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Using the UTAUT Model to Determine Factors Affecting Acceptance and Use of Mobile Health (mHealth) Services in Bangladesh

Mohammad Zahedul Alam[1,2,*], Wang Hu[1], Zapan Barua[3]

[1]School of Management, Wuhan University of Technology, Wuhan, P.R. China-430070

[2]Department of Marketing, Bangladesh University of Professionals (BUP), Bangladesh

[3]Department of Marketing, University of Chittagong, Chittagong -4331, Bangladesh

Corresponding author: zaheddu2000@yahoo.com

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Abstract

mHealth is one of the most promising technologies that has emerged in recent years and could prove to have considerable value to both health services providers and patients for achieving the sustainable development goals (SDGs). But, the adoption of mHealth faces many challenges and barriers, including cultural, technological, personal, organizational and social issues which must be addressed and treated carefully by mHealth services providers. The aim of this study is to identify the critical factors affecting the adoption of mHealth in healthcare system of Bangladesh by extending the Unified Theory of Acceptance and Use of Technology (UTAUT) model to include perceived reliability and price value. A cross sectional survey questionnaire was used to collect data from 296 participants from different public and private hospitals in Dhaka city of Bangladesh. Result demonstrates that performance expectancy, effort expectancy, social influence, facilitating condition & perceived reliability had significant influence on the intention to adopt mHealth services in Bangladesh. Surprisingly, price value ($p>0.05$) had no significant influence on adoption of mHealth services. With the proposed model, it is possible to develop better mHealth services to meet the requirements of the common people based on widely available smartphone. The findings of this study will be beneficial for the government agencies, mobile phone operators, policy makers, healthcare providers and NGOs in developing countries.

Keywords: mHealth, UTAUT, general users, Developing Countries, Bangladesh etc.

1. Introduction

Healthcare sector reform is not only a health-related issue but also a development issue (Saka et al., 2012). The challenges of healthcare sector present arguably the major barriers to sustainable global development especially in developing countries when there is a high prevalence of debilitating illness (Sharif M. et, al., 2013; Jahan & Chowdhury, 2014).

The diffusion rate of digital technologies in healthcare sector has quickly progressed and prompted a great amount of change in this sector over the past ten years (Laurenza, 2018; Abbasgholizadeh et al., 2017; Rahman & Hoque, 2018). Hence, the Information & Communication Technology (ICT) is receiving attention as a potential solution to resolve the issues of limited access to healthcare and reduce healthcare costs (Ivatury et. al., 2016 mHealth is defined as the use of portable electronic devices for mobile voice and data communication over a cellular or other wireless network of base stations to provide health information (Kahn et al., 2010). It delivers healthcare services by overcoming geographical, temporal, and even organizational barriers (Silva Bruno et al., 2015). mHealth has facilitated ease of access to health care for all and especially for female, the elderly and the poor who can now easily access medical advices through smart phone (Hoque & Sorwar, 2017; Sadegh et al., 2018). mHealth could perhaps be a blessing brought about by ICT with noticeable effects upon the advancement of the healthcare sector (Chiarini, 2013; Akter et al., 2013; Hoque, 2016; Deng et al., 2014; Latif et al., 2017).

The issue of mHealth has received considerable critical attention in the field of Information System discipline and the potential of mobile phones to deliver various healthcare services facilitated the emergence of mHealth (Bashshur et. al., 2011). Mobile devices are used to acquire information when personal computers were not available, in that case, smartphones are the sole device for the internet connection due to economical and public Wi-Fi access (Xi-tong et al., 2012; Smith, 2015).

Bangladesh is regarded as one of the most densely populated countries of the world with an estimated population of 164.67 million in 2017 (Bangladesh Population,

2017). Bangladesh as a whole has a severe shortage of hospitals, clinics, doctors, and nurses (Ahmed et al., 2014). There are merely 663 government hospitals in Thana (sub-town) and District head-quarters regions. The total number of beds available in both private and public hospitals is 74,415. The ratio of one hospital bed to citizen of Bangladesh is approximately 1: 1860 (Khan et al., 2012). The number of available doctors, nurses, and midwives is less than 2.3 and only four beds for every ten thousand people in Bangladesh (WHO 2016).

Under these circumstances, alternative and cost-effective solution is essential for providing healthcare services in the context of Bangladesh. This ICT-enabled services can be an effective solution for the countries like Bangladesh where healthcare system faces various challenges.

