

THE MODERATING ROLE OF FACTORS THAT INFLUENCE USER ADOPTION OF MOBILE HEALTH APPLICATIONS: EVIDENCE FROM JORDAN

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ABSTRACT

This research aims to identify factors that influence the intention to use mobile health applications (MHAs) as moderated by the health status of Jordanian users. A survey questionnaire was used to collect the primary data. Forty-four elements operationalized and measured the independent, dependent and moderating variables. The open sample was distributed to 562 mobile health application users and 527 were returned implying a 94% response rate. Statistical processing was implemented to answer research questions and test the research hypotheses. The results showed that system quality, information quality, ease of use, usefulness, entertainment, and social influence have a statistically significant effects on the intention to use mobile health applications. The results show moderating factors that influence the intention to use MHAs packages. Moderating factors include Information quality, Usefulness, Ease of use and Social Influence. Factors that did not moderate include System Quality and Entertainment.

JEL: I13, I14

KEYWORDS: User Health Status, Mobile Health Applications, Information Technology, Health, Usability, Computer Human Interaction

INTRODUCTION

Technology has developed rapidly and extensively in all aspects of life, including health sectors that are not limited to medical tools and equipment (Kamp et al., 2016). Technology has not only introduced many applications to manage health behaviors such as diet, exercise and other health concerns in the field of medical care but has also targeted healthy users to these applications. In the medical field, e-health has been developed with the aim of bringing health and promoting culture of e-health care services to a wide range of users in different healthy and physiological conditions (Miyazaki et al., 2012).

National Aeronautics and Space Administration has played a prominent role in the development of telemedicine technology. Medical devices with spacecraft have monitored physiological measurements and electronically sent them to Earth. Mobile telemedicine is a new and evolving area that exploits recent developments in mobile networks for applications in telemedicine. The use of wireless telecommunication systems, such as Wireless Personal Area Networks (WPANs), Wireless Local Area Networks (WLANs), Worldwide Interoperability for Microwave Access (WiMAX) broadband access, and cellular systems (2.5G, 3G and beyond 4G Nowadays) has enhanced telemedicine services by creating a flexible and homogeneous network with improved quality, availability, and effectiveness. The integration of emerging wireless solutions into healthcare has become a requirement for accurate and efficient healthcare delivery. It raises very significant challenges in terms of interoperability, performance, and security (El Khaddar et al., 2012).

Professionals in the health sector believe in the benefits of mobile health applications that can improve patient health, help people manage their own health and wellness, promote healthy living and gain access to useful information whenever and wherever required. Users usually download health applications to track their physical activity, to learn exercises and to choose good food to lose weight (Lu et al., 2018). Health applications on smartphones, mobile devices, wearable's, and fitness trackers have become an ideal way for people to benefit from mobile health by collecting personal health data that is easy to understand (Lu et al., 2018).

Evidence has confirmed that patient experience can be improved by Mobile Health Applications (MHAs) through which reminders and diagnostic information are delivered to patients. MHAs can improve adherence to medication for patients with chronic diseases, monitor diet behaviors for patients with diabetes, and encourage the collection of blood pressure readings for hypertensive patients. Thus, the increased use of MHAs in health care settings could contribute to better health care outcomes and increase general satisfaction of patients (Marcelle, 2017). The model of the research is based on some of the most important models that explain the behavior of individuals towards the use of information technology (Ajzen, 1985). The models to be discussed are the Technology Acceptance Model (TAM) by Fred Davis (Davis, 1989) and IS success model by Delone & McLean (Delone & McLean, 1992, 2003).

The aim of this research is to develop a comprehensive model that highlights the most significant factors (system quality, information quality, entertainment, ease of use, usefulness, social influence) influencing the intention to use Mobile Health Applications (MHAs). In addition, this research analyzes the moderating effect of user's health status on the adoption of Mobile Health Applications. The contribution of this research is to support the fact that utilization of technological advances and mobile application can facilitate easy, innovative and efficient access to medical information and consequently improve the quality of health care provision. In the following sections, the theoretical frameworks, research variables and hypotheses to be empirically tested are developed. In addition, elements of the research methodology and design employed by focusing on the research nature, research strategy, data collection are identified. Furthermore, a discussion of the results and findings are presented to show the final results. The paper closes with some concluding comments.

