective for women in Bangladesh too. So, this hypothesis can be proclaimed.

H6: Technology Anxiety will have negative impact on the women's intention to use mHealth.

4.4.7 Habit

Habit is considered as one of the primary factor of behaviour in the modified UTAUT and has direct effect on the acceptance or use of specific technology or services [52]. Integration of Habit in the model will have positive effect since habit is one of the key factors that drive a person's behavior [53]. In order to determine the broader environmental factors that might have had direct influence on the individual's acceptance of a technology change, habit has been explored [54].

H7: Habit will have positive impact on behavioral intention to use mHealth for women.

4.4.8 Trust

Trust is a major issue when it comes to mHealth. Consumers will need to have full trust on the system in order for them to use the service. If they don't trust the services to provide correct information or to keep the vital information safe then they will not use the services. In a meta-analysis of impact of trust on technology acceptance model,trust was considered to be an important factor that influences the user's behavior [55].

H8: Lacking of trust will have negative impact on behavioral intention to use mHealth for women.

4.4.9 Personal Innovativeness in IT

Personal innovativeness is defined as the degree to which an individual is relatively earlier in adopting new ideas [56]. It helps the identification of interested individuals who are likely to adopt information technology innovations in earlier stage than others which further explains the role of individual traits in technology adoption [57].

Personal Innovativeness in IT has been introduced in aim of achieving a better prediction of intention to use mHealth in context of our country [32].

H9: Personal Innovativeness in IT will have positive impact on the women's intention to use mHealth.

4.4.10 Privacy

Privacy is one of the factors that are usually explored in systems like banks where the customers need to be assured of their privacy first in order for them to give away their account information [58]. But, apart from personal financial information, personal health information are also a form of private information. Most people are not willing to disclose their medical information to

just anyone, which makes privacy a concern for people in case of adopting mHealth. If no confidentiality is maintained and security protocols are not applied then people's fear of losing their private information will increase. This is why confidentiality or privacy is a significant concern for consumers [59].

H10: Privacy will have negative impact on the women's intention to use mHealth. .

4.4.11 Price Value

The inclusion of price value is significant since it will affect the adoption decision of an individual [60] . The price value construct originated from the perceived value, which often works as an important indicator of predicting the purchase behavior [61]. If mHealth services are heavily priced then it can be assumed that people are going to steer clear of these services. However, many of these services are free of cost(mobile applications) and other subscription services have little cost attached to them. So, the impact of the price on the adoption is to be tested out in the research.

H11: Lesser Price Value will have positive impact on the women's intention to use mHealth.

4.4.12 Resistance to Change

Resistance to change threatens any new venture. Resistance to change means when an individual does not want to change the way they are performing an activity now.Resistance affects the speed at which an individual adopts an innovation. It is stated that Resistance to change reduces the adoption intention of technology [62]. In the context of Bangladesh, Hoque et al. [63], has proved that resistance to change causes a negative impact on mHealth adoption for the elderly people in Bangladesh.As our aim is to find out the factors that affecting adoption of mHealth for women of all age,this hypothesis can be proclaimed.

H12: Resistant to Change will have negative impact on the women's intention to use mHealth.

4.4.13 Moderating factors

Moderating factors affect the strength of the relationship that exists between a dependent and independent variable [64]. Variables such as age, sex, education helps to explore the inclination of various socio-demographic groups towards using e-Health applications along with their intention of usage [65]. Venkatesh et. al [26] argued that ”it is clear that the extensions (moderators) to the various models identified in previous research mostly enhance the predictive validity of the various models beyond the original specification. This was later empirically validated by Chin et al. [66] The moderating variables proposed in our research is explained below along with the corresponding hypotheses.

Age

Age is kept as a moderating factor since younger people are more prone towards using technology than older people. Research on job related attitudes suggested that younger workers place more importance on extrinsic rewards [67]. Venkatesh et al. [26] stated that increased age has been shown to be associated with difficulty in processing complex stimuli and allocating attention to information on the job.

H1a: Age moderates the relationship between PE & BI to use mHealth services among women in Bangladesh.

H2a: Age moderates the relationship between EE & BI to use mHealth services among women in Bangladesh.

H3a: Age moderates the relationship between SI & BI to use mHealth services among women in Bangladesh.

H4a: Age moderates the relationship between FC & UB to use mHealth services among women in Bangladesh.

H5a: Age moderates the relationship between technology anxiety & BI to use mHealth services among women in Bangladesh.

H6a: Age moderates the relationship between Habit & BI to use mHealth services among women in Bangladesh.

H7a: Age moderates the relationship between Trust & BI to use mHealth services among women in Bangladesh.

H8a: Age moderates the relationship between personal innovativeness in IT & BI to use mHealth services among women in Bangladesh.

H9a: Age moderates the relationship between privacy & BI to use mHealth services among women in Bangladesh.

H10a: Age moderates the relationship between price value & BI to use mHealth services among women in Bangladesh.

H11a: Age moderates the relationship between Resistance towards change & BI to use mHealth services among women in Bangladesh.

Education

The level of education may directly correlate with the users ability to adopt a specific technology. Absence of technological literacy will directly affect their usage of the specific technology. Although technological literacy and academic education are not necessarily related directly, they might have significant influence in adoption of technology for which it has been kept as a moderating factor.

H1b: Education moderates the relationship between PE & BI to use mHealth services among women in Bangladesh.

H2b: Education moderates the relationship between EE & BI to use mHealth services among women in Bangladesh.

H3b: Education moderates the relationship between SI & BI to use mHealth services among women in Bangladesh.

H4b: Education moderates the relationship between FC & UB to use mHealth services among women in Bangladesh.

H5b: Education moderates the relationship between technology anxiety & BI to use mHealth services among women in Bangladesh.

H6b: Education moderates the relationship between Habit & BI to use mHealth services among women in Bangladesh.

H7b: Education moderates the relationship between Trust & BI to use mHealth services among women in Bangladesh.

H8b: Education moderates the relationship between personal innovativeness in IT & BI to use mHealth services among women in Bangladesh.

H9b: Education moderates the relationship between privacy & BI to use mHealth services among women in Bangladesh.

H10b: Education moderates the relationship between price value & BI to use mHealth services among women in Bangladesh.

H11b: Education moderates the relationship between Resistance towards change & BI to use mHealth services among women in Bangladesh.

Voluntariness of use

It was described as the degree to which use of the innovation is perceived as being voluntary or of free will [68]. It is the situation in which the user will accept technology voluntarily without having any obligation to choose the technology in consideration [69]. Since social influence is the degree to which a person believes if he or she should use a system or technology, voluntariness of use is closely related to it, because this will be the ultimate deciding factor if one will be more likely to adopt a new technology or not.

H1c: Voluntariness of use moderates the relationship between SI & BI to use mHealth services among women in Bangladesh.

H2c: Voluntariness of use moderates the relationship between technology anxiety & BI to use mHealth services among women in Bangladesh.

H3c: Voluntariness of use moderates the relationship between Habit & BI to use mHealth services among women in Bangladesh.

H4c: Voluntariness of use moderates the relationship between Trust & BI to use mHealth services among women in Bangladesh.

H5c: Voluntariness of use moderates the relationship between personal innovativeness in IT

& BI to use mHealth services among women in Bangladesh.

H6c: Voluntariness of use moderates the relationship between privacy & BI to use mHealth services among women in Bangladesh.

H7c: Voluntariness of use moderates the relationship between price value & BI to use mHealth services among women in Bangladesh.

H8c: Voluntariness of use moderates the relationship between Resistance towards change & BI to use mHealth services among women in Bangladesh.

Experience

Experience is the knowledge required along with having practical involvement in using the technology. Before a user tries to use a specific technology, one of the concerns will be the prior experience of usage of similar technology. It is stated by Venkatesh et al. [26] that increasing experience provides a more instrumental(rather than social) basis for individual intention to use the system.

H1d :Experience moderates the relationship between EE & BI to use mHealth services among women in Bangladesh.

H2d :Experience moderates the relationship between SI & BI to use mHealth services among women in Bangladesh.

H3d :Experience moderates the relationship between FC & UB to use mHealth services among women in Bangladesh.

H4d :Experience moderates the relationship between technology anxiety & BI to use mHealth services among women in Bangladesh.

H5d: Experience moderates the relationship between Habit & BI to use mHealth services among women in Bangladesh.

H6d:Experience moderates the relationship between Trust & BI to use mHealth services among women in Bangladesh.

H7d: Experience moderates the relationship between personal innovativeness in IT & BI to use mHealth services among women in Bangladesh.

H8d: Experience moderates the relationship between privacy & BI to use mHealth services among women in Bangladesh.

H9d: Experience moderates the relationship between price value & BI to use mHealth services among women in Bangladesh.

H10d: Experience moderates the relationship between Resistance towards change & BI to use mHealth services among women in Bangladesh.

CHAPTER 5
METHODOLOGY

5.1 Design of Measures

In Table 5.1 all measures are shown for latent constructs presented in the proposed model on the mHealth context in Bangladesh.

Constructs	**Items**	**Ref**
Performance Expectancy (PE)	PE1: I believe m-health application will be useful for me.	[49]
	PE2:I think using m-health services will increase my productivity.	[49]
	PE3: If I use m-health services then it will help me have better health.	[70]
Effort Expectancy (EE)	EE1: Ease of Use of m-health services is a factor that I would consider before adopting mHealth.	[59]
	EE2: My interaction with the system would be clear and understandable.	[49]
	EE3: Learning to operate the system is easy for me (EU).	[68]
Social Influence (SI)	SI1: People who are important to me think that I should use mHealth services.	[27]
	SI2: People who influence my behavior think that I should use mHealth service.	[71]
	SI3: I am more likely to use mHealth services if it is promoted by government.	Brain Storming
Facilitating conditions (FC)	FC1:I have the necessary resources to use mHealth services.	[53]

	FC2:I have the knowledge necessary to use mHealth services.	[53]
	FC3:IT person should be available for assistance if I find difficulties using mHealth application.	[53]
	FC4:mHealth services should have offline functionality in absence of internet connection.	[53]
	FC5: Content of mHealth service in local language is a factor that I would consider before adopting mHealth.	Brain storming
Behavioral Intention (BI)	BI1: I predict I would use mHealth services in future.	[72]
	BI2: I predict I would use mHealth services frequently.	[72]
	BI3: I plan to use mhealh services in my daily life.	[72]
Use Behavior (UB)	UB1:mHealth service is a pleasant experience.	[53]
	UB2:I use mHealth services currently.	[53]
	UB3: I spend a lot of time using mHealth service.	[53]
Technology anxiety (TA)	TA1: I feel nervous while using mHealth applications.	[51]
	TA2: Using mHealth services may make me feel uneasy and confused.	[51]
	TA3: Using mHealth services makes me worried.	[51]
	TA4: I feel that I might lose a lot of vital information using mHealth applications.	[51]
Habit	HB1:the use mHealth service has become a habit for me.	[53]
	HB2: I am addicted to using mHealth services.	[53]
	HB3: I must use mHealth services.	[53]
Trust	TR1:I would use the system if I have enough authority over my data.	[73]
	TR2: I feel I will be tracked by mHealth applications.	Brain storming
Personal innovativeness in IT (PIT)	PIT1: If I heard about a new information technology I would look for ways to experiment with it.	[57]

	PIT2: Among my peers, I am usually the first to try out new Information Technology.	[57]
	PIT3: In general I am not hesitant to try out new information technologies.	[74]
Privacy	P1: confidentiality of information that I sent via mobile device is a factor that I consider before adopting mHealth.	[59]
Price Value	PV1: I think mHealth service is reasonably priced.	[53]
	PV2: Mobile health service is a good value for the money.	[53]
	PV3: At the current price mobile health service provides a good value.	[53]
Resistant towards change	R1: I dont want the mHealth services to change the way I deal with health relevant problems.	[75]
	R2 : I dont want the mHealth services to change the way I keep myself healthy.	[75]

Table 5.1: Survey Measures

5.2 Questionnaires Quantification

Questions for survey is designed according to the measures of the value of Table 5.1. In the proposed research model, a 5-point Likert scale has been used where 1 is used to quantify ”strongly disagree” and 5 has been used to quantify ”strongly agree”.