As for mobile technology, there are over six nationwide independently owned cell phone operators with 147 million subscribers. Nearly, 80% have mobile phone subscriptions in this country and a calculated 13.8% annual growth rate and 9.05 crore internet users in Bangladesh and about 8.2 million are smartphone users (BTRC, 2018; BTRC, 2017). In comparison to countries, mHealth is at the infant stage in healthcare industry of Bangladesh where mHealth services have been evolved in the mid-1999 (Ashraf et al., 2015). A total of 26 initiatives with direct or indirect associations with eHealth and/or mHealth have been taken in Bangladesh (Ahmed et al., 2014). On the other hand, Different public and private hospitals, nongovernment organizations (NGOs), and private organizations have introduced a number of eHealth programs and services over the time (Hoque, 2016).

On the other hand, the government invested huge amounts of budget for eHealth system and has extended their resources to the training of doctors, administrative staffs and nurses to ensure the effective utilization of eHealth services (Health Bulletin, 2013). The Government of Bangladesh has placed a high priority on eHealth, which is reflected in the ICT Policy 2009. In the context of healthcare challenges, mHealth is being promoted

as a route to cost effective, equitable and quality healthcare in Bangladesh (Ahmed et al., 2014; Hoque et al., 2015).

However, along with this growth of mHealth, but the adoption of mHealth remains low in the context of Bangladesh. A study by Ahmed et. al (2014) reported that few citizens were aware of mHealth services and perceived them as potentially useful. But the adoption rate of mHealth among the general people in Bangladesh is very insignificant. The unfettered proliferation of mHealth solutions has failed to meet expectations. A large number of mHealth projects have not been successfully implemented in the existing health system and adopted by users (Labrique et al., 2013). Many telemedicine/mHealth projects have been discontinued over the years and are dysfunctional whereas mHealth service is not well accepted by its citizen (Rahman & hoque, 2018). So, the question arises, ''What are the key factors affecting the adoption of mHealth services in developing countries among general populations in Bangladesh?"

However, Recent developments in the field of healthcare sector have led to a renewed interest in examining the factors affecting the adoption of mHealth in the context of developing countries. Furthermore, a considerable number of studies in different contexts of various countries have focused on the factors that impact the adoption of mHealth services (e.g. Nematollahi et al. (2017) in Iran; Boontarig (2012) in Thailand; Sun et al.(2013) in China; Moores (2012) in France; Cajita et al., (2018) in USA; Wu et al. (2011) in Taiwan; Zhang et al., (2014) in Hurbin, China; Kim et al.(2014) in Korea; Aggelidis & Chatzoglou (2009) in Greece; Munyua et al. (2015) in India; Lim et al. (2011) in Singapore; Hoerbst et al.(2010) in Australia & German; Schuster et al.(2017) in France; Iwaya et al. (2013) in Brazil; McDonald et al. (2005) in India; Ifinedo (2012) in Canada; Sharif et al. (2013) in Iran; Dunnbeil et al., (2012) in Germany; Sultan and Mohan (2013) in Trinidad and Tobago; Okazaki et al. (2012) in Japan.

Within the context of Bangladesh, numerous studies have examined mHealth usage among patients (Hoque & Sorwar, 2017; Khatun et al., 2016; Andaleeb, 2008;

Rahman et al., 2017; Khan et al., 2013; Hossain et al., 2017; Akther et al., 2010; Shareef et al., 2014; Quaosar et al., 2018; Uddin, 2012; Rahman & Hoque, 2018).

Moreover, in order to examine the factors that affect the adoption intention or actual use of behavior of mHealth services, used various Models/Theories. For example; Hoque et al. (2017) used extend UTAUT; Biemans et al. (2005) implemented UTAUT; Aggelidis and Chatzoglou (2009) applied UTAUT and TAM; Kijsanayotin et al. (2009) employed UTUAT; Alalwan et al. (2017) adopted UTAUT2 and Tam and Olivereira (2017) used the Delone and Mclean (D&M) IS success Model.

Little is known about the adoption behavior of mHealth in the context of Bangladesh and it is not clear what factors affecting the adoption of mHealth in Bangladesh. Furthermore, the gap in the mHealth literature in Bangladesh would be bridged by proposing a comprehensive conceptual model, which scrupulously clarifies the use of mHealth services from the perspective of Bangladeshi users. This is done through the extended UTAUT model (Venketash et al., 2003) for examining the adoption of mHealth. Furthermore, this study would consider the adoption of numeric data in order to inferentially analyze them using SEM. This in turn would assist in generalizing the findings to the whole Bangladeshi population. The article is organized as follows. Firstly, present the literature review. Secondly, present the conceptual framework underpinning the research study. Thirdly, discuss and develop research hypotheses based on the literature. Fourthly, present the research methodology followed to conduct the research. This is followed by data analysis and testing of hypotheses formulated. Finally, the results, the limitations of the study, and suggestions for future research are discussed sequentially.

