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Research Article

Examining consumer use of mobile health applications by the extended UTAUT model

Tüketicilerin mobil sağlık uygulamaları kullanımının genişletilmiş UTAUT modeli ile incelenmesi

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Abstract

Today, rapid changes and innovations in technology cause changes in the health sector as in many areas. Especially mobile technologies and applications are increasing their usage areas in the health sector day by day. Thanks to these mobile health applications, consumers provide a lot of convenience and advantages in healthy eating, reproductive health, disease monitoring, access to health records, etc. The study aims to investigate consumers' usage of mobile health (mHealth) applications with the extended Unified Theory of Acceptance and Use of Technology (UTAUT) model. It is possible to say that it is an empirical study since the data were collected with the questionnaire method. Because this is research based on a cause-and-result relationship, the relationships were revealed with Structural Equation Modelling (SEM). The data were collected between November 2020 and January 2021 via the Google Forms platform from 354 individuals using convenience sampling through social media channels. The SPSS and SmartPLS programs were used for the analyses. First of all, it was determined that the scales' validity and reliability were ensured by performing validity and reliability analysis of the research model. According to the findings, it was revealed that performance expectancy, effort expectancy, social influence, facilitating conditions, habit, hedonic motivation, and perceived trust have a significant effect on the intention to use mHealth applications and, the intention to use mHealth applications has a significant effect on the behaviour of use mHealth applications.

Keywords: Extended UTAUT, Mobile Health, Behavioral Intention

JEL Codes: M31, I12

Öz

Günümüzde teknolojide yaşanan hızlı değişim ve yenilikler, birçok alanda olduğu gibi sağlık sektöründe de değişimlere neden olmaktadır. Özellikle mobil teknolojiler ve aplikasyonlar sağlık sektöründe kullanım alanlarını her geçen gün arttırmaktadır. Bu mobil sağlık uygulamaları sayesinde sağlıklı beslenmeden üreme sağlığına, hastalık takibine sağlık kayıtlarına erişime vb konularda tüketicilere birçok kolaylık ve avantaj sağlamaktadır. Bu çalışma tüketicilerin mobil sağlık uygulamaları kullanımını genişletilmiş UTAUT modeli ile incelenmesini amaçlanmaktadır. Veriler Kasım 2020- Ocak 2021 tarihleri arasında Google Formlar aracılığıyla sosyal medya kanallarından kolayda örnekleme yöntemi kullanılarak anket ile 354 kişiden toplanmıştır. Neden sonuç ilişkisine dayalı bir araştırma olduğundan Yapısal Eşitlik Modellemesi (YEM) ile hipotezler test edilmiştir. Analizler için SPSS ve SmartPLS programları kullanılmıştır. Öncelikle araştırma modelinin geçerlilik ve güvenilirlik analizleri yapılarak ölçeklere ilişkin geçerlilik ve güvenirliğin sağlandığı tespit edilmiştir. Araştırma bulgularına göre ise, performans beklentisinin, çaba beklentisinin, sosyal etkinin, kolaylaştırıcı imkânların, alışkanlığın, hedonik motivasyonun ve algılanan güvenin mobil sağlık uygulamalarını kullanmaya yönelik niyetleri etkilediği, mobil sağlık uygulamalarını kullanmaya yönelik niyetin ise mobil sağlık uygulamalarını kullanım davranışını etkilediği tespit edilmiştir.

Anahtar Kelimeler: Genişletilmiş UTAUT, Mobil Sağlık, Davranışsal Niyet

JEL Kodları: M31, I12

Introduction

Today, mobile devices have extensive contents and resources in terms of electronic health applications. For this reason, it is natural that they are accepted as the most suitable devices for electronic health (e-health) applications, and they provide an infrastructure for mobile health (mHealth) applications. Technology that is developing every day and intelligent devices provide new opportunities today with mHealth applications. With mHealth applications installed on mobile devices, individual awareness of health is better than in the past. Today, mHealth applications allow ill individuals to check their health and healthy individuals to protect their health. It is expected that, with the help of these applications, the number of people in society with consciousness will increase day by day (www.abainnolab.com, 2020).

Additionally, due to several reasons, such as the increase in costs and patient numbers in the health sector and the numerical inadequacy of healthcare personnel, mobile technologies become prominent as an alternative method for the sustainability of providing health (Arslan and Demir, 2017). Consumers who use technology in every area can monitor several data such as medication times, several steps, and menstruation calendars from their mobile devices. When the field related to mobile health is examined, it is seen that there are applications developed for consumers of every age and highly varying needs (Güler, 2015).

The future of a technology depends on the expectations, opinions, attitude and thoughts of those who use it. Therefore, one of the most critical factors affecting and determining mobile health applications' use is users. For this reason, the study aims to investigate consumers' usage of mobile health (mHealth) applications with the extended Unified Theory of Acceptance and Use of Technology (UTAUT) model.