5.3 Data Collection

The next course of action comprised of collection of data from women of different backgrounds by conducting a survey. Google Forms- an online survey tool was used for this purpose. The survey form was distributed among the respondents through internet and some of them were done through personal interaction with the respondents in a hospital and a university. Our aim was to collect data from about 500 women.

5.4 Sample Size Estimation

While doing path modeling in PLS-SEM approach, there are some guidelines which should be followed to determine the sample size. Determining the appropriate sample is our first concern. Depending on the confidence level and margin of error the number of sample size will vary. Having knowledge about two terms i.e population size and margin of error is necessary to understand the sample size. Population size is the size of the targeted group of the survey. And for this study the targeted group is women. The population size for this study which is population the population of women is around 82,844,337 [76]. Margin of error can be defined as the positive or negative deviation that can be allowed on the survey result of the sample. It can also be seen as the difference of the opinions between the respondents and the entire population. At a given confidence level, the lesser the margin of error is taken, the closer we are to reaching the exact result [77].

	Confidence level = 95%			**Confidence level = 99%**		
	Margin of error			Margin of error		
Population size	5%	2,5%	1%	5%	2,5%	1%
100	80	94	99	87	96	99
500	217	377	475	285	421	485
1.000	278	606	906	399	727	943
10.000	370	1.332	4.899	622	2.098	6.239
100.000	383	1.513	8.762	659	2.585	14.227
500.000	384	1.532	9.423	663	2.640	16.055
1.000.000	384	1.534	9.512	663	2.647	16.317

Figure 5.1: Sample Size Estimation

For this study authors have chosen the confidence level of 95 percent and margin of error of 5 percent and the population size of 82,844,337. Thus this results in having sample size around approx 400.

CHAPTER 6
TEST AND ANALYSIS

6.1 Characteristics of Sample Data

The total number of respondents for the survey are 491. Basing on our moderating variables, which are age, experience, voluntariness of use, education, there are various sub-groups of the sample population. The distribution of the sample population based these moderating variables are skewed since the distribution among various age groups and educational backgrounds were not uniform.

6.1.1 Age

From all the women who were surveyed upon, 81% fall in the category of 15-24 years range, 15.4% in the 25-34 years range, 1.2% in the 35-44 years range, 1.6% in the 45-54 years range, 0.8% in the above 55 years category.

6.1.2 Education

The categories kept for education were SSC,HSC, Bachelor, Masters and Above Masters and the percentages among these groups from the respondents were 1.22%, 9.39%, 79.80%, 8.98% and 0.82% respectively.

6.1.3 Experience

78% of the respondents said that they had no prior experience in using m-health services and the rest 22% had previous experience of using m-health services.

6.1.4 Voluntariness of Use

The voluntariness of use was measured by measuring the interest with the help of a yes or no question. 89.6% of them showed interest in using m-health services, whereas 13.1% showed lack of interest in using m-health services.

6.2 Data Analysis Approach

SmartPlS 3 has been used to analyze the data for this study. It is one of the most well known softwares for PLS-SEM modeling.

6.2.1 Structure equation modeling

It is a data analysis method which is globally used to visualize the relationship among the variables. It consists of two sub models: inner model and outer model. Inner model can also be specified as structural model whereas outer model can be specified as measurement model. Outer model can be designated for showing the relationship between the latent variables and their respective indicators. On the contrary inner model signifies the relationship between independent and dependent latent variables.

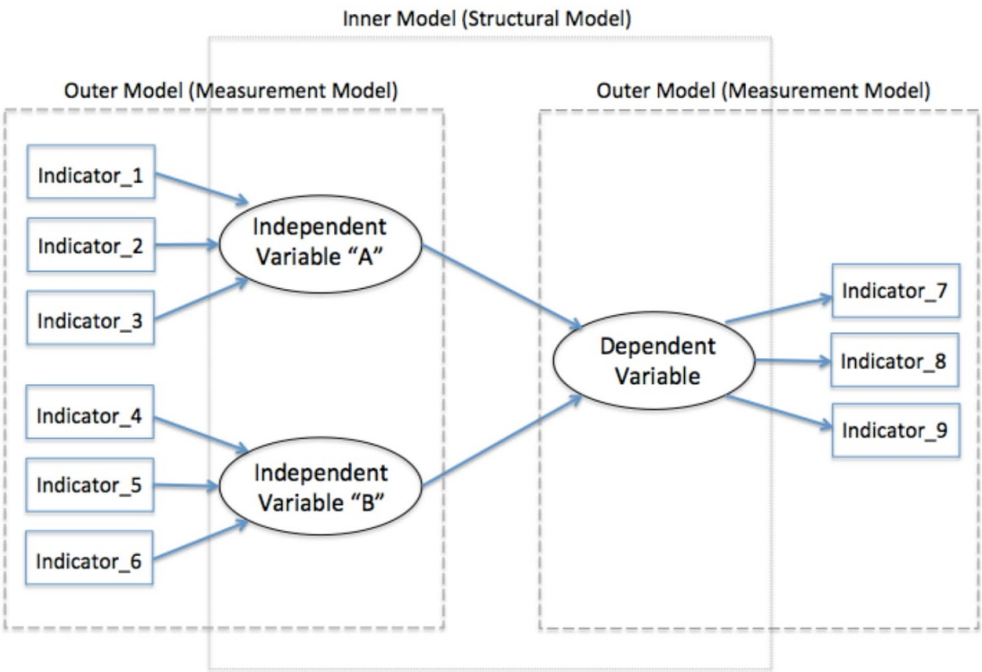

Figure 6.1: Inner vs Outer model

There are two approaches in SEM. They are covariance-based SEM(CB-SEM) and Partial Least square(PLS). The approach which should be performed is decided basing on the goal of the research. CB-SEM is usually undertaken when we need to go for theory testing, theory conformation or comparison. On the contrary, if constructs need to be predicted then PLS-SEM approach can be prioritized [78]. PlS-SEM should be considered if there is no proper assumption on data distribution [79]. According to the book by Joseph F. Hair Jr. et al. [80], if the structural model is complex (which means there are too many indicators and constructs), small sample size and data is not normally distributed, PLS-SEM should be considered. As the characteristics of this study goes with the second case, the analysis is conducted using the PLS-SEM approach.

6.2.2 PLS-SEM Algorithm

According to [81] the basic PLS algorithm includes the following three stages:
Stage 1: Iterative estimation of latent variable scores consists of a 4-steps iterative procedure and it is repeated till convergence has been obtained (or the maximum number of iterations has been reached):
(1) outer approximation of the latent variable (2) estimation of the inner weights (3) inner approximation of the latent variable (4) estimation of the outer weights.
Stage 2: Estimation of outer weights or loading and path coefficients.
Stage 3: Estimation of location parameters.
Hair et al. [82] and Henseler et al. [83] explained how the basic PLS algorithm operates after implementing it in SmartPLS 3.0 [84].

6.2.3 PLS Algorithm Setting

- **Weighting Scheme** means assigning weights to inner model path coefficient. It can be of three types such as centroid, factor and path. Choosing any of these scheme results in approximately same value [85]. Path weighting is the recommended approach for weighting scheme.It provides the highest R^2 value for reflective latent variables and is generally applicable for all kinds of PLS path model specifications and estimations. [81]

- **Maximum Iteration** represents the maximum number of iteration needed for determining the PLS algorithm result. It is set at 300 by default to reach the convergence of the solution.

- **Stop Criterion** stops the PLS algorithm when the change in the outer weights between two consecutive iteration is smaller then 1×10^{-7}(by default).

6.2.4 Model Build and Factor Analysis

A model has been built for analyzing the data using PLS approach.This model has both structural and measurement part. Structural part specifies the relationship among latent variables which ultimately validates the proposed hypothesis. Measurement part states which indicators are effective for each latent variables.

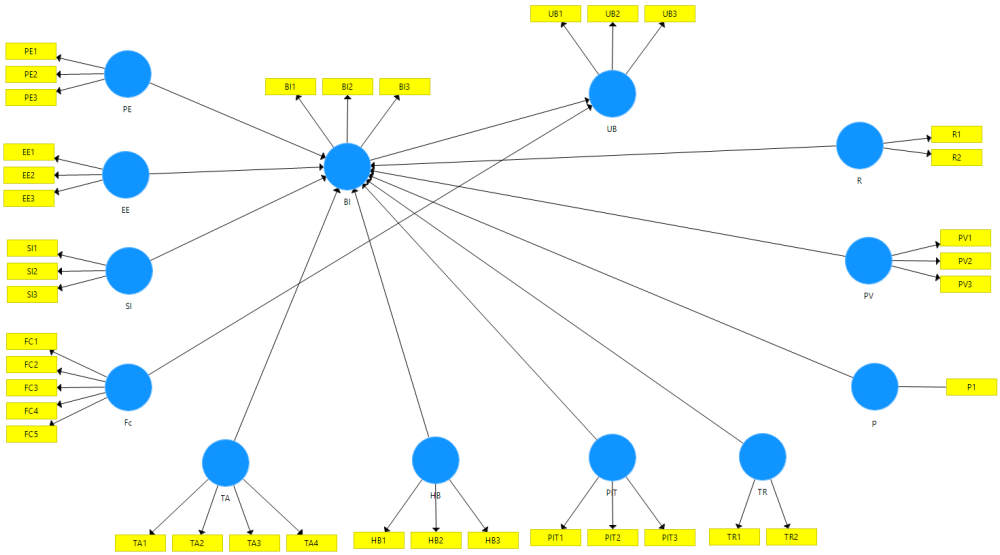

Figure 6.2: Model Creation

6.3 Measurement Model

Confirmatory Factor Analysis (CFA) method is used to evaluate measurement model. This method is used to get value from several factors that affect data and specify whether the data itself is appropriate to do next analysis. The measurement model is evaluated using outer loadings, convergent validity, construct reliability and validity, and discriminant validity.

Outer Loading

An indicator is considered to be reliable if its outer loading is greater than 0.70 [86].If an item has outer loading less than 0.7, it should be eliminated from model for further analysis because it's not significant enough.

From the analysis of Outer Loading of each constructs, EE2 has the value of 0.5,which is less than 0.7. All the constructs of FC have outer loading less than 0.7, that means FC is not significant for our proposed model. SI3,TA2,TA3,TR2 are also not significant constructs for their corresponding independent variables. Among these, TA2 has the lowest loading 0.3,so this can be eliminated from TA variable for better result.

Convergent and Discriminant Validity

Convergent and discriminant validity both are sub types of construct validity. Construct validity means that a test which is outlined to see that a particular construct is actually measuring that construct or not. Only convergent validity or only discriminant validity alone is not enough for

	BI	EE	FC	HB	P	PE	PIT	PV	R	SI	TA	TR	UB
BI1	.742												
BI2	.836												
BI3	.857												
EE1		.709											
EE2		.516											
EE3		.838											
FC1			.616										
FC2			.616										
FC3			.558										
FC4			.449										
FC5			.551										
HB1				.791									
HB2				.794									
HB3				.804									
P					1								
PE1						.812							
PE2						.768							
PE3						.827							
PIT1							.828						
PIT2							.718						
PIT3							.75						
PV1								.81					
PV2								.847					
PV3								.867					
R1									.876				
R2									.947				
SI1										.875			
SI2										.884			
SI3										.558			
TA1											.794		
TA2											.378		
TA3											.548		
TA4											.772		
TR1												.948	
TR2												.476	
UB1													.762
UB2													.808
UB3													.759

Table 6.1: Outer Loading

establishing construct validity. The convergent validity is evaluated through the average variance extracted(AVE), which needs to exceed a standard minimum level. of 0.5.The reliability of the constructs is measured with composite reliability and Cronbachs alpha.In general,the minimum value of composite reliability is 0.7, and the minimum value of Cronbachs alpha is 0.6 [87]. The values marked as green are reliable constructs, according to convergent validity analysis.

	Cronbachs Alpha	**Composite Reliability**	**Average Variance Extracted**
BI	0.7439	0.8536	0.6611
EE	0.524	0.7359	0.4906
FC	0.4865	0.6945	0.3152
HB	0.7306	0.8388	0.6343
P	1.0000	1.0000	1.0000
PE	0.7244	0.8445	0.6444
PIT	0.6511	0.8101	0.5879
PV	0.7942	0.8793	0.7085
R	0.8053	0.908	0.8318
SI	0.6805	0.8248	0.6198
TA	0.8252	0.7272	0.4174
TR	0.2933	0.6988	0.5628
UB	0.6785	0.8199	0.603

Table 6.2: Construct Reliability and Validity

The discriminant validity is examined by using the square root of AVE and latent variable correlations. The square root of the AVE of each latent variable should exceed the correlation shared between one latent variable and other latent variable in the model [88].