2. Review of Literature

A considerable amount of literature has been published on the factors affecting the adoption of mHealth, but the generalizability of much published research on this issue is problematic. Identifying the factors that impact the level of actual use of technology has

Table 01 Summary of the research on the mHealth adoption behavior in different developed and developing country context.

Author	Country /Region	Target Population	Theoretical Framework	Objectives	Key Factors Affecting the Adoption
Hsiao et al. (2013)	Taiwan	Elderly Person	TRA-TAM	to explain factors influencing the elder persons' adoption of mobile healthcare devices.	Perceived ease of use, Perceived Ubiquity, Health knowledge, Social Norms & Healthcare need
Gao et al. (2015)	China	All Population	UTAUT2, PMT	to investigate the factors associated with consumer's intention to adopt wearable technology in healthcare,	Hedonic motivation, functional congruence, social influence, perceived privacy risk, and perceived vulnerability,
Cocosila and Archer (2010)	Canada	Young persons	Experiment	To investigate the unbiased evaluation of adopting the mobile health	intrinsic motivation, Usefulness, Enjoyment etc.
Li et al. (2016)	United States	All populations	The privacy calculus theory	To explore the predictors of individuals' adoption of healthcare wearable devices.	health information sensitivity, personal innovativeness, legislative protection, and perceived prestige, perceived informativeness and functional congruence.
Mohamed et al. (2011)	United Kingdom	Young persons	TAM	To explore acceptance smart mobile phones from users' perceptions, viewpoint, and experience.	Perceived Usefulness, Perceived Ease of Use, Technology design, social, cultural,
Boontarig et al. (2012)	Thailand	Elderly Persons	UTAUT	To investigate factors that influence the adoption of e-Health services.	Facilitating Conditions and Effort Expectancy, Perceived Value.
Lee and Han (2015)	Korea	All Populations	Integrated Model	to explore the mobile health adoption behavior of potential adopters	usefulness, convenience and monetary values and Gender, age and income are not significant.
Basak et al. (2015)	Turkey	All Populations	TAM	identifying the factors affecting the intention to use personal digital assistant (PDA)	perceived usefulness and perceived ease of use. perceived enjoyment
Okazaki et al. (2012)	Japan	All Populations	Integrated	To evaluate the perceptions and user acceptance of mobile diabetes monitoring.	System quality, information quality, service quality, health improvement, ubiquitous control, privacy and security concerns, perceived value, subjective norms etc.
Okazaki et al. (2015)	Spain	All Populations	MDM	to evaluate the perceptions and adoption of mobile phone-based diabetes monitoring system	Overall quality, net benefits, and perceived value, Experiences etc.
Moores (2012)	France	All Population	TAM	To develop and test an integrated model of IT acceptance in healthcare	Perceived expectancy, effort expectancy, social influence, Attitudes etc.
Cajita et al. (2018)	USA	All Population	TAM	To identify potential facilitators of and barriers of mHealth adoption	Experience, willingness, ease of use, useful features, adequate training, free equipment and doctors' advice

been perceived as an essential aim for hanging the characteristics of a given technological service to make its adoption more attractive (Baadullah et al., 2018; Kuisma et al., 2007).

Due to acknowledgment of the healthcare value of wireless technologies, research on mHealth has been growing exponentially in the last couple of years and the explosive growth of

Mobile phone usage and the large funding initiatives in mHealth have drawn the attention of the researchers (Cameron et al., 2017). Williams et al. (2015) revealed that there are many journals and conferences publishing UTAUT based research, with contributors from many regions although the majority is unsurprisingly from the developed countries. Whereas most academic concentration has gone to understanding user acceptance of technology in organizations, some recent studies have extended the scope of the research to consumer context (Krishnaraju et al., 2013). Khatun et. al (2015) found that the government has extended their resources to the training of doctors and nurses to ensure the effective utilization of eHealth Services. Khatun et al. (2016) also found that mHealth provide accessibility and availability to qualified healthcare professionals at affordable cost, accessible as well as convenient time. It is also recognized that the same IT system can be seen as success by one department or professional group, but as a failure or at least as problematic by another department or professional group.