Literature review

mHealth (Mobile Health)

The health sector is one of the sectors where mobile applications are used. The prevalence of the use of mobile devices also increases the use of mHealth applications. Individuals who use mHealth applications can monitor medication times, heart rate and a number of their steps from their mobile devices. When the mHealth market is examined, applications developed for every need and age may be found (Güler, 2015). Mobile technologies refer to wireless devices and sensors that can be accessed, worn and carried by the consumer in daily activities, while these technologies are defined as cost-effective tools (Ni, Wu, Samples and Shaw, 2014; Kumar, Nilsen and Swendeman, 2013).

Today, it may be argued that mobile applications have become almost an indispensable part of daily life. The health sector is also one of the sectors that have been affected by and responded to this change and development the fastest. Mobile applications that are increasing day by day are also getting a severe place in health. Mobile health technologies may provide consumers with different opportunities, and applications may have the power to increase consumers' quality of life (Güler, 2015).

mHealth may be defined as providing health services with smart devices and mobile technologies (Ni et al., 2014; Güler and Eby, 2015). According to Hernandez, Mora, Villegas, Passariello and Carrault (2001) and Yan, Huo, Xu and Gidlund (2010), mHealth refers to tools, processes developed to support e-health service applications and software related to health services provide communication. The World Health Organization defines mHealth as supporting health-related applications to mobile devices (Liu, Zhu, Holroyd and Seng, 2011). According to another definition, mHealth refers to innovative health applications that increase the health system's effectiveness in remote disease management, collection of health data, and early warning systems by using mobile communication technology and infrastructure (TUSIAD, 2020). From another perspective, mHealth is also expressed as mobile communication and computation technologies in health services (Free, Phillips, Watson, Galli, Felix, Edwards and Haines, 2013). While mHealth is a still-developing field, it has critical importance in supporting the health system to make health services prevalent, reducing their cost and increasing their quality (TUSIAD, 2020).

According to the Global Mobile Application Trends report of the firm Adjust which works on mobile measurement, the installation rates of mHealth applications increased by 67% in the world with the quarantine process brought by the COVID-19 pandemic, and 593 million health and fitness applications were downloaded in the first quarter of 2020. Additionally, in the same report, it was stated that there was an increase of 144% in the rates of downloading fitness applications in Turkey from February to April, and besides this, the rate of active users increased by 21%. Moreover, while there was a decrease of 76% in the download rates in July, according to April, the 40% increase in the active use rate was striking (www.dijitalage.com, 2020). It may be stated that users use already downloaded applications rather than downloading more applications.

According to research conducted by the firm Sector Tower, in 2020, among mHealth applications downloaded to smartphones using both iOS and Android operating systems in Turkey, the first three places belonged to Hayat Eve Sığar (HES, [Life Fits Inside the Home]), e-Nabız [e-Pulse] and applications for exercising without equipment at home. The applications that followed were weight and exercise applications for Android and applications like meditation, menstruation calendar, exercise and pulse measurement applications for iOS (www.sensor.com, 2020).

Greenspun and Coughlin (2012) stated that possibilities and opportunities that mHealth applications can provide as follows: They may be a communication tool that shares real-time information and messages, may act as a remote monitor that can bring care home, monitor the patient's health status in real-time and report it. Additionally, they provide a video conference feature that allows both the patient and healthcare professionals to communicate bilaterally, and they may be like a friend to motivate and remind the user to take their medication.

The unified theory of acceptance and use of technology (UTAUT)

The Theory of Reasoned Action is a theory that aims to understand the facts that lie under the behaviours of individuals and argues that individuals assess the outcomes of behaviour before performing that behaviour, and unconscious instincts and strong desires do not have a place at this stage (Ajzen and Fishbein, 1980). The Theory of Planned Action was created to eliminate the aspects of the theory as mentioned above that were considered shortcomings with the idea that the assumption in the Theory of Reasoned Action that whether or not a behaviour will take place is under the control of the individual contradicts reality (Ajzen and Fishbein, 1980). The Technology Acceptance Model aimed to make the Theory of Reasoned Behavior stronger by adding the variables of perceived usefulness and perceived ease of use and the already existing variables in theory (Davis, Bagozzi and Warshaw, 1989). With the effectiveness of the variable of perceived usefulness in studies and the expansion of the phenomena forming this variable, the Technology Acceptance Model 2 was proposed (Venkatesh and Davis, 2000).

The fact that there were several technology acceptance models in the relevant field, each of them researched with different variables, and could not utilize contributions that could arise from other variables, gave rise to the need for a synthesized model. For this reason, Venkatesh, Morris, Davis and Davis; 2003) proposed the UTAUT (Unified Theory of Acceptance and Use of Technology) model. The limitations of other models played a role in the emergence of the UTAUT model. The main reason why this model gained acceptance was that it was created by taking several theories at the point of acceptance of technology as a basis, studies that had been conducted in different countries with UTAUT showed similarities, and it had proven its international validity (Chang, 2012).