6.4 Hypothesis Testing

Hypothesis testing is done in SmartPLS using Bootstrapping. This process is often used when sample data cannot be assumed to be normal. SmartPLS generates T-statistics for significance testing of both the inner and outer model using bootstrapping. In T testing, significant difference is measured between population means,called 2-sample t or between the population mean and a hypothesized value, called 1-sample T can be found.The T-value measures the size of the difference relative to the variation in sample data with a significance level of 5%, the path coefficient

	BI	EE	FC	HB	P	PE	PIT	PV	R	SI	TA	TR	UB
BI	.813												
EE	.312	.700											
FC	.327	.389	.561										
HB	.515	.198	.237	.796									
P	.257	.160	.28	.206	1								
PE	.483	.414	.295	.332	.144	.802							
PIT	.435	.326	.326	.322	.398	.233	.767						
PV	.457	.241	.350	.373	.310	.347	.360	.842					
R	.080	.050	.123	.102	.163	-.017	.155	.214	.912				
SI	.501	.289	.361	.411	.170	.406	.277	.412	.140	.787			
TA	.119	.066	.130	.220	.081	.010	.061	.111	.119	.134	.646		
TR	.329	.171	.280	.292	.389	.215	.360	.281	.125	.226	.241	.750	
UB	.479	.194	.281	.641	.174	.244	.311	.370	.227	.366	.201	.185	.777

Table 6.3: Discriminant Validity

will be significant if the T-statistics is larger than 1.96 [89]. P values is determined in PLS-SEM as a basis for hypothesis testing. P value specifies probability level. In traditional significance tests,probability level of 0.05 means out of 20, there is one chance that a stronger result will occur due to the chance of taking another random sample from population.So, in 95% confidence level, path coefficients which will have T value greater than 1.96 and P value less than 0.05, will be accepted or failed to reject.

6.5 Structural Model

The structural model is used to validate the hypotheses by using path coefficients.Path coefficients are another version of linear regression weights which is used in determining the possible causal linkage between statistical variables in the SEM approach [90].
Table 6.4 represents the result of Structural Model.

	Original Sample	**Sample Mean**	**Standard Deviation**	**T Statistics**	**P Values**
BI->UB	0.4333	0.4278	0.0336	12.9037	0.0000
EE->BI	0.0188	0.0249	0.0428	0.4402	0.6599
FC->UB	0.139	0.1523	0.0385	3.6112	0.0003
HB->BI	0.2359	0.237	0.0406	5.8066	0.0000
P->BI	0.0093	0.0113	0.0393	0.2354	0.8139
PE->BI	0.214	0.2115	0.0431	4.9668	0.0000
PIT->BI	0.1805	0.172	0.0442	4.0796	0.0000

PV->BI	0.1309	0.1264	0.0395	3.3152	0.0009
R->BI	-0.0344	-0.0277	0.0401	0.859	0.3906
SI->BI	0.196	0.1975	0.0448	4.3719	0.0000
TA->BI	0.0001	-0.0182	0.0541	0.001	0.9992
TR->BI	0.0646	0.0693	0.0412	1.5684	0.1171

Table 6.4: Result of Structural Model

6.6 Hypothesis Testing Results

Hypothesis 1:The path coefficient between performance expectancy and behavioral intention is 0.214, T value is4.9668>1.96 & p< 0.05. Since the T statistics and P value maintain their required criterion respectively, the hypothesis **H1** is proved to be **true**.
Hypothesis 2:The path coefficient between effort expectancy and behavioral intention is 0.0188, T value is 0.4402<1.96 & p> 0.05. Since the T statistics and P value don't maintain their required criterion respectively, the hypothesis **H2** is proved to be **false**.
Hypothesis 3:The path coefficient between Social Influence and behavioral intention is 0.196, T value is 4.3719>1.96 & p< 0.05. Since the T statistics and P value maintain their required criterion respectively, the hypothesis **H3** is proved to be **true**.
Hypothesis 4:The path coefficient between Facilitating Condition and Use Behaviour is 0.139, T value is 3.6112>1.96 & p< 0.05. Since the T statistics and P value maintain their required criterion respectively, the hypothesis **H4** is proved to be **true**.
Hypothesis 5:The path coefficient between Behavioral Intention. and Use Behaviour is 0.4333, T value is 12.9037>1.96 & p< 0.05. Since, the T statistics and P value maintain their required criterion respectively, the hypothesis **H5** is proved to be **true**.
Hypothesis 6:The path coefficient between Technology Anxiety and behavioral intention is 0.0001, T value is 0.001<1.96 & p> 0.05. Since the T statistics and P value don't maintain their required criterion respectively, the hypothesis **H6** is proved to be **false**.
Hypothesis 7:The path coefficient between Habit and behavioral intention is 0.2359, T value is 5.8066>1.96 & p< 0.05. Since the T statistics and P value maintain their required criterion respectively, the hypothesis **H7** is proved to be **true**.
Hypothesis 8:The path coefficient between Trust and behavioral intention is 0.0646, T value is 1.5684<1.96 & p> 0.05. Since the T statistics and P value don't maintain their required criterion respectively, the hypothesis **H8** is proved to be **false**.
Hypothesis 9:The path coefficient between Personal Innovativeness in IT and behavioral intention is 0.1805, T value is 4.0796>1.96 & p< 0.05. Since the T statistics and P value maintain

their required criterion respectively, the hypothesis **H9** is proved to be **true**.
Hypothesis 10:The path coefficient between Privacy and behavioral intention is 0.0093, T value is 0.2354<1.96 & p> 0.05. Since the T statistics and P value maintain their required criterion respectively, the hypothesis **H10** is proved to be **false**.
Hypothesis 11:The path coefficient between Price Value and behavioral intention is 0.1309, T value is 3.3152>1.96 & p< 0.05.Since,the T statistics and P value maintain their required criterion respectively, the hypothesis **H11** is proved to be **true**.
Hypothesis 12:The path coefficient between Resistance to Change and behavioral intention is -0.0344, T value is 0.859<1.96 & p> 0.05. Since the T statistics and P value don't maintain their required criterion, the hypothesis **H12** is proved to be **false**.

So for the further analysis of moderating variable EE, P , R, TA, TR are eliminated from the proposed model in context of mHealth adoption among women in Bangladesh.

6.6.1 Moderating Variable Analysis

If the relationship between two variables depends on another third variable, that third variable is called moderating variable. Moderating variable changes the strength of relationship between two variables. As already described there are four moderating variable added to the model which are age, education, voluntariness of use and experience. Now these variables have their own effect on the relation between other latent variables.

Age

Age has been categorized into five groups. But two of categories are more significant which are 15-24 and 25-34 (81% and 15.4% respectively). As the number of respondents of other groups are very low, so we did not take them under consideration. So two groups are formed using Multi-Group Analysis in SmartPLS. Group 1 contains participants whose age are (15-24) and Group 2 contains all other participants except Group 1. Table 6.5 shows the result of moderation for Age.

	Path co-efficient mean (15-24)	**Path co-efficient Mean (25-35)**	**P Values (15-24)**	**P Values (25-35)**
BI->UB	0.417	0.482	0.0000	0.0000
FC->UB	0.144	0.239	0.006	0.008
HB->BI	0.234	0.293	0.000	0.001
PE->BI	0.200	0.253	0.000	0.006

PIT->BI	0.167	0.235	0.0000	0.002
PV->BI	0.121	0.132	0.007	0.165
SI->BI	0.241	0.174	0.000	0.075

Table 6.5: Result of MGA analysis for age group

The path coefficient mean for both of the groups is not significant as both values are almost same. So both of the groups have almost the same effect on the relations between the latent variable. But, the p value for the age group of 25-35 is not less than 0.05 which is the required criterion for the moderating factor to be accepted. Therefore the affect of this group on the relation between PV and BI, SI and BI is not significant.

Experience

Experience is categorized into two groups.78% of sample population had no prior experience of using mHealth and 22% had experience. Table 6.6 shows result of moderation analysis of experience.

	Path co-efficient mean (exp No)	**Path co-efficient Mean (exp Yes)**	**P Values (exp No)**	**P Values (exp Yes)**
BI->UB	0.417	0.440	0.0000	0.0000
FC->UB	0.167	0.211	0.001	0.357
HB->BI	0.204	0.377	0.000	0.000
PIT->BI	0.221	0.097	0.0000	0.442
PV->BI	0.150	0.089	0.002	0.379
SI->BI	0.181	0.270	0.000	0.004

Table 6.6: Result of MGA analysis for experience

From the analysis,it is found that, experience moderates the relationships of FC->UB, PIT->BI, PV->BI more significantly for people having no prior experience.

Voluntariness of Use

Among the sample data,89.6% were interested to use mHealth in future and 13.1% showed lack of showed lack of interest. Table 6.7 shows the result for moderation of Voluntariness of Use.

	Path co-efficient mean (VU No)	**Path co-efficient Mean (VU Yes)**	**P Values (VU No)**	**P Values (VU Yes)**
HB->BI	0.413	0.248	0.511	0.000
PIT->BI	0.066	0.192	0.606	0.0000
PV->BI	0.208	0.125	0.05	0.006
SI->BI	0.178	0.211	0.174	0.000

Table 6.7: Result of MGA analysis for Voluntariness of Use

So, voluntariness of use moderates the relationships of HB->BI, PIT->BI, SI->BI more significantly for people who are interested to use mHealth in future.

Education

SSC, HSC, Bachelor, Masters and Above Masters were the categories for education in our survey. Among these categories, HSC(9.39%), Bachelor(79.80%) and Masters(8.98%) had the higher amount of participants. Table 6.8 shows the effect of education between the relation of variables.

	Path co-efficient mean (Bachelor)	**Path co-efficient Mean (HSC)**	**Path co-efficient Mean (Masters)**	**P Values (Bachelor)**	**P Values (HSC)**	**P Values (Masters)**
FC->UB	0.194	0.197	.0170	0.000	0.245	0.737
HB->BI	0.203	0.415	0.428	0.000	0.000	0.009
PE->BI	0.235	0.132	0.353	0.000	0.393	0..036
PIT->BI	0.186	0.130	0.240	0.0000	0.346	0.008
PV->BI	0.132	0.057	-.050	0..005	0.664	0.778
SI->BI	0.208	0.373	0.222	0.000	0.002	0.392

Table 6.8: Result of MGA analysis for Education

So, it can proclaimed from the analysis that,education effects significantly all the relations of the model and has high significance for Bachelor.

6.7 Summary of Findings

To conclude, all of the findings and hypothesis is shown in the table 6.9 as a summary.

Hypothesis Number	**Dependent Variables**	**Independent Variables**	**Moderators**	**Result**
H1	Behavioral Intention	Performance Expectancy	Age, Education	Accepted
H2	Behavioral Intention	Effort Expectancy		Not Accepted
H3	Behavioral Intention	Social Influence	Age, Education, Voluntariness of Use, Experience	Accepted
H4	Use Behavior	Facilitating Conditions	Age, Experience	Accepted
H5	Use Behavior	Behavioral Intention		Accepted
H6	Behavioral Intention	Technology Anxiety		Not Accepted
H7	Behavioral Intention	Habit	Age, Education, Voluntariness of Use, Experience	Accepted
H8	Behavioral Intention	Trust		Not Accepted
H9	Behavioral Intention	Personal Innovativeness in IT	Age, Education, Voluntariness of Use, Experience	Accepted
H10	Behavioral Intention	Privacy		Not Accepted
H11	Behavioral Intention	Price Value	Age,Education, Voluntariness of Use, Experience	Accepted
H12	Behavioral Intention	Resistant to Change		Not Accepted

Table 6.9: Summary of Findings

6.7.1 Final Model

After analyzing all the findings and results, the ultimate modified model is given below as fig 6.3 that the author can decide on.