Few previous studies have been examined from patients' perspective. Lim et al. (2011) revealed that Perceived Usefulness and Self-efficacy positively predicted the intention to use mobile phones to seek health information. Phichitchaisopa & Naenna (2012) found that the factors with a significant effect on mHealth adoption are performance expectancy, effort expectancy, facilitating conditions and behavioral intention on technology adoption. A study conducted by Lee & Han (2015) explored that usefulness, convenience and monetary values of mHealth positively influence adoption intention and gender, age & income do not influence adoption intention.

Liang et al., (2010) explored that performance expectancy and facilitating conditions have significant influence on IT usage while effort expectancy and subjective norms do not influence on IT adoption. Singh (2010) shown that customer attitude (CA), perceived usefulness (PU) and perceived ease of use (PEoU) are vital factors affecting the acceptance of the technology. Performance expectancy, effort expectancy, social influence, facilitating conditions and threat appraisals are the determinants of users' intention to use mHealth services (Sun et al., 2013).

Quaosar et al., (2017) demonstrated that performance expectancy, effort expectancy, social influence, technology anxiety, and resistance to change had a significant impact on the users' behavioral intention to adopt mHealth services.

In contrast, the studies on health technology adoption behavior from the perspective of general patients are relatively rare. This lack is a divergence for the increasing prevalence of health technology or services for consumers who receive medical care (Or et al., 2009). A meta-analysis conducted by **Zhao et al. (2017)** indicated that perceived usefulness, perceived ease of use, perceived vulnerability and perceived severity all have significant impacts on individual attitude, while perceived usefulness, perceived ease of use, subjective norms, trust, perceived risk and attitude significantly influence behavioral intention.

Few or no research have been conducted on general people in the urban areas of Bangladesh (Saroj & Indra, 2008; Jahan & Chowdhury, 2014; WHO, 2006).

In the mobile context to the best of our knowledge, no research has yet studied mHealth adoption behavior of general people by extending the perceived reliability and price value through UTAUT variables in Bangladesh.

2 Theoretical Framework and Hypotheses Development

Different researchers focused on various technology acceptance model and incorporated one or two additional construct and one or two moderating variables that affect the core determinants of intention and made conclusion regarding the factors affecting the

adoption of the technology in different context (Anshari et al., 2016). Some of the theories and models that have been widely accepted and applied to explain the technology acceptance, namely: (a) Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) (b) Technology Acceptance Model (TAM), (Davis,1989) (c) Technology Acceptance Model-2 (Venkatesh & Davis, 2000) d) Technology Acceptance Model-3 (Venkatesh & Bala, 2008) (e) Theory of Planned Behavior (TPB) (Ajzen, 1991), (f) Combined TAM and TPB (C-TAM-TPB) (Taylor & Todd, 1995) and (g) Innovation Diffusion Theory (IDT) (Roger, 1995).

The UTAUT model aims to analyze any technological innovation acceptance and usage intention in consumers' point of view. This diverse body of work has seen numerous new constructs being incorporated into the original theory (Hoehle & Venkatesh, 2015). There are some limitations of the UTAUT theory, an analysis of acknowledged limitations across studies indicated that focusing on a single subject-in terms of a community, culture, country, organization, agency, department, person, or age group was the most widespread reported constraint. Nevertheless, its adequacy in predicting technology adoption in healthcare is unclear especially in developing countries (Venkatesh et al., 2012).

With UTAUT's limitations, there is a need to find variables that are able to improve the model and measure the different dimensions of technology adoption and measure the effect of external factors on the model (Lee et. al., 2003). However, the UTAUT outperformed all the eight models using the same data explaining about 70% of variance in behavioral intention (Venkatesh et al., 2003) and 50% in technology use (Venkatesh et. al., 2012). Many previous studies confirmed the acceptability of UTAUT model in mobile technology in healthcare context (Chiu & Eisenach, 2010).

In order to fill this gap, this study applied the original UTAUT model with two additional constructs. Given the complex environmental, cultural, and social paradigm in developing countries, researchers adopted perceived reliability and price value as two

additional construct that affect consumer's behavioral intention to adopt mHealth services in Bangladesh. The extended proposed model is shown in figure 1.