Definition of variables and development of hypotheses

The term performance expectancy is defined as individuals' belief that a system will increase their job performance when they use it (Venkatesh et al., 2003). This study used to believe a consumer using a mHealth application that application will increase their health expectancy. According to Lu, Yu and Liu (2009), performance expectancy affects consumers significantly in terms of mobile applications usage. It is possible to see that several studies in the literature have investigated the effects of mHealth applications on behavioural intentions (Boontarig, Chutimaskul, Chongsuphajaisiddhi, and Papasratorn, 2012; Phichitchaisopa and Naenna, 2013; Hoque and Sorwar, 2017; Alam, Hu and Barua, 2018; Alam, Hoque, Hu and Barua, 2020). The common point of these studies is that they have revealed the positive effects of performance expectancy on consumers' intention to use mHealth applications. In light of this information, H_1 may be expressed as follows:

H_1: Performance expectancy has a positive effect on intentions to use a mHealth application.

According to Venkatesh et al. (2003), effort expectancy is also a significant variable that plays a role in technology acceptance and use behaviour. The authors defined effort expectancy as the degree of ease regarding the use of technological systems. In this study, effort expectancy was used to consider mHealth applications as easy by consumers. If it is easy to use technology, as consumers are more easily motivated, their adaptation to such technologies would be more accessible (Or, Karsh, Severtson, Burke, Brown and Brennan, 2011; Alalwan, Dwivedi and Rana, 2017). In studies examining mHealth applications in the framework of UTAUT, it has been revealed that effort expectancy has a positive effect on intentions to use mHealth applications (Boontarig et al., 2012; Sun, Wang, Guo and Peng, 2013;

Lee and Han, 2015; Alam et al., 2018; Alam et al., 2020). According to these considerations, H_2 was established as follows:

H_2: Effort expectancy has a positive effect on intentions to use a mHealth application.

Social influence, which is another variable of the UTAUT model that affects behavioural intentions, believes that the individual needs to use new technology (Venkatesh et al., 2003). In this study, social influence was used to support consumers around the consumer to use mHealth applications. Alam et al.'s (2018) study on the adoption of mHealth applications by Bangladeshi consumers demonstrated that social influence positively affected mHealth application use intentions. In the study by Boontarig et al. (2012) conducted with Thai consumers, it was also stated that social influence has a positive effect on intentions to use eHealth applications via smartphones. In this context, H_3 may be stated as follows:

H_3: Social influence has a positive effect on intentions to use a mHealth application.

Facilitating conditions are the degree to which the individual believes there is an infrastructure supporting their use of a technological system (Venkatesh et al., 2003). In this study, facilitating conditions were used as consumers' belief in the technology and knowledge they have about their use of mHealth applications. Studies in the literature on this topic have presented that facilitating conditions have a positive effect on the intentions of consumers to use mHealth applications (Boontarig et al., 2012; Phichitchaisopa and Naenna, 2013; Hoque and Sorwar, 2017; Alam et al., 2018; Alam et al., 2020). Accordingly, H_4 was created as follows:

H_4: Facilitating conditions have a positive effect on intentions to use a mHealth application.

Habit, one of the variables added to the UTAUT2 model, the extended UTAUT model by Venkatesh, Thong and Xu (2012), as defined by Limayem, Hirt and Cheung (2007) as the degree of the tendency of individuals to perform their behaviours due to learning automatically. The result that has been reported by many studies which investigated the effects of habit on behavioural intentions by using the UTAUT2 model is that habit has a positive effect on intentions (Venkatesh et al., 2012; Farooq, Salam, Jaafar, Fayolle, Ayupp, Markovic, and Sajid, 2017; Tak and Panwar, 2017; Gunasinghe, Hamid, Katibi and Azam, 2019; Saumell, Forgas-Coll, Sánchez-García, and Robres; 2019). Therefore, in light of this information, H_5 may be stated as follows:

H_5: Habit has a positive effect on intentions to use a mHealth application.

Hedonic motivation, which is an essential variable in determining the acceptance and use of technology in the framework of the UTAUT2 model, is defined as the pleasure and enjoyment that the individual gets from technology use (Brown and Venkatesh, 2005). Some studies in the literature have revealed that hedonic motivation influences the acceptance and use of technology (Childers, Carr, Peck and Carson, 2001; Der Van, 2004; Brown and Venkatesh, 2005; Venkatesh et al.,2012; Farooq et al., 2017; Tak and Panwar, 2017; Gunasinghe et al., 2019; Saumell et al., 2019). According to this information, H_6 was established as follows:

H_6: Hedonic motivation has a positive effect on intentions to use a mHealth application.

As in electronic commerce, perceived trust is a factor that also affects consumer behaviours (Lee, 2005). As consumers' trust in electronic commerce increases, their behavioural intentions are also positively affected (Kim, Ferrin and Rao, 2008). Additionally, in some studies, perceived trust has affected behavioural intentions as a significant technology acceptance factor (Chandra, Srivastava and Theng, 2010; Shin, 2010). Alam et al. (2018) stated that one of the most critical factors in selecting health services is trust due to their life-long threat. Additionally, in their study, they revealed that perceived trust positively affects intentions to use mHealth applications. Accordingly, H_7 was as follows:

H_7: Perceived trust has a positive effect on intentions to use a mHealth application.