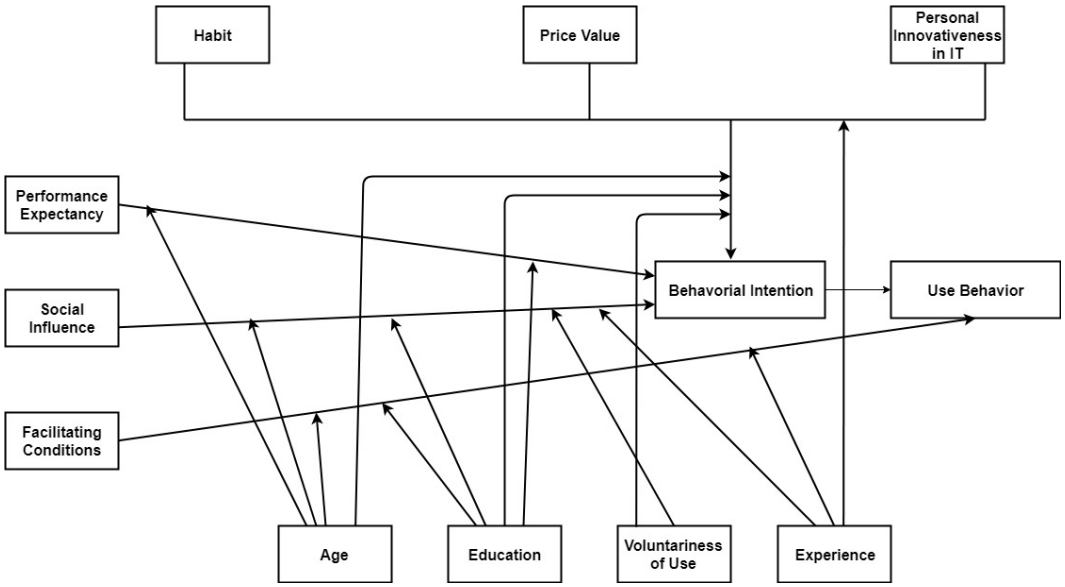

Figure 6.3: Final Model

CHAPTER 7
CONCLUSION

7.1 Conclusion

Introduction

The first chapter starts with describing what mHealth is, its classification and the advantages that come along with it. In the beginning it has been explained that mHealth is any kind of health service that can be provided with the help of any mobile device. mHealth services can be of various types. It can be normal health information, it can a reminder based service or it can be a support group.The main aim of mHealth service is to help people to improve their health in various ways. Some of the advantages of mHealth includes qualities like omnipresence, improved access to health information, maintaining medication, faster primary care and appointment system. The chapter then proceeds with why mHealth is specifically important for women. It goes on to describe various conditions like pregnancy and menstruation brings about many changes in women that call for medical help. These are the various aspects where mHealth can prove to be helpful for women and help them to deal with their well-being more effectively. The chapter then discusses about mobile phone subscription of Bangladesh as our work is based on mobile phone users. There are about 85 million mobile phone users are in Bangladesh and almost half of them are women. State of mHealth in Bangladesh is not very good.Bangladesh is identified as a country with shortage in health-care workforce. Then Government Non-Government initiatives are discussed to improve the infrastructure of mHealth. Currently, health service through mobile phone, tele-medicine service, pregnancy care advice through sms are made available by Government. Till March 2012, private initiatives that were taken by some organizations include MedinovaTelemedicine, eClinic24, Grameen Phone, Teletalk, AMCARE by TRCL, MJiVita by JSPH CRP, MAMA by DNet, BRAC mhealth. Then mobile health applications made for Bangladesh are discussed. The chapter ends with a brief explanation of the motivation behind the research work, which is, inspite of the various facilities that mHealth brings, women are still reluctant in adopting it for their betterment. At last approach towards research work was mentioned. Firstly a base model has been chosen,then a proposed model is developed considering the key factors that can be effective. Then hypotheses are assumed according to the factors. Then a survey is conducted among women of different standards of Bangladesh. Then data is analyzed using smartpls 3 software and validity of the hypothesises are checked and finally the affecting factors are found.

Theoretical Background

The second chapter is based on the theoretical background of the studied models. The models Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Unified Theory of Acceptance and Use of Technology (UTAUT) has been explained briefly. The basis of TRA was attitude towards an act of behavior and subjective practice. It explained how intention was the most important factor towards behavior change. This model proposes that a persons behavior is determined by several intended motives that are in line with the attitude of the person concerning behavior and subjective practices. Here, intention is the most important factor in determining the change in behaviour. TAM was designed to predict the acceptance as well as usage of technology. The TAM model excluded the attitude construct on which intention was predicted to be based on previously. TAM emphasized on the perceived usefulness and perceived ease of use in explaining the behavioral intention. This model basically tells that the attitude towards using a technology is driven by the perceived usefulness and perceived ease of use. The perceived usefulness affects the attitude towards using the technology as well as the behavioral intention to use. Attitude towards use is also driven by the perceived ease of use. The attitude towards using drives the behavioral intention which ultimately affects the actual system of use. TPB was an extension of TRA which added perceived behavioral control as a construct. This theory has been proved successful and applied to the understanding of individual acceptance and usage of many different technologies. Here, the attitude toward behavior, subjective norm and perceived behavioral control are all interrelated with one another and all of these drive the intention of usage. The ultimate construct which is the behavior is driven by both intention and perceived behavioral control. Lastly UTAUT was explained which evaluated eight other pre-existing models during its formulation. Various aspects of the previous theories were also included in the UTAUT model which made it more powerful in helping to determine the behavioral intention and use behavior of people in accepting a new technology. The UTAUT model consists of four predictors: i) Performance Expectancy ii) Effort Expectancy iii) Social Influence and iv) Facilitating Conditions. The two expected outcomes are i) Behavioral Intention and ii) Use Behavior etc. The four moderating variables are: i) Gender ii) Age iii)Experience and iv) Voluntariness of Use. UTAUT is chosen as base model because it gives results of 70% variance of user intentions. UTAUT is a combination of eight behavioral models, so it also combines core constructs from other models. The combination of improved result explaining the variance in user intentions as well as the combination of core constructs in the model are the main reasons behind the choice of this model to use as the base model for our research work.

Literature Study

This chapter included study of various researches that were studied before coming up with the final topic. Most of the researches that were studied were based on various developing countries of the world. Since Bangladesh is a developing country as well, similarities between geographical

location and backgrounds were considered. For example: if the rural area of India is considered, then many of the issues that are prevalent there in acceptance of mHealth will also be applicable in our context. The lack of acceptance among various age groups was also a common trait that was noticed in many of the papers. The importance of mHealth in context of the reachability, cost, diagnostic support has been discussed. The success factors that make mHealth so lucrative has been explored in some research works. Various ways of improving the state of mHealth, interactive ways to design mHealth were also discussed in many researches. The ways to design better health care system with mHealth in order to attract more health-care providers was taken into account. Involvement of more health-care workers will bring about more consumers of mHealth which is one of the lacking in many countries. Along with the importance of mHealth, various concerns like security that can drive one away from adopting mHealth was discussed as well. Various short-comings in Bangladesh, whether in terms of resources or mentality was also discussed in brief.

Comparative study between mHealth and contemporary services available in the internet has been done as well. Participatory design sessions were run in a studied research in order to understand the type of expectation that consumers hope to have in the mHealth services. The Information Systems Research (ISR) framework has been studied as well which took the design preferences of the user in account. All of these papers studied how better design that involves the probable users of the system can be done. Importance of participatory design sessions were emphasized which were useful because the main viewpoint of the main stakeholder of the system is given the utmost importance.

Systematic Review was conducted for finding out the effect of mhealth in dealing with chronic diseases. It was later found that the studies were of low quality and obtained health outcomes were inconsistent. Various interventions were studied and meaningful design of effective interventions were studied. The gender differentials that played role in adoption of mHealth was studied. Factors like ownership of mobile phone, experience in using mobile phone and social influence towards using new technology was found out. Technology anxiety was one of the reasons that came out to have played a role in lack of acceptance of mHealth.

The perceived usefulness, perceived ease of use and the overall thought process that is in works for accepting mHealth has been studied in many researches. Many theories have been used to determine the acceptance of mHealth among various demographics. Apart from the UTAUT model that has been modified in many of the papers studied, the TAM model has been modified as well. Along with the existing TAM variables the strong relationship between the purpose of use of mHealth and the perceived social pressure in not performing a behavior was also found.

Theoretical Framework

The Fourth chapter is Theoretical Framework and Hypothesis. The chapter is initiated by describing why UTAUT has been chosen as the base model. UTAUT gave 70% variance of user

intentions, which is why it was chosen as the basis of our research. Along with this, the model is efficient because its a unified model. 8 models were studied and the factors from those models were combined in the UTAUT model. The inclusivity of previous factors was one of the other reasons of choosing this model. The chapter proceeds with briefly describing the overall constructs of the proposed model. The four main constructs that have been directly taken from the UTAUT model were, Performance Expectancy, Effort Expectancy, Facilitating Conditions, and Social Influence. The additional constructs were Technology anxiety, Habit, Trust, Personal innovativeness in IT , Privacy , Price Value, Resistance towards change. These constructs are not dependent on other variables and are known as the independent variable. These constructs have been described in the chapter along with the references from where they have been taken from. Behavioral Intention and Use Behavior are the dependent variables. All of the constructs except for Facilitating Conditions were hypothesized to influence the behavioral intention of women in accepting mHealth. Use Behavior was moderated by Facilitating Conditions and Behavioral Intention in the base model. The moderating factors that were considered to be affecting the relationship between the independent and dependent variables were age, education, voluntariness of use and experience. Gender was eliminated as a moderating factor since our research is based on women only and does not include other genders. Our proposed model has been illustrated in this chapter which displays the existing relationships between the dependent and independent variables. Along with the four existing factors , Technology anxiety, Habit, Trust, Personal innovativeness in IT , Privacy , Price Value, Resistance towards change all affect the behavioral intention positively. The Use Behavior is only driven by the Behavioral Intention and the Facilitating Condition like the base UTAUT model. All of the relations shown between the dependent and independent variables are moderated by age, education, voluntariness of use and experience. A lot of factors have been included in this model which seemed like probable factors. But, subsequent chapters showed how many of the factors in the proposed model were eliminated.
The hypotheses have been designed in such a way the nature of these relationships are highlighted. The positive impact on womens intention to use mHealth have been hypothesized to be affected by Performance Expectancy, Effort Expectancy, Social Influence , Habit, Personal Innovativeness in IT, lesser Price Value. The hypotheses including the negative impact on the womens intention to use mHealth were by lack of trust, technology anxiety and privacy. Facilitating Condition and behavioral intention were hypothesized to have positive influence on the use behavior of women in using mHealth.

Methodology

This chapter discusses the methodology that has been followed in conducting the research. It begins with the design of measures. All of the constructs have associated statements with them, which has later served as the questionnaire for conducting the survey. These questions were used to find out the significance of the factors. The factors have been denoted with their initial

letters and the next number signifies the number of question under that construct. A total of 38 measures have been shown in the chapter with their corresponding references. The references show the source of the respective statements or indicators. Although Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, Use Behavior and Behavioral Intention was taken from the base UTAUT model, the statements were not limited to the base paper of the UTAUT model. Other researches that were done to modify the UTAUT model were used as a reference. Some statements were also obtained by simply brainstorming. Statements of additional factors, namely, Technology Anxiety, Habit, Trust, Personal Innovativeness in IT, Privacy, Price Value and Resistance to Change were achieved by studying various previous research works. The questions or statements had options like : strongly disagree, disagree, neutral, agree and strongly agree. The quantifications were as follows: strongly by 1, disagree by 2, neutral by 3, agree by 4 and strongly agree by 5. All of these points that were associated with the respective responses were used in the subsequent calculations were the significance of each of the factors were calculated. Basing on this, the insignificant factors were discarded. The data collection was conducted with the help of the online survey tool, Google Form. Google Form has some additional features where each of the responses are represented with the help of a pie chart. The initial aim was to collect the data of about 500 women. The survey forms were distributed through the Internet and also in collected person. We collected data from the Gynaecology Ward at a hospital and we also went to a university where we conducted the survey in person. Google Form was used during the personal interaction as well where the respondents filled the form.
Before adopting the PLS-SEM approach, some guidelines needed to be followed ford determining the appropriate sample size. The sample size varies with the confidence level and the margin of error. Along with this, the size of the population has to be known as well. The margin of error is the allowed deviation in the survey result of the sample. The margin of error has to be less in order to achieve a better result. The size of population of women is around 82,844,337 which has been mentioned in the chapter. After the sample size estimation was done for 95% confidence level and 5% margin of error, it was found that the sample size of approximately 400 was enough to conduct the survey in order to have accurate results. Even if the sample size is increased after 400, the results wont vary much in comparison to the result obtained for 400 respondents .