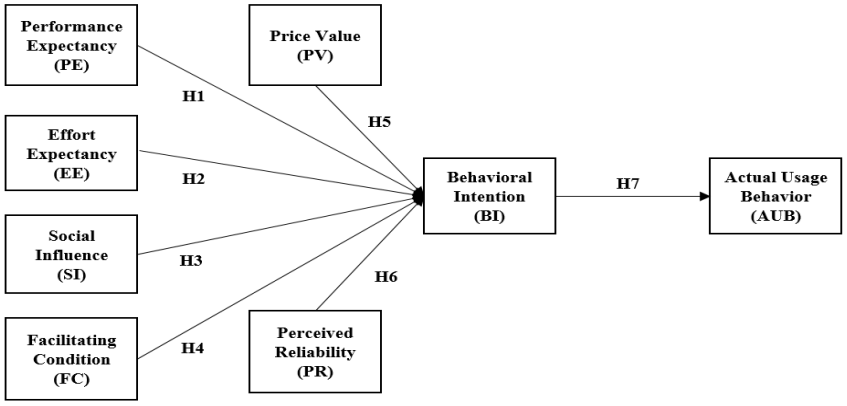

Figure 1 Research Model (Extension of UTAUT Model) (Adapted from Venkatesh et al., 2012; Ganguli and Roy, 2011);

Performance Expectancy (PE)

Performance expectancy is defined as the degree to which an individual believes that using the system will help him/her to attain gains in job performance (Venkatesh et, al., 2003). Carlson et. al. (2006) revealed that PE has direct effect on intention to use mobile phones. Lu et al. (2009) illustrated that performance expectance significantly influenced people to use mobile services. Hoque and Sorwar (2017) have found that PE is one of the significant determinants of users' behavior intention to adopt mHealth. So, the following hypothesis was postulated;

H1: Performance Expectancy is positively correlated with intention to use mHealth services.

Effort Expectancy (EE)

Users tend to consider the effort required before using the information system. EE is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p.428). Users feel connected to technologies that are convenient and simple to use (Alalwan et al., 2017; Ozturk et al., 2016; Shareef et al., 2017). The easy accessibility of a

technology tends to motivate users, making them highly inclined to adopt the technology (Dwivedi et al., 2017; Oliveira et al., 2014). It describes users' opinion of the efforts associated with the use of a technology and customers' benefits vary regarding the kind of click and collect model and the age of customers (Venkatesh et al., 2003; Jara et al., 2018). Therefore, we postulated the following hypothesis:

H2: Effort Expectancy is positively correlated with the intention to use mHealth services.

Social Influence (SI)

The preferences and values of society tend to change the perceptions and viewpoints of users profoundly (Alsheikh & Bojei, 2014; Rana et al., 2015). Technology adoption such as mHealth adoption are often (Hoque and Sorwar, 2017) significantly influenced by social influence. The technology adoption greatly relies not only on an individual belief but also on social influence (Yang et al., 2009; Hsu and Lu, 2004). Social influential factors, such as affiliation and perceived popularity of a new technology, also have an impact (Amin et al.,2008; Kim et al., 2014). In addition, online customers are more influenced by peer groups (Chen & Lin, 2018; Spero & Stone, 2004; Al-Maghrabi et. al., 2011; Singh et al., 2010). Thus, we postulate the following hypothesis;

H3: Social Influence (SI) is positively correlated with the intention to use mHealth services.

Facilitating Condition (FC)

Facilitating condition is defined as "the degree to which an individual believes that an organization and technical infrastructure exists to support the use of the system" (Venkatesh et. al., 2003, p.453). Aggrelidis and Chatzoglou (2009) indicated that FCs significantly affect behavioral intention to use health information systems. Mun et al. (2006) reported that FC has direct impact on behavioral intention and use of technology. Therefore, following hypothesis was postulated:

H4: Facilitating condition is positively correlated with users' intention to use mHealth services.

Perceived Reliability (PR)

In the context of healthcare services, reliability is the most important factor in selecting the health services because of lifetime threat. Reliability, a fundamental attribute of superior service quality (Gunawardana & Perera, 2015; Kumar & Thilagar, 2014), is characterized by Self Service Technology's (SST) perfect technical functioning to deliver the service accurately (Elliott et al., 2013). Nicolaou et al. (2013) found trust to be very important when it comes to exchanging electronic data. In addition to this, Skard & Nysveen (2016) stated that if customers perceived the systems as easy to use they will perceive the systems as reliable and trustworthy. Venkatesh & Bala (2008) specifies that reliability is the perceived output quality in their TAM3. So, hypothesis was postulated;

H5: Perceived Reliability is positively correlated with the intention to use the mHealth services.

Price Value (PV)

Price value means acceptable price levels and best value for money paid (Sweeney & Soutar, 2001). Chen & Chan (2011) also note that cost of technology adoption is neglected in many studies, although it seems to be a critical factor in determining an older adult's acceptance of technology. In general, mobile services are perceived to save money and are often priced lower than alternatives. In the case of mobile health, it can provide more cost-effective delivery of healthcare services than traditional healthcare services by reducing in-person visits, trips to emergency centers and hospitalizations (Meuter et al., 2000). Steele et, al., (2009) demonstrated that cost may be the most prominent determinant influencing the adoption of technology. On the basis of the previous literature, researchers speculate the following hypothesis;

H6: Price value is positively correlated with the intention to use mHealth services.