According to Davis (1989), behavioural intention means behavioural preparation towards accepting, using or embracing a particular technology. In this study, behavioural intention refers to the intention of consumers to use mHealth applications. Hundreds of studies on adopting any technology in the UTAUT model framework have presented the positive effect of behavioural intentions on behaviour. Furthermore, this result has not changed in studies investigating the effects of intentions to use mHealth applications on behaviours of using mHealth applications (Alam et al., 2018; Alam et al., 2020). Based on this information, H_8 was established as follows:

H_8: Behavioral intention of using mHealth applications has a positive effect on using mHealth applications.

Method

As this study adopted a positivist approach, a survey was used as the data collection method. The data were collected between November 2020 and January 2021 via the Google Forms platform from 354 individuals using convenience sampling through social media channels. The sample of the study consisted of consumers who had used at least one mHealth application before. Ethics committee approval was obtained from Bilecik Şeyh Edebali University Ethics Committee on 08.02.2021 (document number: E-54674167-050.01.04-4970) for the questionnaire form used in the collection of research data. The scales related to the variables that were used in the study were adapted from various studies and used by a translation into Turkish with the translate-back translate method. The scales of social influence, facilitating conditions, performance expectancy, perceived trust and effort expectancy were adapted from the study by Alam et al. (2018), the habit and hedonic motivation scales were adapted from the study by Venkatesh et al. (2012), and the scales for behavioural intention towards the use of mobile health applications and behaviours of using mobile health applications were adapted from the study by Qingfei, Shaobo and Gang (2012) in this study. The variables of performance expectancy, effort expectancy, facilitating conditions, habit, perceived trust and mobile health applications usage behaviour were measured with four statements on a five-point Likert-type scale.

In contrast, the variables of social influence, hedonic motivation and behavioural intention towards mHealth application usage were measured with three statements on a five-point Likert-type scale. Before the survey form used in the study was distributed on the internet environment, a pilot implementation was made with 22 individuals. As a result of this implementation, the parts that the participants did not understand were revised. According to Hair, Hult, Ringle and Sarstedt (2017), it is needed to reach a sample size of ten times the number of observed variables in a study. This study included 33 observed variables. Therefore, it may be stated that the sample consisting of 354 was adequate for this study.

Initially, frequences analysis was conducted to describe participants' demographic characteristics. Then, to test the goodness of fit of the research model, confirmatory factor analysis was conducted. Secondly, to test the hypotheses and the model, path analysis was conducted that structural equation modelling was utilized with the SmartPLS package software, and Bootstrapping analysis, which is the resampling method, was run 5000 sub-samples were selected. The effects of the variables were measured. Finally, a Blindfolding analysis was conducted to determine the predictive power coefficients of the research model. The model of the study was as shown in Figure 1.