Test and Analysis

Test and Analysis started with the demographics of the collected data. The age groups, educational background, experience with prior use and voluntary intention towards usage. The characteristics of the sample data are used as moderating factors in this research. Age,Education, Voluntariness of Use and Experience are the moderating factors. For analysis of data, the structural equation modeling has been used. This modeling is used to conceptualize the relationship among variables in a model. There are two sub models which are the inner and outer models.

Inner model is the structural model that describes the relation between independent and dependent variables, whereas the outer or measurement model described the relation between the latent variables and the respective indicators. Structural Equation Modeling has two approaches and between those,PLS scheme is used.The PLS scheme is generally used for finding out the significance of the factors in any model. PLS algorithm is used for analysis of the data of survey. PLS algorithm includes three stages. Mainly,this algorithm estimates outer weights and path coefficients which specifies the significance of any factor. PLS algorithm is applied through Smartpls 3 tool. Some basic settings are required according to requirement. Then a model is built in Smart-Pls according to the hypotheses. After going through the required calculations, the outer loading showed which indicators were significant enough. If the value was less than 0.7 , then it was considered as insignificant. All the indicators of Facilitating Conditions are found as insignificant. EE2,SI3,TA2,TA3,TR2 are also found as insignificant. Next, the validity was measured.Validity is measured by convergent validity and discriminant validity. If the Composite Reliability was greater than 0.7 and Average Variance Extracted exceeded 0.5, then the constructs were considered to be reliable. The structural model was used to validate the hypotheses by using the path coefficients. In 95% confidence level, path coefficients which will have T value greater than 1.96 and P value less than 0.05, will be accepted. The relations between R and BI, TA and BI, TR and BI, P and BI, EE and BI were eliminated from this analysis. Then the hypothesis that were proved to be true or false were discussed. The effect of moderating variables has been shown in a tabular form. There the path coefficients are analyzed for moderating variables. path coefficients whose P values are less then 0.05,they are accepted. Lastly the final model has been illustrated, where Performance Expectancy, Social Influence, Facilitating Conditions, Habit, Price Value, Personal Innovativeness in IT are the independent variables and the Behavioral Intention and Use Behavior are the dependent variables. All the moderating factors have shown significant importance in the final model.

7.2 Research Limitation

Bangladesh is a country comprising of 164 million people of which 48.56% are females. The amount of data collected during our survey do not portray the entire populace of our country. The respondents who took part in the survey also do not represent the entirety of the women in our country since the demographic of the respondents do not cover all possible educational and economic backgrounds. The research was mainly conducted in Dhaka, the capital of Bangladesh. Variations are present among the women of various divisions and districts. So, the results obtained in Dhaka will not necessarily be the same for the women in other divisions of the country. Although the survey was open for all age groups over the age of 15, most of the respondents were teenagers and young adults. So, the data collected was not scattered uniformly among all the ranges, rather it was concentrated around certain groups only which may have affected the

overall result the survey.

7.3 Future Work

Since there were some limitations in the research conducted, further work can be initiated which looks into the raised concerns of lack of absence of proper distribution of the data among all age groups, extension of geographic location by taking representatives of the population from various divisions of the country. Opinions obtained in rural areas is supposed to vary than those obtained in urban areas. Many people in rural areas might not have the required technology needed for using mhealth services. Along with that, knowledge required for using these services may not be up to the mark. During conducting the survey, it was observed that people who were from other regions of the country often had lack in knowledge of using their mobile phones to their full capability. So, it is evident that the opinions not be same all over the country. Application developers can take the results obtained in consideration while designing their mhealth applications or services so that it can cater towards most of the women which can increase the overall usage of mhealth services throughout the country. However they will need to bridge the gap between various regions in the country and come up with a solution that is universal in all the regions. If the gap in opinions cannot be reduced then they can design applications by concentrating on the divisions rather than thinking of all regions as a whole.

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APPENDIX A
SURVEY RESPONSE

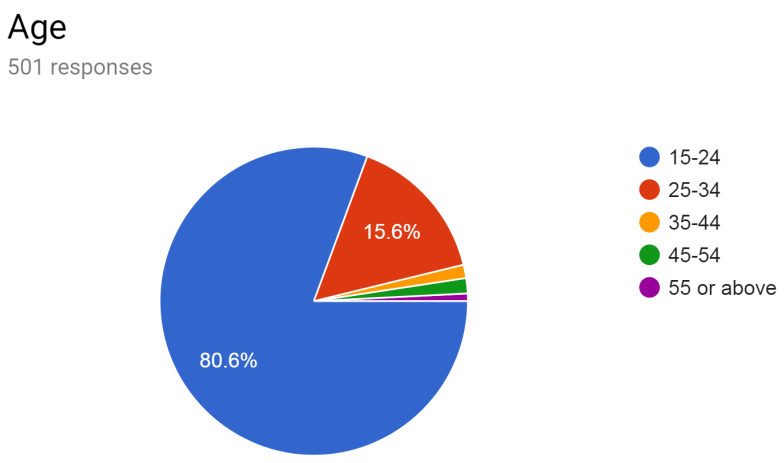

Figure A.1: Age of the respondents

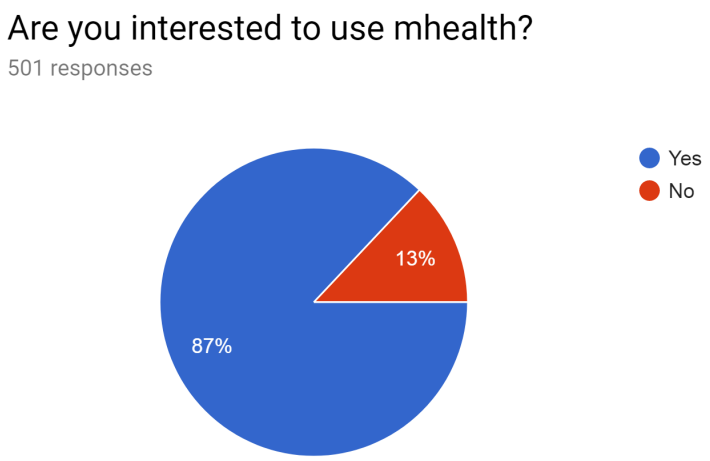

Figure A.2: Voluntariness of use of the respondents

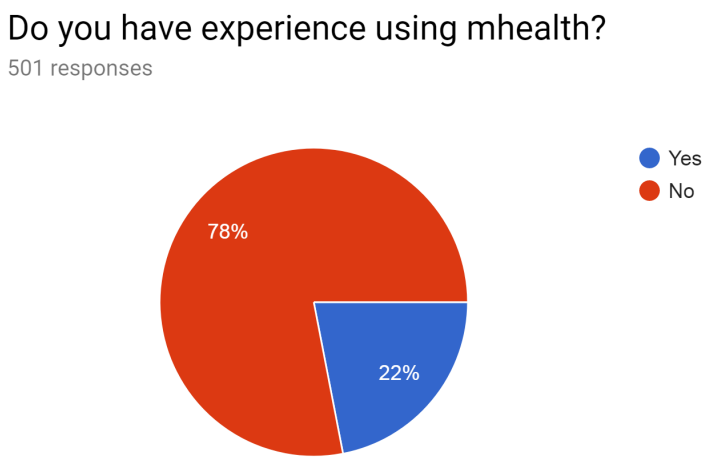

Figure A.3: Experience of the respondents

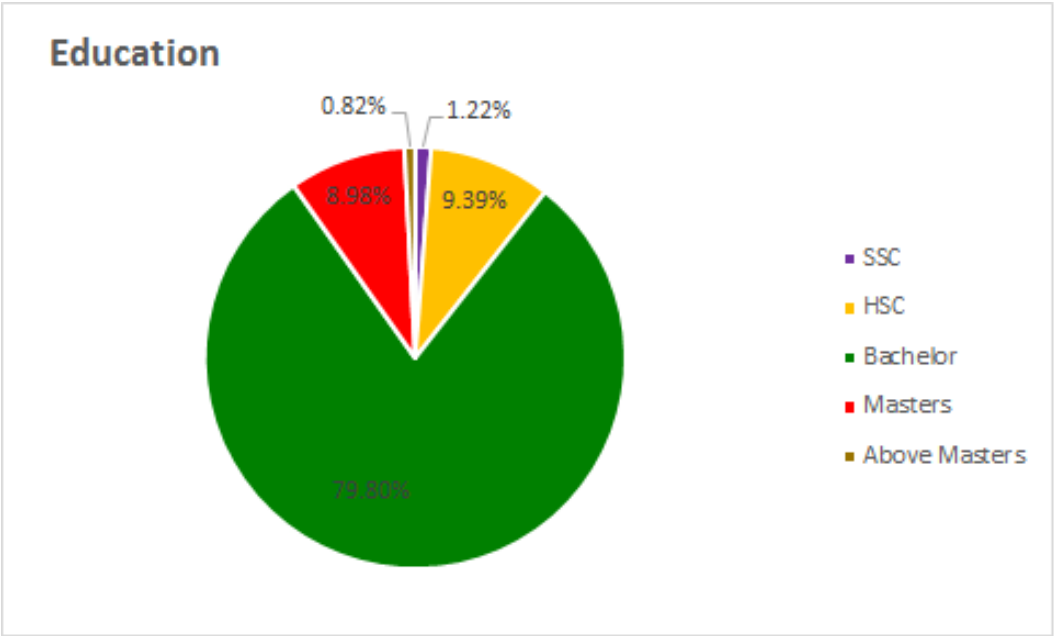

Figure A.4: Education of respondents

I believe m-health application will be useful for me. (আমি বিশ্বাস করি mHealth (মোবাইল স্বাস্থ্য) পরিসেবাগুলি আমার জন্য উপযোগী হবে।)

501 responses

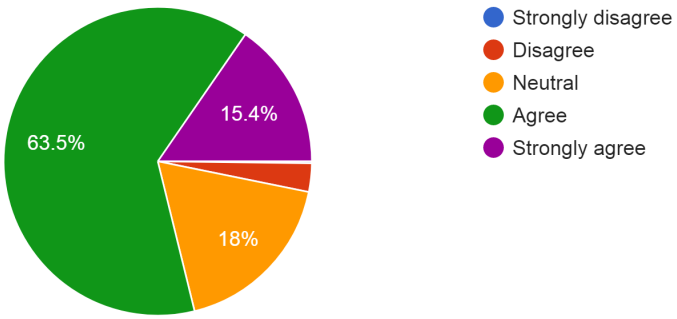

Figure A.5: First indicator of Performance Expectancy

I think using m-health services will increase my productivity.(আমি মনে করি mHealth (মোবাইল স্বাস্থ্য... আমার উত্পাদনশীলতা বৃদ্ধি করবে।)

501 responses

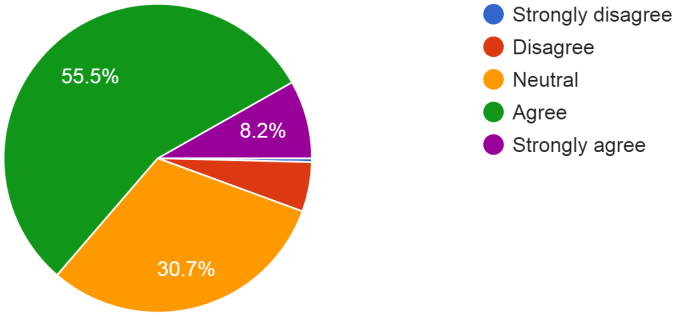

Figure A.6: Second indicator of Performance Expectancy

Using mhealth services will help to me to have better health .(mHealth (মোবাইল স্বাস্থ্য) পরিসেবাগু...রও ভাল স্বাস্থ্য পেতে সাহায্য করবে.)
501 responses