LITERATURE REVIEW

Many theories and models of technology acceptance exist to assist researchers in identifying the antecedents of successful Information Technology usage and predicting users' decisions and behavior. Some of these profoundly prominent theories include the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Acceptance Model (TAM). The Technology Acceptance Model (TAM), developed by Fred Davis in 1989 (Davis, 1989), is a leading theory in the analysis of Information and Communication Technology (ICT) acceptance. The Technology Acceptance Model (TAM) has evolved into a key model in understanding the predictors of behavior by accepting or rejecting technology. The UTAUT (Venkatesh et al., 2003) model has been selected in many gap areas and promises to be a great tool to analyze user acceptance of health technology (Venkatesh et al., 2003).

This section provides an explanation of some of the relevant concepts to the main objective of this research, which is to investigate and analyze the most prominent factors that affect individuals' intention to use mobile health applications. This section discusses Electronic Health Technology, Mobile Health, Jordanian health sector and Mobile health applications.

Electronic Health Technology

According to Laudon & Laudon (2012) information technology (IT) is one of many tools managers use to cope with change. Computer hardware is that the physical instrumentality used for input, processing, and output activities in an information system. IT consists of computers of varied and assorted sizes and shapes (including mobile hand-held devices); various input, output, and storage devices; and telecommunications devices that link computers (Laudon & Laudon, 2012).

Health information technology is best seen as having the potential to improve the quality, safety and efficiency of health care by allowing healthcare providers to collect, store, retrieve and transmit information electronically (Gulavani et al., 2014). It enables the provision of high-quality health care and the integration of information from health providers and patients. These include increasing the ability of doctors, medical/clinical staff and others to easily access and to use correct information about their patients as well as to improve the health care provided. Increasing the ability of patients to obtain information to manage their health-related issues and to better communicate with the health system can improve the efficiency and quality of care (Kim et al., 2016).

Mobile Health

Mobile Health represents the introduction of the latest technologies of smart phones, tablets and wearable devices to support healthcare, which contributes to frequent data transfer and use, making mobile phones an ideal delivery platform for health interventions due to their proliferation (Laurenza et al., 2018). Mobile Healthcare has become an emerging technology for personal use and often used voluntarily. The spread of mobile phone technology, such as mobile phones and tablet computers provide an ideal way to deliver health interventions. Mobile health-based interventions constitute an element of a larger surveillance system. Mobile devices can deliver health and self-management educational messages, improve quality of life and reduce mortality (Cajita et al., 2017, Kitsiou et al., 2017). The advent of 3G mobile phones introduced a wide range of application services to perform mobile health care in an easy and convenient way.

Mobile health is one of the latest e-health applications. It is known by the number of mobile technologies adopted in healthcare environments including mobile computing, mobile devices and wireless networking technologies. Mobile-health provides an opportunity to increase the number of e-health applications available (Laurenza et al., 2018). Mobile health technology aims to engage the user in activities of the applications for receiving the service, leading to high-quality healthcare (Singh et al., 2016). It also aims to improve the service provided through advanced communication capabilities that offer the possibility of communication between the doctor and the user in the interventions of early health care at lower cost with increased surveillance (Cortez et al., 2014).

Jordanian Health Sector

Jordan is well-known, both regionally and internationally, for high-quality healthcare services. In 2014, Jordan was ranked as a leading medical tourism destination in the Arab world according to the Jordan Tourism Board (JTB, 2019). Health care is provided in Jordan through the public and private sectors. Although Jordan has made a remarkable leap in the provision of health services in the public and private health sector, there are many challenges facing the health sector in Jordan. These challenges can be summarized as follow: The exacerbation of poverty and its negative impact on the quality of health services and weak health infrastructure, especially with regard to health technology and Information and Communication systems. Another problem is the environment, which is a multi-faceted problem. Increased and disorganized acquisition of inappropriate medical technologies presents challenges. Further, an increase in the burden of chronic diseases, injuries and emerging diseases exists. In addition, insufficient

efforts have been made to promote and encourage individuals' behavior and proper diets needed to avoid chronic diseases and injuries. Diseases caused by unhealthy lifestyles including cancer, cardiovascular disease and respiratory diseases are always present. Diabetes is one of the leading causes of morbidity and mortality in the over 45 age group.