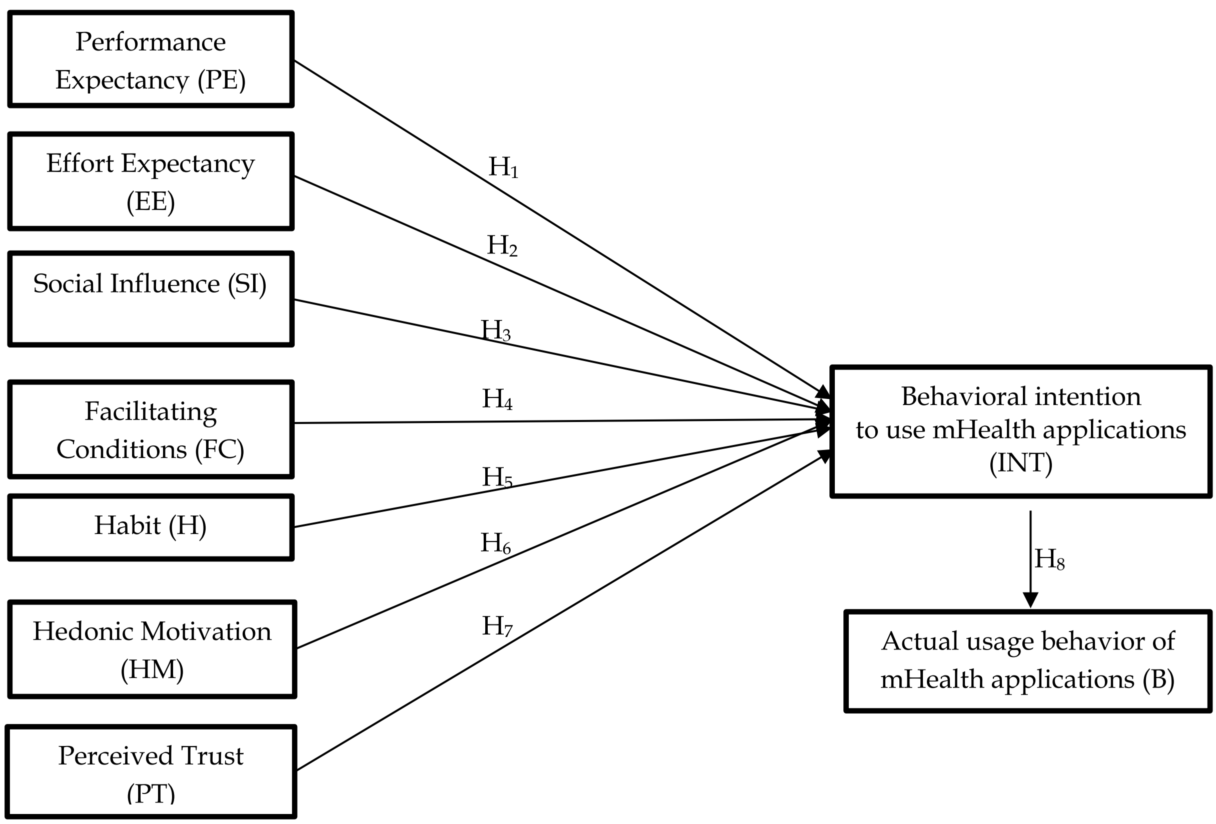

Figure 1: Research Model

Data analysis

Information on the sample of the study is presented in Table 1. As seen in Table 1, 54.5% of the sample were female, and 45.5% were male. In terms of age, 52.3% of the participants were 18-25 years old. Two-thirds of the participants consisted of single individuals, and 55.6% had undergraduate degrees. In terms of occupation, 26.8% of the participants were students, and 21.5% were civil servants. Regarding income status, the first three of the categories had a balance distribution, while the other two had a balanced distribution.

Table 1: Demographic Characteristics of the Participants

Gender	f	%	**Occupation**	f	%
Female	193	54,5	Academician	42	11,9
Male	161	45,5	Employee	53	15,0
Age	f	%	Civil Servant	76	21,5
18-25	185	52,3	Self-Employment	23	6,5
26-35	66	18,6	Student	95	26,8
36-45	51	14,4	House-wife	27	7,6
46-55	33	9,3	Retired	17	4,8
56-65	19	5,4	Craft/Tradesman	9	2,5
Marital Status	f	%	The Others	12	3,4
Married	116	32,8	**Income Status**	f	%
Single	238	67,2	2500 TL and below	91	25,7
Education Level	f	%	2501- 4500 TL	96	27,1
Primary School	13	3,7	4501- 6500 TL	92	26,0
College	59	16,7	6501- 8500 TL	38	10,7
Vocational High School	45	12,7	8501 TL and above	37	10,5
Undegraduate	197	55,6			
Graduate	40	11,3			

Construct validity

Confirmatory factor analysis was conducted to test the construct validity of the research model. As a result of the confirmatory factor analysis, one item belonging to the variable of behaviour towards mobile health application use with a factor load of lower than 0.708 was removed from the analysis (Hair, Hult, Ringle and Sarstedt, 2014).

In the scope of construct validity, first of all, convergent validity was checked. In order to express the presence of convergent validity that the composite reliability (CR) value and the Cronbach's alpha reliability coefficient should be 0.7 or higher, the factor loads should be 0.5 or higher, and the AVE (Average Variance Extracted) value should be 0.5 or higher (Fornell & Larcker, 1981). According to the values in Table 2, the CR (Composite Reliability) values were higher than 0.6, and therefore, it may be stated that convergent validity and internal reliability were provided (Fornell & Larcker, 1981).

Table 2: Confirmatory Factor Analysis Results

	Factor Loadings	Cronbach Alpha Coefficients	AVE	CR	t-Values	VIF
Performance Expectancy (PE)						
"PE3. Using mHealth applications help me accomplish things more quickly."	0,900	0,880	0,736	0,917	66,986	3,078
"PE1. I find mHealth applications useful in my daily life."	0,868				52,551	2,282
"PE2. Using mHealth applications increase my chances of achieving things that are important to me."	0,852				48,810	2,151
"PE4. Using mHealth applications increases my productivity."	0,807				28,128	2,113
Effort Expectancy (EE)						
"EE3. I find mHealth applications easy to use."	0,947	0,952	0,873	0,965	97,727	6,514
"EE2. My interaction with mHealth applications are clear and understandable."	0,945				106,647	6,326
"EE1. Learning how to use mHealth applications are easy for me."	0,935				76,277	4,599
"EE4. It is easy for me to become skillful at using mHealth applications."	0,910				58,540	3,338
Social Influence (SI)						
"SI2. People who influence my behavior think that I should use mHealth applications."	0,908	0,885	0,813	0,929	61,524	2,891
"SI3. People whose opinions that I value prefer that I use mHealth applications. "	0,902				45,786	2,544
"SI1. People who are important to me think that I should use mHealth applications. "	0,895				56,970	2,311
Facilitating Conditions (FC)						
"FC3. mHealth applications are compatible with other Technologies."	0,899	0,868	0,723	0,912	47,098	3,419
"FC1. I have the resources necessary to use mHealth applications."	0,895				47,186	3,368
"FC2. I have the knowledge necessary to use mHealth applications."	0,881				31,325	3,053
"FC4. I can get help from others when I have difficulties using mHealth applications."	0,712				17,608	1,330
Habit (H)						
"H3. I must use mHealth applications."	0,880	0,870	0,720	0,911	52,722	2,501
"H1. The use of mHealth applications have become a habit for me."	0,849				41,140	2,154
"H2. I am addicted to using mHealth applications."	0,845				34,256	2,160
"H4. Using mHealth applications have become natural."	0818				26,192	1,955
Hedonic Motivation (HM)						
"HM3. Using mHealth applications are very entertaining."	0,953	0,930	0,878	0,956	145,734	4,921
"HM2. Using mHealth application are enjoyable."	0,930				101,748	3,479
"HM1. Using mHealth applications are fun."	0,926				71,536	3,644
Perceived Trust (PT)						
"PT2. I can rely on the service provided by mHealth applications."	0,919	0,921	0,809	0,944	66,414	3,649
"PT3. mHealth applications are consistent over the time."	0,910				62,185	3,431
"PT4. mHealth applications maintain standard continuously."	0,908				77,416	3,178
"PT1. I obtain accurate and error free services from mHealth applications."	0,859				42,957	2,414
Behavioral Intention to Use mHealth Applications (INT)						
"INT2. I will always try to use mHealth applications in my daily life."	0,916	0,897	0,829	0,936	76,032	2,918
"INT3. I plan to continue to use mHealth applications frequently."	0,913				69,251	2,823
"INT1. I intend to continue using mHealth applications in the future."	0,903				58,799	2,542
Actual Usage Behavior of mHealth Applications (B)						
"B1. mHealth applications are a pleasant experience."	0,900	0,788	0,706	0,877	50,719	2,346
"B2. I really want to use mHealth applications to keep my health safe."	0,893				72,878	2,209
"B4. I use mHealth applications on regular basis."	0,713				18,415	1,339
"B3. I spend a lot of time on mHealth applications." (dropped)	This statement was dropped the scale because of it's factor loading was smaller than 0,708.					