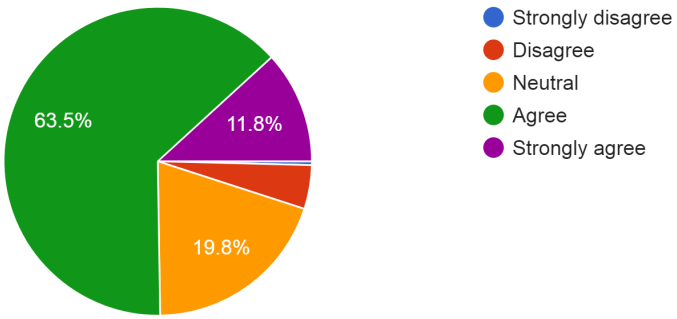

Figure A.7: Third indicator of Performance Expectancy

I will consider using mhealth services if it's easy to use. (এটি ব্যবহার করা সহজ হলে আমি mHealth (ম...স্বাস্থ্য) ব্যবহার বিবেচনা করব।)
501 responses

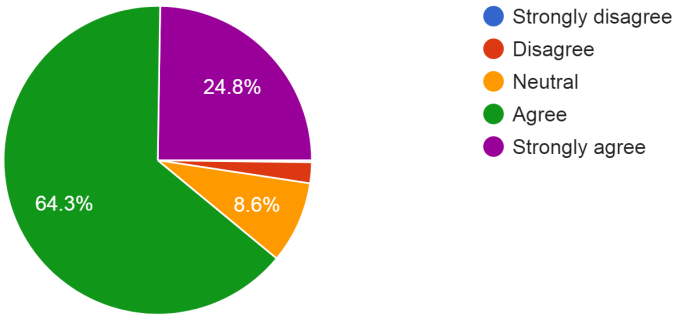

Figure A.8: First indicator of Effort Expectancy

My interaction with the system should be clear and understandable.(সিস্টেমের সাথে আ...রিষ্কার এবং বোধগম্য হওয়া উচিত।)
501 responses

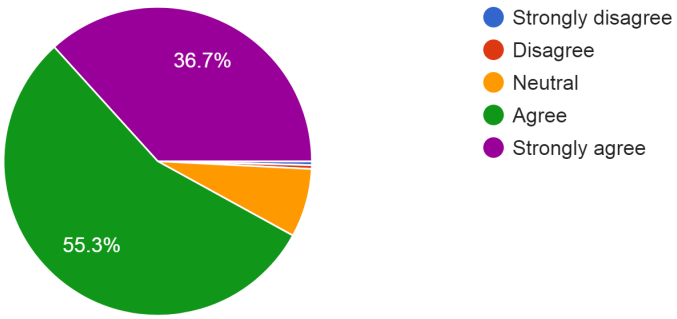

Figure A.9: Second indicator of Effort Expectancy

Learning to operate the mHealth system is easy for me.(mHealth (মোবাইল স্বাস্থ্য)সিস্টেম পরিচালনা শেখা আমার পক্ষে সহজ।)
501 responses

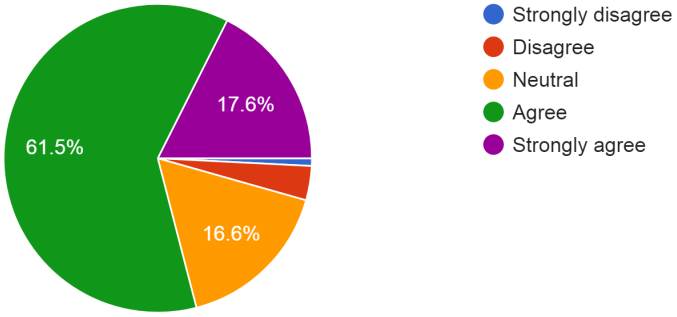

Figure A.10: Third indicator of Effort Expectancy

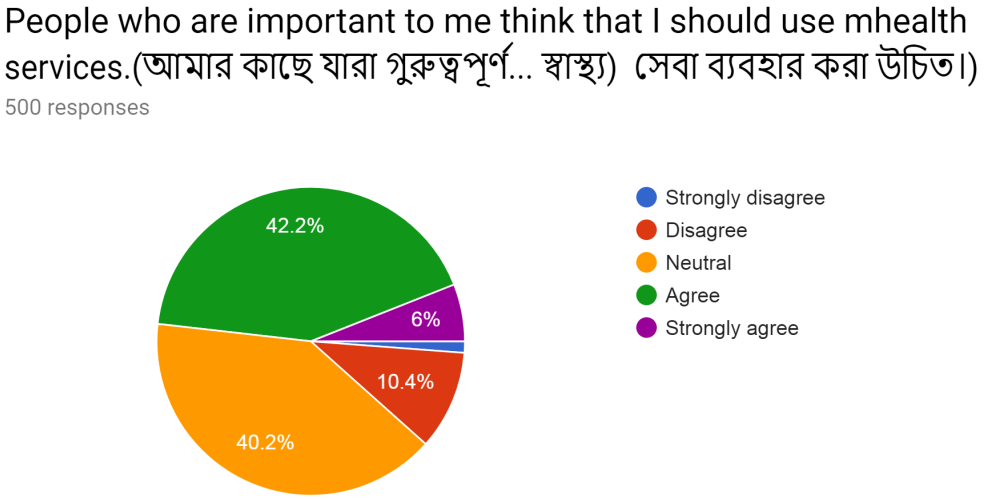

Figure A.11: First indicator of Social Influence

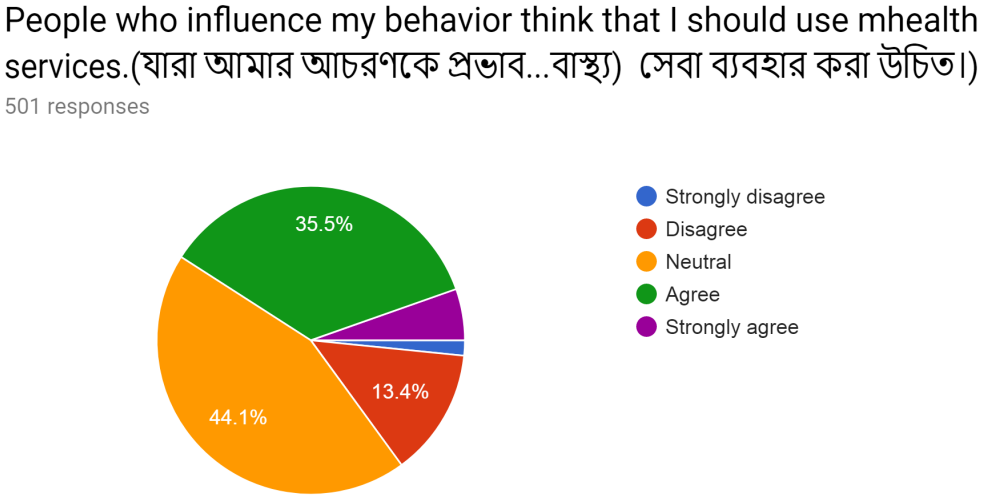

Figure A.12: Second indicator of Social Influence

I am more likely to use mhealth services if it is promoted by government .(সরকার কর্তৃক প্রচারি...্ভিস ব্যবহার করার সম্ভাবনা বেশি।)
501 responses

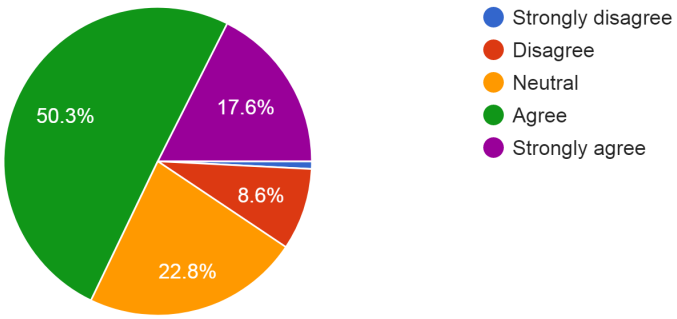

Figure A.13: Third indicator of Social Influence

I have the necessary resources to use mhealth services।(আমার কাছে mHealth সেবা ব্যবহার করার জন্য প্রয়োজনীয় সম্পদ আছে)
501 responses

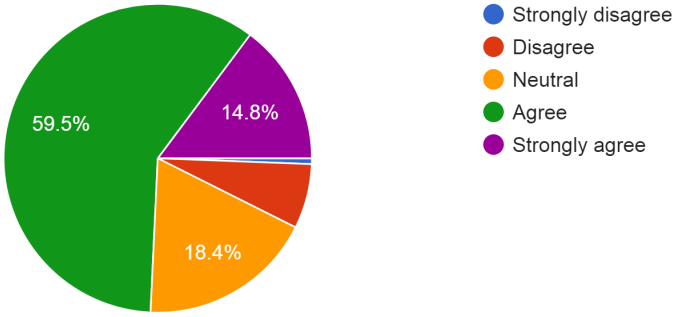

Figure A.14: First indicator of Facilitating Conditions

I have the knowledge necessary to use mhealth services .(আমার কাছে mHealth সার্ভিস ব্যবহার করার প্রয়োজনীয় জ্ঞান আছে।)

501 responses

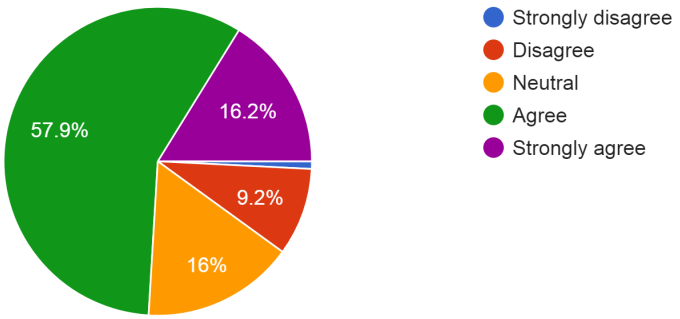

Figure A.15: Second indicator of Facilitating Conditions

IT person should be available for assistance if I find difficulties using mhealth application.(আমি য...হায্যের জন্য উপলব্ধ হওয়া উচিত।)

501 responses

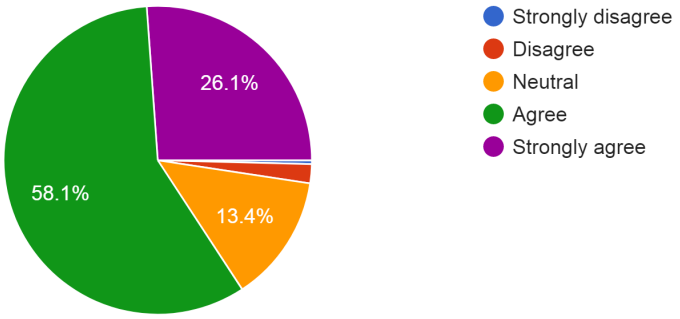

Figure A.16: Third indicator of Facilitating Conditions

i think mhealth services should have offline functionality in absence of internet connection.(আ...থ্য) এর কার্যকারিতা থাকা উচিত।)
501 responses

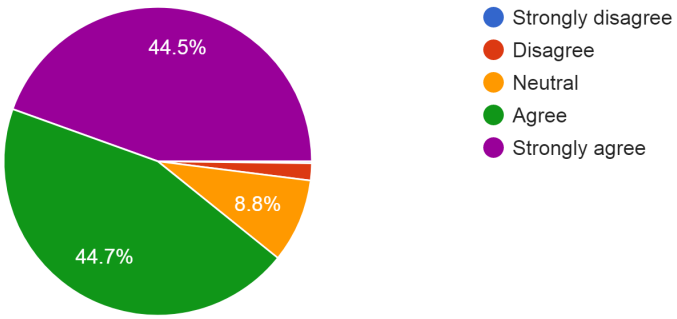

Figure A.17: Fourth indicator of Facilitating Conditions

I will consider using m-health services if it's available in Bangla.(বাংলায় সহজলভ্য হলে আমি...ষেবা ব্যবহার করা বিবেচনা করব।)
501 responses

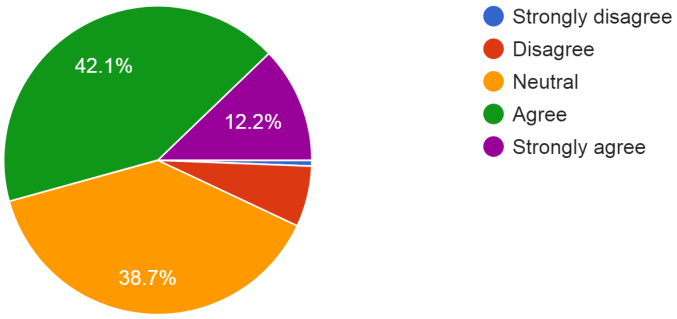

Figure A.18: Fifth indicator of Facilitating Conditions

I predict I would use mhealth services in future. (আমি ভবিষ্যতে মোবাইল হেলথ সেবা ব্যবহার করব বলে মনে করি।)