Mobile Health Applications

Mobile health applications play an increasingly important role in providing easy access to health information and help overcome communication barriers between healthcare providers, facilities and patients. This is important for improving care as mobile devices will become, if not already, a platform of the best options for communication, information and healthcare delivery (Zhang et al., 2014). Using mobile medical health systems with new-generation mobile communication technology aims to integrate primary medical services, improve the quality of primary health care, control the growth rate of a variety of common acute and chronic diseases and to increase population awareness of health management and disease prevention. In particular, the establishment of an integrated system of health services for people with diseases makes it easy for the doctor to control the patient health (Free et al., 2013). The integration of mobile health systems with different resources allows the expansion of the health system in terms of time, space, participants targeted and service groups (Ma et al., 2017).

Factors Affecting the Use of MHAs and Hypotheses Development

With every passing moment, technology is developing new solutions that solve many problems that were once impossible to solve, especially in the field of medicine. The latest developments are medical applications that are put on electronic platforms and installed on smart phones. These applications have become famous due to multiple factors including information quality, system quality, ease of use, usefulness, entertainment, and social impact. This paper explores the relationship between selected factors influencing the adoption of mobile health applications. This section provides a review of the literature that focused on those selected factors.

Information Quality

Information quality refers to “the suitability of the information for use” (Todoran et al., 2015 p5). It is one of the most important dimensions on which information systems are evaluated. The quality of information also affects user satisfaction with the system and user intentions to use the system, which in turn affects the ability of the system to achieve the benefits for the user and the organization (Delone & McLean 2004). The quality of information must be taken into account when performing organizational functions effectively because it is an important factor and depends on the effectiveness of organizational decisions and procedures (Alsabawy et al., 2016). Based on the above discussion, we propose the following hypothesis:

H0.1: There is no significantly statistical impact of Information Quality on the intention to use Mobile Health Applications

System Quality

System quality plays an important role in the success of a comprehensive software system. It is an important aspect for developers, users and project managers. System quality is the extent to which the industry determines a set of desirable features that should be integrated into the product to improve its lifetime performance. Furthermore, according to the information system model, system quality is one of the most important features of success that affects user satisfaction and desire to use it (Dreheeb et al., 2016). More sophisticated systems are needed in the healthcare sector. Systems such as calling nurses or following patients need accurate and up-to-date information. Once this information is installed in medical systems, a

full range of new services will be available (Haute et al., 2016). Based on the above discussion, the researcher proposes the following hypothesis:

H0.2: There is no significantly statistical impact of System Quality on the intention to use Mobile Health Applications.

Ease of Use

Ease of use based on the user experience measures the technology usage requirements or the degree to which the user accepts that using a particular innovation will be easy and smooth (Davis, 1989). The diversity of user's ages imposes special requirements on applications (Melzner et al., 2014). That is, the use of a particular technology (such as mobile health applications) will be free of physical and mental effort. The user may accept that a particular innovation (such as mobile health applications) is useful (Hussain et al., 2016). Based on the above discussion, the researcher proposes the following hypothesis:

H0.3: There is no significantly statistical impact of Ease of Use on the intention to use Mobile Health Applications.

Usefulness

The perceived benefit is that people tend to use application if they think it will help them do their jobs better. Positive use of performance has a high degree of perceived benefits (Davis, 1989). This concept is a key factor in explaining the intention to use advanced mobile applications in general (Wang et al., 2006) and mobile health applications specifically (Wu et al., 2007). Interest has been defined as the comparative advantage and hence the degree to which innovation is better used than its counterparts (Moore and Pompas, 1991). The validity and reliability of the expected benefit indicates the intention to using information technology, as confirmed by (Davis et al., 1989). Based on the above discussion, the researcher proposes the following hypothesis:

H0.4: There is no significantly statistical impact of Usefulness on the intention to use Mobile Health Applications.