Second of all, according to the Fornell and Larcker criterion, discriminant validity was checked. Table 3 shows the square roots of the AVE values of the variables and the correlation coefficients between the variables. In the table, bold values on the diagonal are the square roots of AVE. These values have to be more significant for discriminant validity than the correlation values (Compeau & Higgins, 1995; Fornell & Larcker, 1981). Therefore, looking at the table's values, it is seen that the square root of the AVE for each construct was more remarkable than its correlations with the other constructs. Accordingly, it may be stated that discriminant validity was also provided.

Table 3: Discriminant Validity

	EE	FC	H	HM	INT	PE	PT	SI	B
EE	***0,935***								
FC	0,422	***0,850***							
H	0,222	0,533	***0,848***						
HM	0,201	0,396	0,365	***0,937***					
INT	0,383	0,587	0,482	0,496	***0,911***				
PE	0,236	0,507	0,392	0,464	0,568	***0,858***			
PT	0,298	0,462	0,389	0,558	0,572	0,532	***0,899***		
SI	0,171	0,329	0,322	0,373	0,454	0,458	0,447	***0,902***	
B	0,316	0,613	0,527	0,551	0,771	0,571	0,601	0,487	***0,840***

Additionally, in Table 2, the VIF (Variance Inflation Factor) value shows the correlation between variables. As a default value, SmartPLS accepts VIF values of lower than 3. However, one may accept values of under 5 (Hair et al., 2014) or under 10 (Ringle, Wende and Becker, 2015). As seen in the table, the VIF values of the 18 items in the scales were under 3, those of 12 items were under 5, and the remaining two were very close to 5 and under 10, which may be considered an acceptable result. Therefore, it may be stated that there was no multicollinearity problem between the items (Field, 2013).

Testing the research model

The partial least squares analysis method (PLS-SEM) was used in the analysis of the research model. The data were analyzed using the SmartPLS statistics program. The findings reached due to the analyses are presented in Table 4, while the model was as shown in Figure 2.

Table 4: Structural Equation Modelling Results

Hypothesis		Standardized Beta	Standardized. Error	t-values	p*	Results
H_1	INT←PE	0,182	0,061	2,982	0,003	Accepted
H_2	INT←EE	0,129	0,058	2,238	0,025	Accepted
H_3	INT←SI	0,119	0,053	2,216	0,027	Accepted
H_4	INT←FC	0,210	0,057	3,688	0,000	Accepted
H_5	INT←H	0,122	0,046	2,635	0,009	Accepted
H_6	INT←HM	0,117	0,056	2,096	0,036	Accepted
H_7	INT←PT	0,175	0,058	3,029	0,003	Accepted
H_8	B←INT	0,771	0,032	24,123	0,000	Accepted

*p<0,05

Bootstrapping analysis was conducted to measure the effects of the variables. I was determined that performance expectancy (β=0.182; p<0.03), effort expectancy (β=0.129; p<0.025), social influence (β=0.119; p<0.027), facilitating conditions (β=0.210; p<0.000), habit (β=0.122; p<0.009), hedonic motivation (β=0.117; p<0.036) and perceived trust (β=0.175; p<0.003) affect intention towards using mHealth applications. Additionally, the intention of using mHealth applications affects the behaviour of using mHealth applications (β=0.771; p<0.000). Therefore, it may be stated that all hypotheses were confirmed.