501 responses

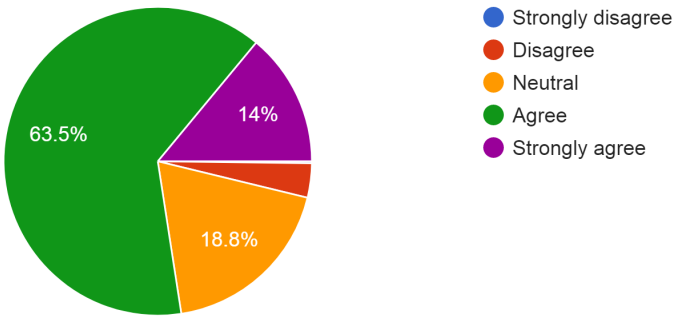

Figure A.19: First indicator of Behavioral Intention

I predict I would use mhealth services frequently.(আমি ভবিষ্যতে mhealth সেবা ঘন ঘন ব্যবহার করব বলে মনে করি।)

501 responses

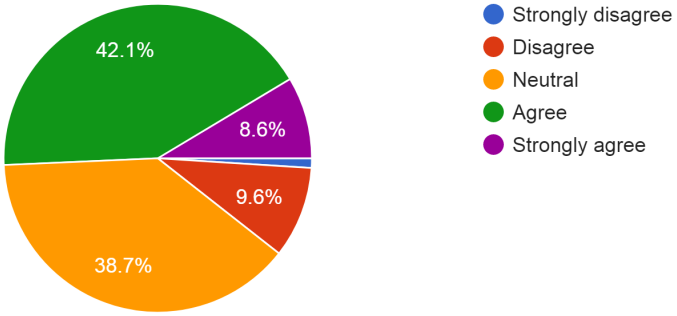

Figure A.20: Second indicator of Behavioral Intention

I plan to use mhealh services in my daily life.(আমি আমার দৈনন্দিন জীবনে mHealth সেবা ব্যবহার করার পরিকল্পনা করছি।)

501 responses

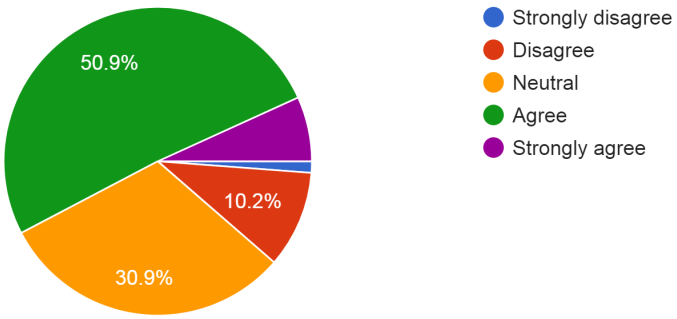

Figure A.21: Third indicator of Behavioral Intention

M-health service is a pleasant experience . (এম-স্বাস্থ্য সেবা একটি আনন্দদায়ক অভিজ্ঞতা।)

501 responses

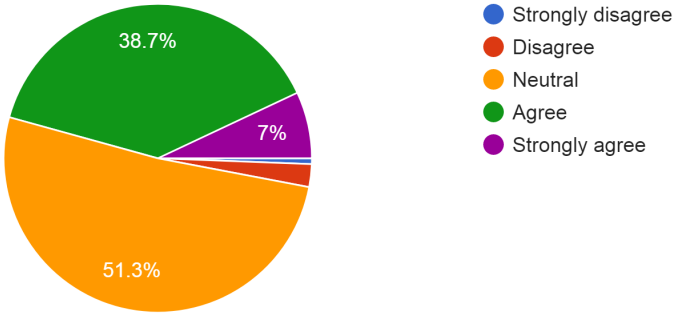

Figure A.22: First indicator of Use Behavior

I use mhealth services currently. (আমি বর্তমানে mhealth সেবা ব্যবহার করি।)

501 responses

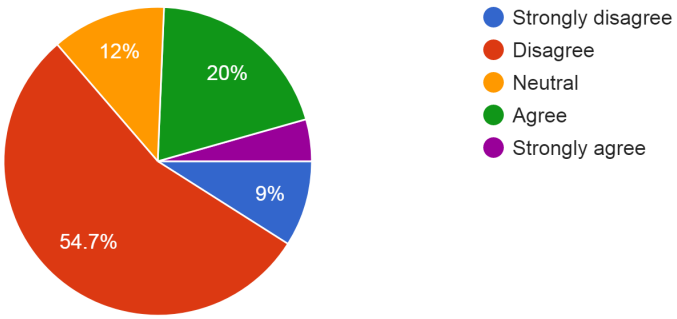

Figure A.23: Second indicator of Use Behavior

I spend a lot of time using mhealth service.(আমি mhealth সেবা ব্যবহার করে অনেক সময় ব্যয় করি।)

501 responses

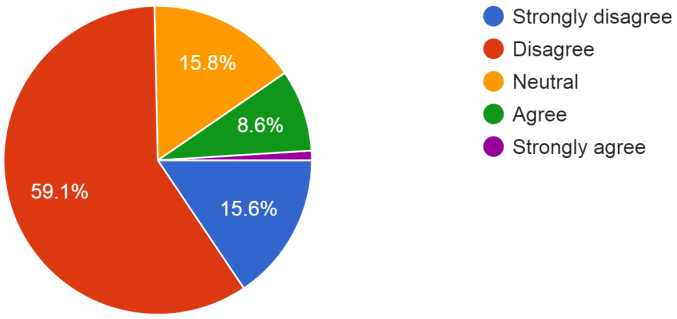

Figure A.24: Third indicator of Use Behavior

I feel nervous while using mhealth applications.(আমি হেলথ অ্যাপ্লিকেশন ব্যবহার করার সময় বিচলিত বোধ করি।)

501 responses

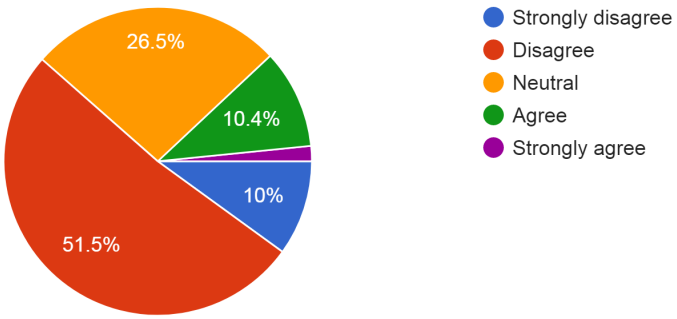

Figure A.25: First indicator of Technology Anxiety

Using mhealth services may make me feel uneasy and confused.(Mhealth সেবা ব্যবহার ক...কর এবং বিভ্রান্ত বোধ করতে পারি।)

501 responses

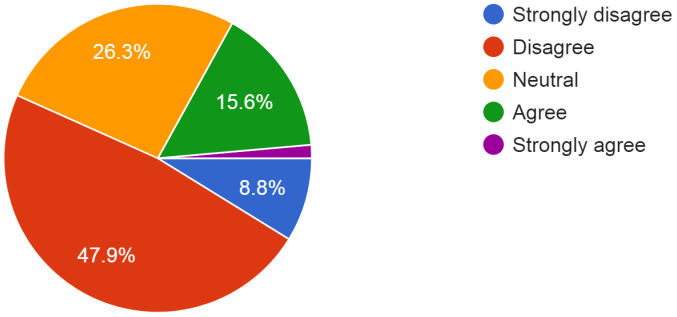

Figure A.26: Second indicator of Technology Anxiety

Using mhealth services makes me worried(for security reasons)(mHealth সেবা ব্যবহার করা আমাকে চিন্তিত করে (নিরাপত্তার কারণে)।)
501 responses

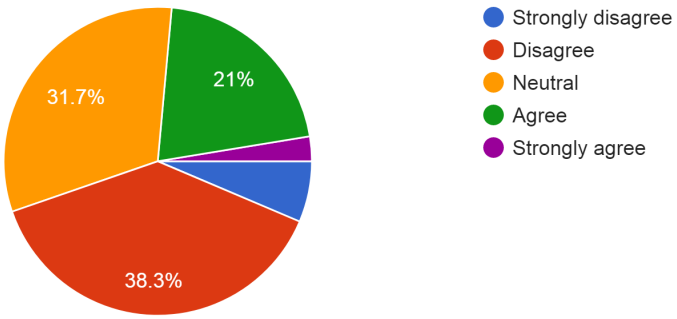

Figure A.27: Third indicator of Technology Anxiety

I feel that I might lose a lot of vital information by using mhealth applications.(আমি মনে করি আমি হেল...ক গুরুত্বপূর্ণ তথ্য হারাতে পারি।)
501 responses

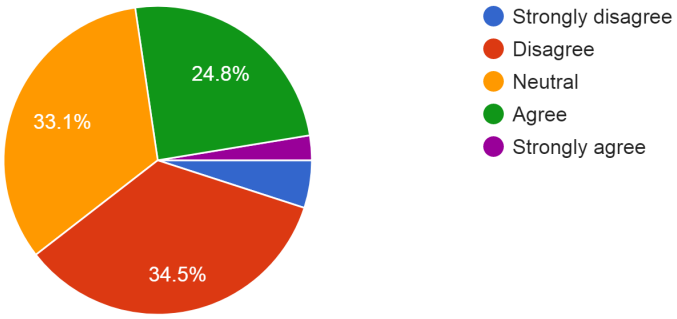

Figure A.28: Fourth indicator of Technology Anxiety

I would use the system if I have enough authority over my data (যদি আমার নিজের তথ্যের উপর যথ...হলে আমি সিস্টেম ব্যবহার করব।)

501 responses

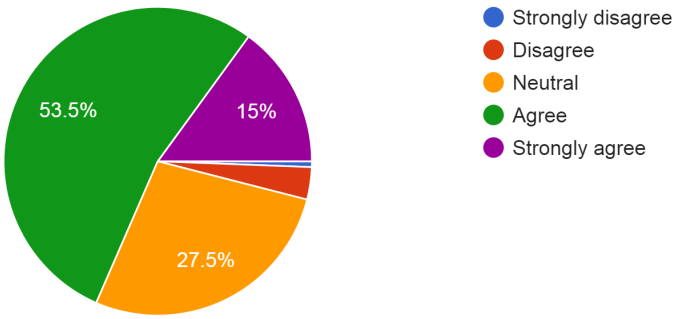

Figure A.29: First indicator of Trust

I feel I will be tracked by mhealth applications.(আমি মনে করি আমাকে হেলথ অ্যাপ্লিকেশন দ্বারা ট্র্যাক করা হবে।)

497 responses

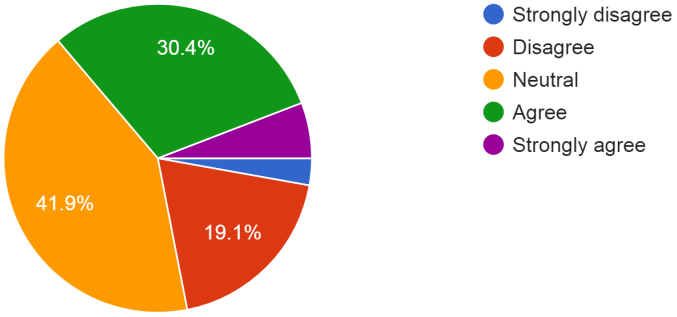

Figure A.30: Second indicator of Trust

The use mhealth service has become a habit for me.(mhealth সেবা ব্যবহার আমার জন্য একটি অভ্যাস হয়ে গেছে।)