Behavioral intention and actual use behavior are highly correlated and behavioral intention is a predictor of actual use behavior (Bhattacherjee & Hikmet, 2008). Furthermore, interestingly, behavioral intention explained that the intention to use a technological service should be done when a service is still new in the markets (Delone & McLean, 2003). Turner et al. (2010) found that Behavioral Intention is highly correlated with actual usage and they also confirmed the presence of an intention–behavior gap among participants. So the following statement was hypothesized;

H7: Behavioral Intention is positively correlated with the actual purchase behavior of mHealth services.

Research Design and Methods

The research philosophy of this study is positivism approaches where quantifiable hypotheses were developed to be tested. In this study, deductive approach has been followed since research objectives and hypotheses have been developed on the basis of existing theory or knowledge.

The Target Population

The target population for this study was the general inhabitants of Dhaka City, the Mega and Capital City of Bangladesh where most of the citizens use smart phone for online services with the high internet penetration. Most of the medical or clinical services are centralized in a specific area whereas Dhaka city is a densely populated city. So, it is suitable area for the study. Convenience sampling method was used as survey instrument with judgment sampling method in some aspect. Moreover, it is cost effective and has been widely accepted in Information System (IS) (Ritchie et al., 2013). Theoretically, the sample size for executing PLS software requires 10 times of the number of indicators associated with the most complex construct or the largest number of antecedent constructs linking to an endogenous construct. Consent forms and information sheets were shown to all the participants which clearly explained the

purposes of the study. Respondents were also made aware of their rights to withdraw participation at any time during the study period and may request the findings of the study after completion.

Measures

The reliability and validity should be evaluated before testing the proposed hypotheses (Bagozzi, 1994). Therefore, items selected for the constructs were mainly adapted from literature and modified to fit the specific technology studied in the context of developing countries including Bangladesh. The variables in the proposed model were measured using 5-point Likert scale from one (Strongly Disagree) to five (Strongly Agree) to evaluate the responses from the participants. Furthermore, the literature review, discussions with academicians, researchers, medical experts and personal experiences helped in the generation of scale items. Items of Perceived reliability adapted from (Ganguli & Roy, 2011; Gunawardana & Perera, 2015; Van et al., 2003; Walker et al., 2002). Price value from UTAUT-2 (Viswanath & Venkatesh, 2012), Behavioral intention (Venkatesh, 2012), Actual Use Behavior from (Taylor & Todd, 1995); Performance expectancy, Effort Expectancy, Social Influence and Facilitating Condition from (Venkatesh, 2003).

Before proceeding, Researchers established the face and content validities of the confirmatory factors affecting the adoption of mHealth services scales for items through deliberations with subject experts, researchers, physicians, nurses and patients etc. The questionnaire was tested with twenty respondents chosen randomly for the pilot test and results obtained from the questionnaire were modified according to some difficulties that the researchers observed during the pre-Pilot test and therefore changes have been made accordingly.

Questionnaire Design and Data Collection

To test our proposed hypotheses, a survey of patients at different private and public hospitals in Dhaka, Bangladesh, was conducted. Since most of the private and public

hospitals in Dhaka offer eHealth/mHealth services with high internet penetration. Respondents were screened for whether they had ever conducted mHealth services. The interviews were conducted over a period of three weeks by a team of three interviewers who were well-trained and professional in conducting the personal interviews. To contact with the respondents, trained interviewers from a professional research firm randomly approached people in public places or on a street and asked them to participate in an interview. At the initial stage of face to face interviews, the interviewers presented the mHealth concept. Next, they asked about the respondents' intention to adopt mHealth and posed multiple observed questions for each value construct using five point Likert scales. The first part of the questionnaire consists of questions based on the respondents' demographic profile like age, gender, education, experience of mobile phone usage & mHealth experiences etc. The second part included questions on the subject of each variable in the proposed research model. The study distributed 323 questionnaires, and 304 were returned, resulting in a 94% response rate. Eight incomplete questionnaires were excluded from the analysis. 296 valid responses were obtained for analysis. Data management and analysis was performed using smart PLS 2.0. Statistical significance was analyzed using analysis of variance and t-test as appropriate.