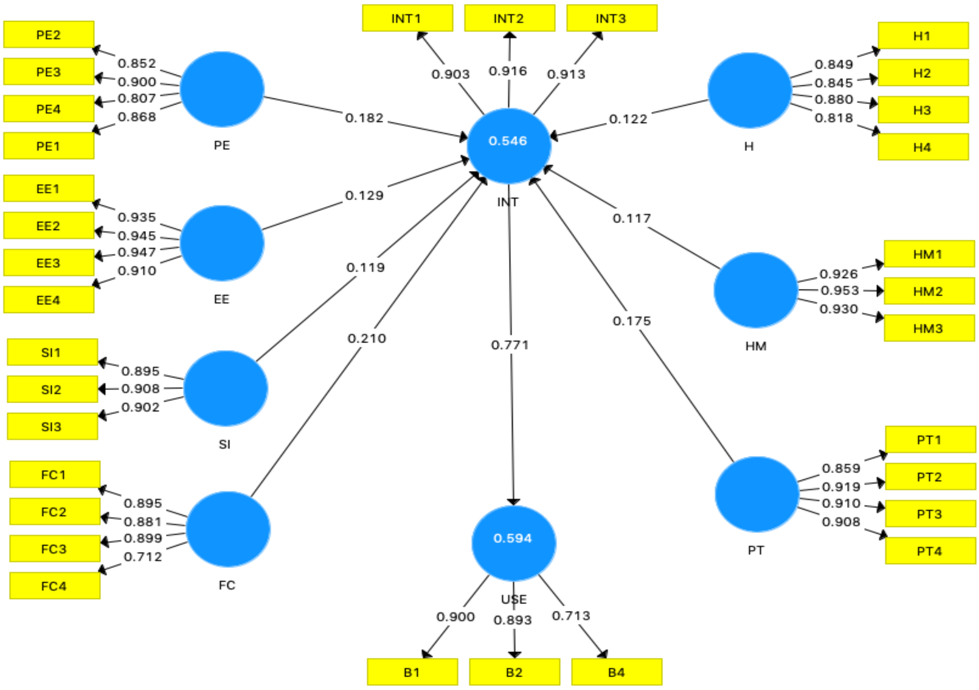

Figure 2: PLS-SEM Results

The regression coefficients of the variables in the model were as 0.807-0.90 for the performance expectancy variable, 0.910-0.947 for effort expectancy, 0.895-0.908 for social influence, 0.712-0.899 for facilitating conditions, 0.818-0.880 for habit, 0.926-0.953 for hedonic motivation, 0.859-0.919 for perceived trust, 0.903-0.916 intention towards using mHealth applications and 0.713-0.90 for the behaviour of using mHealth applications.

When the R^2 values obtained for the model were examined, it was found that the intention to use mobile applications was 54.6% explanatory, and the behaviour of using mobile applications was 59.4% explanatory. Based on these findings, it may be stated that the endogenous variables of the study had a medium explanation rate (Henseler, Ringle and Sinkovics, 2009; Hair, Ringle and Sarstedt, 2011).

If the prediction power coefficients calculated for the endogenous variables (Q^2) are more significant than zero, the research model can predict the endogenous variables (Hair et al., 2014). As a result of the Blindfolding analysis conducted to determine the predictive power of the endogenous variables, the Q^2 values were 0.442 for intention towards using mHealth applications and 0.412 for the behaviour of using mHealth applications. Therefore, as these values were more outstanding than zero, it may be stated that the research model had the power to predict the variables of intention towards using mHealth applications and behaviour of using mHealth applications.

Conclusion and recommendations

In parallel with the rapid development of information technologies, the global COVID-19 pandemic has increased mHealth applications by consumers. UTAUT, which has been a subject to academic studies at the point of the acceptance and use of several different technologies, is a frequently preferred model on these topics as it contains many theories within. This study aimed to present the factors affecting intentions to use mHealth applications and the effect on the intention to use mHealth applications in the extended UTAUT model framework. In this context, the data were collected from 354 consumers using at least one mHealth application. Due to the low number of studies in Turkish literature on the acceptance and use of mHealth applications, it is believed that this study will fill this gap in Turkish literature.