Entertainment

Entertainment was given attention in many aspects including medicine. It is also used in other areas, for instance commercial uses, where many electronic media are used in interesting presentations in advertising. Software engineering is interested in computer simulation software for the design of military or industrial training (Hamari et al., 2014). Perceived enjoyment is the extent to which the activity in which the computer is used is enjoyable in itself, regardless of any performance implications that might be expected (Davis & Wiedenbeck, 2001). Davis & Wiedenbeck (2001) postulated that perceived enjoyment is an important indicator in the use of information systems. Although medical technology relates only to functions, health applications must include playful features that emphasize the fun aspects of use (Ziefle & Jakobs, 2010). Based on the above discussion, the researcher proposes the following hypothesis:

H0.5: There is no significantly statistical impact of Entertainment on the intention to use Mobile Health Applications.

Social Influence

Social influence is a pervasive force in social encounters of human social interaction, where people exchange their opinions, beliefs, actual behavior, or even attitudes under pressure from those who interact

with them. People are also influenced by the opinions of others as evidence that they are convinced of the arguments presented. This is an attempt to track the progress of others when they feel social pressure (Flache et al., 2017). In addition, when an individual understands the culture of people he/she refers to, and the agreements he/she has made with them during specific social situations affects the individual (Thompson et al., 1991). It was also observed that social influence has a significant impact when the behavior is new and in its initial stages of adoption (Teo et al., 2003). Based on the above discussion, the researcher proposes the following hypothesis:

H0.6: There is no significantly statistical impact of social influence on the intention to use Mobile Health Applications.

Moderating role of User Health Status

In addition, the diversity of the user's age, different health status and particular requirements of the applications affect the intent to use those applications. We would expect use should be easy and smooth (Melzner et al., 2014). The existence of quality health systems and information is one of the success features that affect user satisfaction and the desire to use it for health applications and his desire to rely on them to document data according to his health (Dreheeb et al., 2016). Based on the above discussion, the researcher proposes the following hypothesis and the research model are presented in Figure 1 below.

H0.7: There is no significantly statistical moderating impact of User Health Status on the effect of Information Quality on the intention to use Mobile Health Applications.

H0.8: There is no significantly statistical moderating impact of User Health Status on the effect of System Quality on the intention to use Mobile Health Applications.

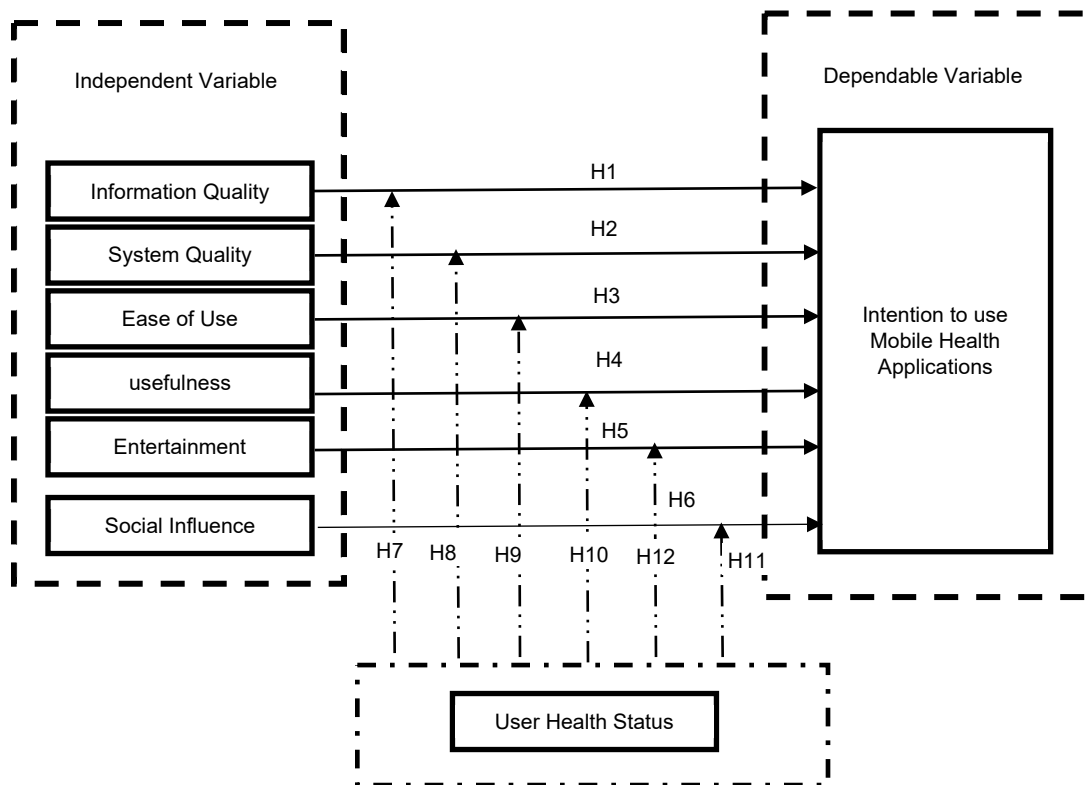
H0.9: There is no significantly statistical moderating impact of User Health Status on the effect of Ease of Use on the intention to use Mobile Health Applications.