4 Result and Discussion

The demographic profiles of the respondents are provided in the Table 1. The majority of the respondents were female (56%). Participants were in the range of different age level. Majority of the respondents were graduate (71%), post graduate (28%) and PhD holders (1%). Experiences in using mHealth were 1 to 3 years (61%), whereas experiences in using mobile phone were more than 5 years (86%).

Table 1 Participants' Description (N=296)

Variables	Frequency	Percentages	Variables	Frequency	Percentage
Gender			**Experiences in Using mHealth**		
Male	129	44	1 to 3 years	180	61
Female	167	56	4 to 6 years	80	27
Age Level					
18 Above	60	20	7 to 9 years	31	10
25 Above	70	24	10 +	5	2
35 Above	90	30	**Experiences in Using Mobile Phone**		
45 Above	50	17			
55 Above	26	9			
Level of Education			1 to 5 years	40	14
Graduate	210	71	6 to 10 years	170	57
Postgraduate	84	28	11 to 15 years	50	17
PhD/Others	2	1	16 +	36	12

The following table 2 shows that all the constructs used in the research model have Cronbach's alpha and composite reliability values of more than 0.80, which is higher than the threshold value recommended by literature.

Table 2 Reliability and Convergent Validity

Constructs	No. of Items	Items Loading	CR	AVE	Cronbach'@
Performance Expectancy	4	0.85-0.87	0.89	0.75	0.89
Effort Expectancy	4	0.83-0.87	0.91	0.72	0.87
Social Influence	4	0.87-0.89	0.93	0.76	0.90
Facilitating Condition	5	0.80-0.88	0.93	0.73	0.91
Perceived Reliability	4	0.78-0.89	0.91	0.72	0.87
Price Value	3	0.87-0.92	0.93	0.80	0.88
Behavioral Intention	3	0.86-0.89	0.91	0.76	0.84
Actual Usage	4	0.77-0.88	0.89	0.68	0.84

The measurement model shows that AVE are ranged from 0.681 to 0.805, whereas cross loading matrix shows that items loading ranging from 0.773 to 0.921 are higher than the threshold level recommended by literature. Therefore, conditions for convergent validity requirement were satisfied. The calculated square root of AVE, which is shown in above table 2, was greater than the corresponding correlation, Confirming the discriminant validity of the data.

Table 3 Correlation Matrix and Square Root of the Average Variance Extracted (AVE)

Construct	Mean	S.D.	AU	BI	EE	FC	PE	PR	PV	SI
AU	3.56	0.83	**0.825**							
BI	3.56	1.00	0.364	**0.873**						
EE	3.63	0.95	0.426	0.584	**0.851**					
FC	3.66	0.96	0.419	0.615	0.547	**0.854**				
PE	3.67	0.97	0.299	0.546	0.504	0.498	**0.867**			
PR	3.51	0.99	0.320	0.562	0.525	0.562	0.446	**0.847**		
PV	3.39	1.07	0.116	0.201	0.112	0.247	0.099	0.184	**0.897**	
SI	3.48	1.05	0.215	0.500	0.461	0.441	0.430	0.428	0.257	**0.873**

Note: PE=Performance Expectancy, EE=Effort Expectancy, SI= Social Influence, FC= Facilitating Condition, PR= Perceived Reliability, BI=Behavioral Intention

In this study, discriminant validity was assessed by comparing the absolute value of the correlations between the constructs and the square roots of the average variance extracted by a construct. When the correlations are lower than the square root of the average variance extracted by a construct, constructs are said to have discriminant validity (Fornell & Larcker, 1981). As shown in table, all square roots of the AVEs are higher than the correlations between constructs and that definitely confirmed adequate discriminant validity. In order to avoid multicollinearity, the correlations among all constructs should be below 0.85 threshold (Kline, 1998).

4.1 Structural Model

The bootstrapping method was used to test the hypothesized relationship at a level of significance of 0.05 ($p<0.05$) (Efron & Tibshirani, 1993). In this stage, the study tests the relationship between dependent and independent variables by path coefficient (β) and t-statistics at a level of significance of 0.05 ($p<0.05$) shown in table 3. The study shows that PE ($t=2.210$, $\beta=0.181$), EE ($t=2.045$, $(\beta)=0.201$), SI ($t=1.997$, $\beta=0.136$), FC ($t=2.423$, $\beta=0.250$), PR ($t=1.990$, $\beta=0.173$), BI ($t=4.832$, $\beta=0.372$), and had a significant effect on general people's intention to adopt mHealth services. Thus, H1, H2, H3, H4, H6 & H7 were supported. However, surprisingly, price value ($t=0.579$, $\beta=0.034$) had no significant effect on general people's intention and actual use of mHealth services. So, H5 were not supported.