This study's findings supported the findings of previous studies on mHealth (DeVeer, Peeters, Brabers, Schellevis, Rademakers and Francke, 2015; Alam et al., 2018; 2020). According to the study's findings, the most significant factor affecting using mHealth applications may be facilitating conditions. This finding was parallel with mHealth and e-health studies in the literature (Boontarig et al., 2012; Alam et al., 2018; Garavand, Samadbeik, Nadri, Rahimi and Asadi, 2019; Lestari and Rofianto, 2020). In this context, it may be stated that consumers intend to use mHealth applications due to the advantages these applications provide for their lives. Performance expectancy was the variable that affected intention to use mHealth applications the second most following facilitating conditions. Previous studies on mHealth and eHealth have also found the effects of this factor on intentions to use (Hoque and Sorwar, 2017; Bawack and Kamdjoug, 2018; Alam et al., 2018; Alam et al., 2020). Effort expectancy and social influence were also factors affecting intention to use mHealth and eHealth applications in many studies (Dünnebeil, Sunyaev, Blohm, Leimeister and Krcmar, 2012; Martinez-Caro, Cegarra-Navarro and Solano-Lorente, 2013; Hoque and Sorwar, 2017; Garavand et al., 2019; Ndayizigamiye, Kante and Shingwenyana, 2020). Again, similar results have been revealed on accepting several different technological developments (Mun, Jackson, Park and Probst, 2006; Schaper and Pervan, 2007). However, among studies on social influence in health (Fan, Liu, Zhu and Pardalos, 2018) and other fields (Gunasinghe et al., 2019), there are also studies proposing that it is not influential. Additionally, according to the study's result, habit and hedonic motivation were also other factors affecting intentions to use mHealth applications. It is possible to encounter several sources in the literature revealing this finding regarding the acceptance of various technologies (Venkatesh et al., 2012; Farooq et al., 2017; Gunasinghe et al., 2019). Similarly, perceived trust also affected intentions to use mHealth applications (Alam et al., 2018; Alam et al., 2020). Another finding of the study, which was in parallel with the literature, was that intentions to use mHealth applications affected behaviours of using mHealth applications (Venugopal, Jinka and Priya, 2016; Alam et al., 2018; Garavand et al., 2019; Alam et al., 2020; Ndayizigamiye et al., 2020). Moreover, not only in mHealth application studies but also in studies on other topics regarding the acceptance of technologies, it is possible to encounter similar results (Rawstorne, Jayasuriya and Caputi, 2000; Chen, Wu and Crandall, 2007; Venkatesh and Bala, 2008; Goulão, 2014; Farooq et al., 2017; Gunasinghe et al., 2019).

It is thought that mHealth applications will also be used frequently in the process after now. Therefore, one may express the contributions of this study in terms of implementers (mHealth application developers) as follows: First of all, the contents of mHealth applications should be constantly kept up-to-date, and user-friendly applications should be developed. Second of all, the service provided should satisfy certain minimum conditions. Third of all, the privacy of the health data of consumers should be ensured. Furthermore, the reliability of the measurements of mHealth applications should be ensured.

Moreover, the integration of mHealth applications with other applications should be achieved. Additionally, to achieve the continuity of the increase in the usage rates of mHealth applications in the pandemic period, awareness may be kept alive through social media channels. Gamifying (advergaming) applications may also be added inside mHealth applications. Finally, raising awareness among consumers regarding mHealth applications should be achieved through public service advertisements and regular advertisements. Advertisements should be made in both social media and traditional media to reach more audiences.

Since this study examines the use of mHealth applications with the expanded UTAUT model, it is thought that it will contribute to the mHealth services and health services marketing literature in terms of theoretical and methodology few numbers of studies. Besides, the study results can guide the academicians as they indicate that there are other determinants of the intention of consumers to use mHealth applications.

Future studies may investigate whether or not there is a difference in smartphone users' mHealth preferences using different software. Additionally, which consumers prefer mHealth applications with different lifestyles may be revealed. Studies may be conducted on what the most prevalently used mHealth applications are. Additionally, more in-depth data on the reasons for these to be preferred may be obtained via qualitative methods. Moreover, with data to be obtained from qualitative studies, it may be possible to determine other factors that affect mHealth applications' intentions within the UTAUT model's scope. Another study may ensure the results' generalizability by collecting a probability-based sampling method with a similar model.

As in all research, this study implemented under some limitations. The first of these limitations was that the data were collected by the method of convenience sampling. Therefore, it is impossible to generalize all consumers' results because it is a non-probability sampling method. Secondly, collecting the data in a specific time interval resulted in a limited sample volume. It may be stated that different results may be obtained in the case of collecting more data.

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Ethics Committee Approval

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T.C.
BİLECİK ŞEYH EDEBALİ ÜNİVERSİTESİ REKTÖRLÜĞÜ
Etik Kurul

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08/02/2021

Sayın Dr. Öğr. Üyesi Buket BORA SEMİZ
Öğretim Üyesi

İlgi : a) 30.12.2020 tarihli ve E.4348 sayılı yazınız,
b) Üniversitemiz Etik Kurulunun 27.01.2021 tarihli ve 1 sayılı toplantısının 11 nolu kararı.

İktisadi ve İdari Bilimler Fakültesi Dekanlığı'nda görevli Dr. Öğr. Üyesi Buket BORA SEMİZ'in 30.12.2020 tarihli ve E.4348 sayılı yazısı eki "Mobil Sağlık Uygulamalarının Benimsenmesine Yönelik Davranışsal Niyeti Etkileyen Faktörler Üzerine Bir Araştırma" isimli çalışmasının etik açıdan uygunluğu görüşülmüş olup, Üniversitemiz Etik Kurulunun 27.01.2021 tarihli ve 1 sayılı toplantısının 11 nolu kararı ile çalışmasında etiğe aykırılık bulunmadığına toplantıya katılanların oy birliği ile karar verilmiştir.

Bilgilerinizi rica ederim.

Prof. Dr. Nurgül ÖZBAY
Etik Kurul Başkanı

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