H0.10: There is no significantly statistical moderating impact for User Health Status on the effect of Usefulness on the intention to use Mobile Health Applications.

H0.11: There is no significantly statistical moderating impact for User Health Status on the effect of Entertainment on the intention to use Mobile Health Applications.

H0.12: There is no significantly statistical moderating impact for User Health Status on the effect of social influence on the intention to use Mobile Health Applications.

Figure 1: Proposed Research Model



This figure shows relationships between the independent variables (Usefulness, System Quality, Information Quality, Ease of use, Entertainment, Social Influence) and the dependent variable (Intention to use mobile health applications) with the moderation factor of user health status which are represented by 12 hypotheses.

DATA METHODOLOGY AND DESIGN

In this research, a mixed method, a “process of collecting, analyzing and mixing quantitative and qualitative research methods in a single study to understand the research problem” (Creswell, 2012, p. 220) is adopted. Moreover, this research adopts both deductive and inductive techniques. We use deductive techniques for testing designed hypotheses and inductive techniques to generate new knowledge or conclusions based on data and procedures followed (Etikan and Alkassim, 2016). A survey strategy is the main quantitative strategy used in the study.

Research population refers to a subset of individuals with the condition or characteristics of interest defined by the aptness criteria (Ritchie & Elam, 2003; Etikan and Alkassim, 2016). In sampling design, there are several techniques adopted including as convenience and purposive or randomly based. However, when the population size is very large and cannot be either randomly or purposely defined, convenient and purposive sampling is preferred (Etikan, Musa and Alkassim, 2016). Since our population frame is large and can't be either randomly or purposely defined, we used convenient and purposive sampling. The convenience sample includes MHAs users questioned online. The web-based survey was distributed over a period of 2 months (March and April 2019) and targeted Jordanian MHA users within all health centers and hospitals in Jordan. The open sample was distributed to 562 MHAs users and 527 were returned producing a 94% response rate. An online link was provided based on the period in which the poll was available and active. A sample of (5) medical staff, mainly doctors were interviewed to validate the instrument. The questionnaire consists of two parts. Part one contains questions in general about participants while part two focused on the variables of the study as shown in Appendix 1.

We examined descriptive statistics including means, frequencies, and standard deviations to measure the sample perceptions on research variables. We further utilize structured equation model (SEM), average variance explained, composite reliability to ensure our model validity and fit goodness for testing the proposed hypothesis, skewness coefficients, conformity of the data and the validity of the model for the purposes of examination hypotheses. Skewness coefficients are a used to examine the normal distribution of data. We use simple linear regression analysis to examine hypotheses (H0.1, H0.2, H0.3, H0.4, H0.5, H0.6, H0.7, H0.8, H0.9, H0.10, H0.11, and H0.12).