Table 3 Testing The Hypotheses in The Structural Model

Hypothesis	Relationship	β	Std error	t-value	P-values	Decision
H1	PE -> BI	0.181	0.082	2.210	0.027	supported
H2	EE -> BI	0.201	0.097	2.045	0.041	supported
H3	SI -> BI	0.136	0.069	1.997	0.046	supported
H4	FC -> BI	0.250	0.104	2.423	0.015	supported
H5	PV -> BI	0.034	0.054	0.579	0.562	rejected
H6	PR -> BI	0.173	0.086	1.990	0.047	supported
H7	BI -> AU	0.372	0.076	4.832	0.000	supported
Note: t-value >= 1.96 at p = 0.05 level, t-value >= 2.58 at p = 0.01 level, t-value >= 3.29 at p = 0.001 level,						

4.2 Discussion

The UTAUT model was proven to be stronger to the other competing models (Venkataesh et al. 2003; Park et al. 2007; Venkataesh & Zhang 2010), but only a little UTAUT-based research exists, particularly compared huge TAM/TPB-based research. This is why Venkatesh and Zhang (2010) proclaimed that studies examining and enhancing the generalizability and validity of UTAUT in various technology contexts are

demanded. Based on the feedback from 296 respondents in Bangladesh, the empirical evidence of this study indicates that the variances of consumer intention and actual behavior can be significantly explained by the extended UTAUT theory. This study added on trust based construct (Perceived Reliability) to the core determinants of the UTAUT model and another resource based construct (price value). Regarding the phenomenon that the adoption rate and usage of mHealth are still marginal, this study reveals that social influence, perceived financial cost, performance expectancy, and perceived reliability, in their order of influencing power, were the four salient factors in predicting consumer intention to adopt mHealth services.

The findings of the study are in agreement with the result of previous studies on the application of UTAUT model in mHealth adoption. Results indicate that the extended UTAUT is a good predictive model of general people's intention to use mHealth services. Out of the seven constructs, Effort expectancy and Facilitating condition have the highest positive impact on the intention to use mHealth services in comparison to other constructs. Perceived reliability has a significant impact on the adoption of mHealth due to life time threat for wrong treatment. In Bangladesh, healthcare system is losing reliability day by day due to wrong treatment which in turn ultimately cause the death of the patients. So, people are going neighboring countries for better treatment at high cost. But patients want quality services rather than low cost. It is somewhat surprising that price value has no significant effect on behavioral intention to use. So, it is confirmed that price value was less salient to the general people those who are health conscious which is the inconsistent with the research conducted by Deningtyas & Ariyanti, 2017). On the other hand, Behavioral intention has the strongest impact on the actual usage behavior. Previous studies of technology adoption also found this relationship to be extremely significant (Ami-Narh & Williams, 2012; Carlsson, 2006; Ifinedo, 2012; Venkatesh et al., 2003).

Conclusion

This study is the milestone for developing countries to examine factors affecting the adoption of mHealth services especially in Bangladesh. The present study confirms previous findings and contributes additional evidence that suggests Perceived reliability is vital for adoption of mHealth in the context of Bangladesh. For achieving greater adoption and use of mHealth services, an effective roadmap needs to be set and followed by both public, private and NGOs level healthcare providers. Although the current study is based on a small sample of participants, the findings suggest that the study contributes theoretically to the existing literature of mHealth usage within the domain of Bangladesh for a number of reasons. Firstly, it produces new quantitative knowledge about the factors that influence the usage of mHealth in Bangladesh. Secondly, this study got reliable findings, which can be generalized to the targeted population. Thirdly, this study tested the UTAUT model in a new context (i.e. Bangladesh) and new technological services (i.e. mHealth services). The findings of this study contribute to the development of strategies and policies to enhance mHealth services by policy makers, government agencies, NGOs and mobile phone companies in Bangladesh. This research has several practical applications for Bangladesh decision makers in order to increase the level of mHealth adoption rate. This is done by manipulating the effective variables from each model which were proved to have significant influence over adoption intention and actual usage behavior among Bangladeshi mHealth users. A limitation of this study is that the numbers of patients and controls were relatively small in size. However, with a small sample size, caution must be applied, as the findings might not be generalized to the entire population of Bangladesh. This research has thrown up many questions in need of further investigation i.e. telemedicine adoption behavior, telecare behavior in particular chronic disease with new constructs.

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