501 responses

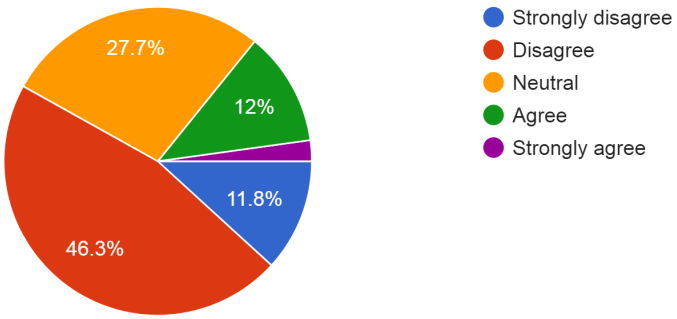

Figure A.31: First indicator of Habit

I am addicted to using mhealth services.(আমি mhealth সেবা ব্যবহার আসক্ত)

501 responses

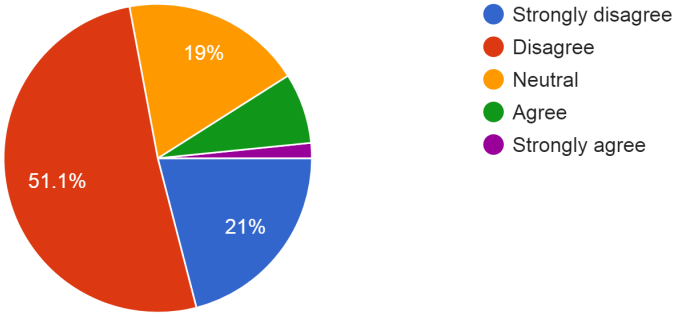

Figure A.32: Second indicator of Habit

I must use mhealth services .(আমার অবশ্যই mhealth সেবা ব্যবহার করা উচিৎ।)

501 responses

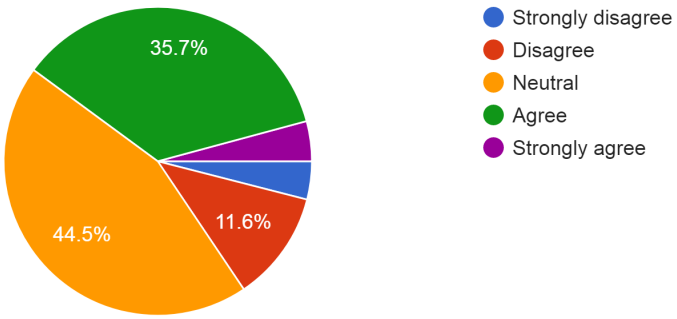

Figure A.33: Third indicator of Habit

If I heard about a new information technology I would look for ways to experiment with it.(যদি আ...ীক্ষা করার উপায়গুলি সন্ধান করি।)

498 responses

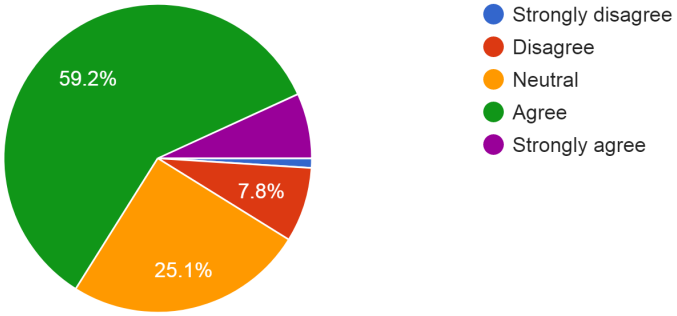

Figure A.34: First indicator of Personal Innovativeness in IT

Among my peers, I am usually the first to try out new Information Technology(আমার সহকর্মীদের মধ্যে, ...ম নতুন তথ্য প্রযুক্তি চেষ্টা করি।)

501 responses

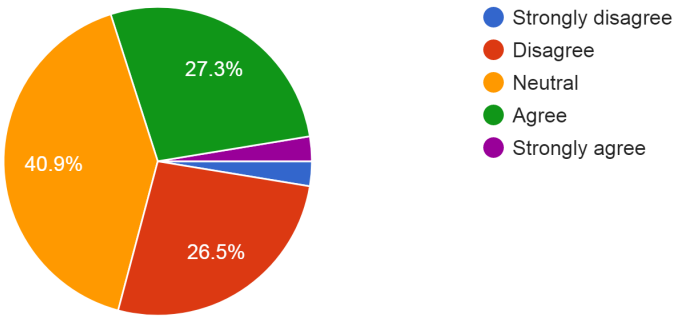

Figure A.35: Second indicator of Personal Innovativeness in IT

In general I am not hesitant to try out new information technologies (সাধারণভাবে আমি নতুন ...ুক্তির চেষ্টা করতে দ্বিধান্বিত নই)

501 responses

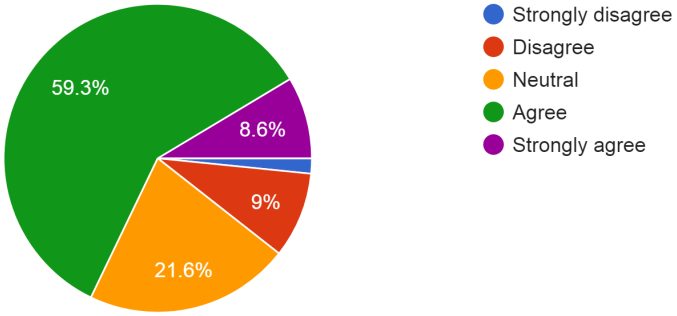

Figure A.36: Third indicator of Personal Innovativeness in IT

Confidentality of information that I sent via mobile device is a factor that I consider before ado...র আগে বিবেচনা করা একটি ফ্যাক্টর।)

501 responses

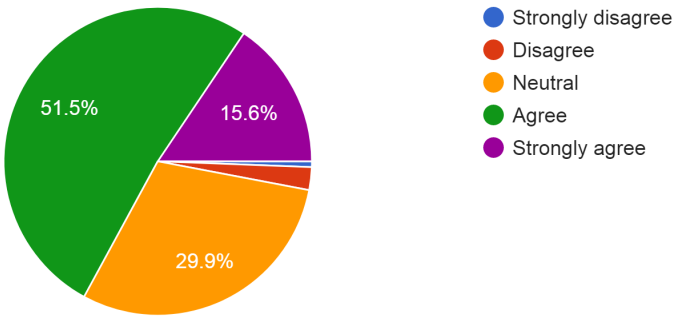

Figure A.37: indicator Of Privacy

I think mhealth service is reasonably priced.(আমি মনে করি mhealth সেবার মূল্য যুক্তিসংগত)

501 responses

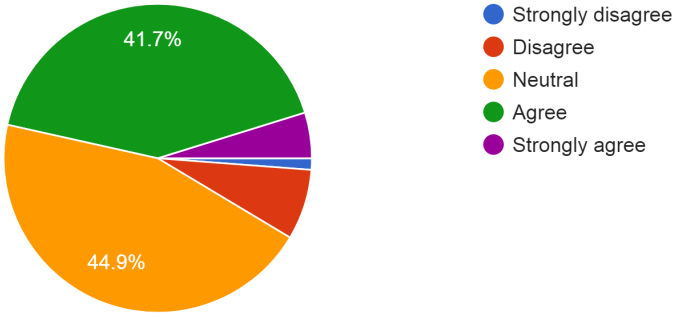

Figure A.38: First indicator of Price Value

Mobile health service is a good value for the money(মোবাইল স্বাস্থ্য সেবা অর্থের জন্য একটি ভাল মান)

501 responses

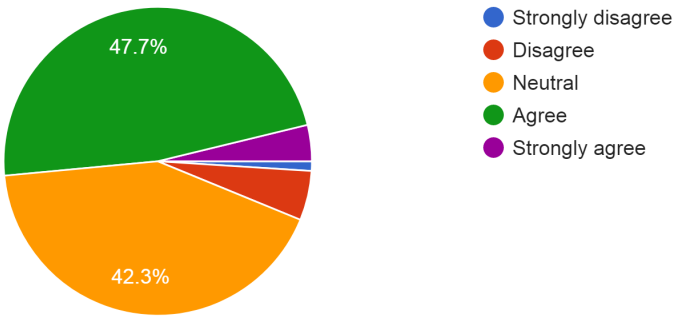

Figure A.39: Second indicator of Price Value

At the current price mobile health service provides a good value।(বর্তমান মূল্য অনুযায়ী মোবা...থ্য সেবা একটি ভাল মান প্রদান করে)

501 responses

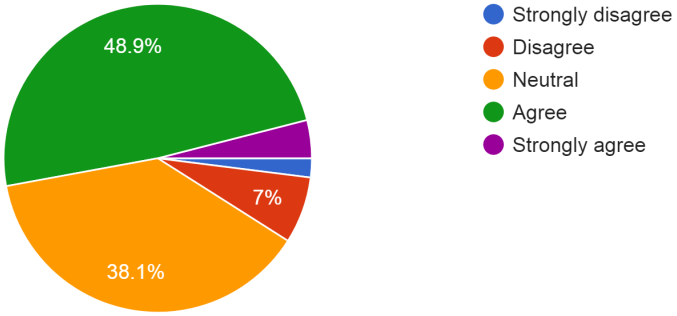

Figure A.40: Third indicator of Price Value

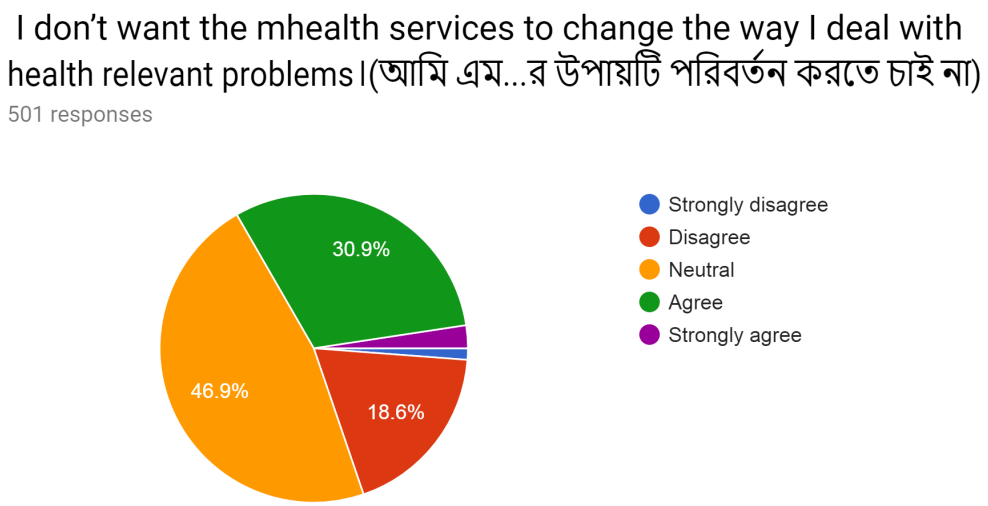

Figure A.41: First indicator of Resistant Towards Change

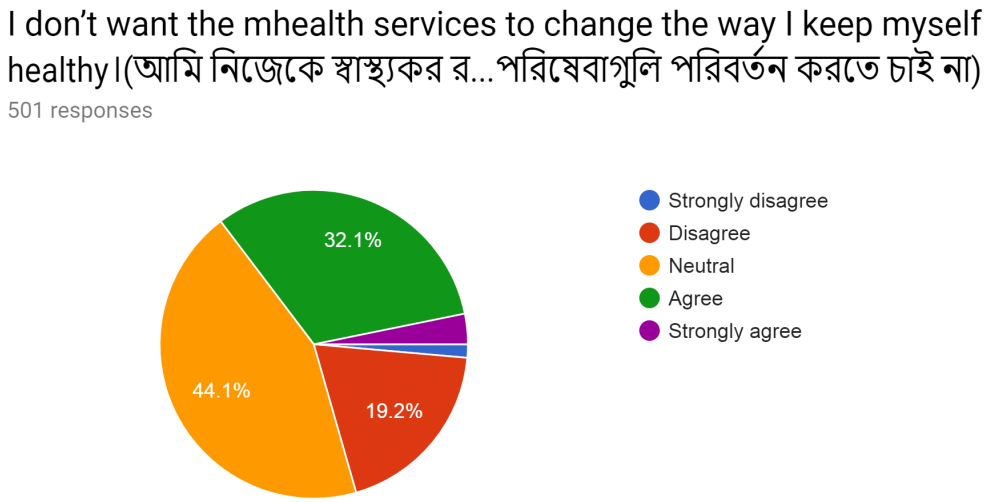

Figure A.42: Second indicator of Resistant Towards Change