Hypotheses Testing

Before testing the proposed null hypotheses, several tests were performed to identify the proposed model validity for testing the proposed hypotheses.

Model Validity

To validate hypothesized model, several tests were carried out to ensure that there was not excessively high correlation between the independent variables. We use the Multicollinearity test using the tolerance and Variance Inflation Factor (VIF) for the independent variables with variance tolerance value exceeding (0.05) and the coefficient of VIF tolerance level less than (10) (Hair et al., 2006). The skewness coefficient for scale independent variables (System Quality, Information Quality, Usefulness, Ease of use, Entertainment, Social Influence) ensures that the data is normally distributed considering that the data follow a normal distribution if the skewness value is less than (1) (Hair et al.,2014). The dummy ordinal variables (Gender, Age, and qualification) do not subject to normal distribution tests. Table (1) summarizes the validity results.

Table (1) shows that permitted tolerance test values ranged from (0.354 to 0.55), which is greater than 0.05, and the values of the coefficient of variance inflation are less than (5) (Hair et al., 2006) indicating there is no multicollinearity threat between independent variables. In addition, Skewness values were less than (1), which confirms a normal distribution of data. Therefore, the model is valid for further statistical factor analysis based on convergent and decremental analysis to ensure the construct validity and reliability of this model to test the proposed hypotheses.

Table 1: Tolerance and Variance Inflation Test

Model	Collinearity Statistics			
	Skewness	Tolerance	VIF	
System Quality	0.325	0.530	1.887	
Information Quality	0.325	0.354	2.825	
Independent variables	Usefulness	0.214	0.434	2.304
	Ease of use	0.325	0.463	2.160
	Entertainment	0.241	0.439	2.278
Social influence	0.245	0.555	1.802	

*This table shows mean difference analysis. Panel A shows results for observations in the top quartile. Panel B shows results for observations in the bottom quartile. The third column reports the results of the Mann Whitney test for differences in means. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Average Variance Explained (AVE)

The AVE test was applied to assess the validity of discrimination. The AVE of each latent construct should be higher than the highest squared correlation with any other latent variable. Table (2) shows the results. The average variance extracted (AVE) for each structure is above 0.5, indicating that the model scale has sufficient convergent validity. Further, the results show the average output contrast (AVE) is higher than 0.6, which confirms the model has sufficient validity. Table (2) suggests the square root of the AVE for each variable is higher than that of the other variable, thus providing evidence of the discriminant validity of the model (Chin et al., 2003; Yi & Davis, 2003).

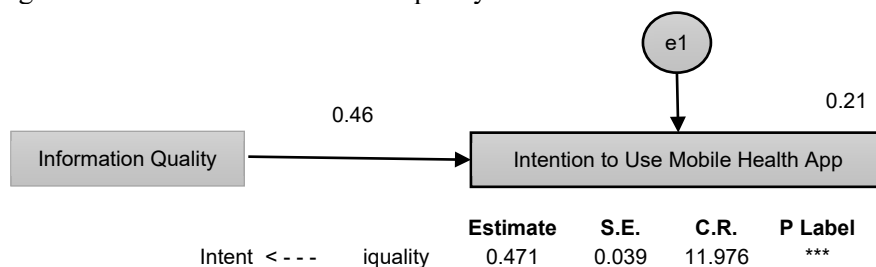
Table 2: AVE and Composite Reliability Analysis

		Usefulness	System Quality	Information Quality	Ease of Use	Entertainment	Social Influence	AVE	CR	\sqrt{AVE}
Usefulness	Pearson Correlation	1.00	0.56	0.50	0.35	0.35	0.26	0.67	0.85	0.81
System- Quality	Pearson Correlation	0.31	1.00	0.39	0.34	0.22	0.16	0.69	0.81	0.83
Information- Quality	Pearson Correlation	0.50	.623**	1.00	0.35	0.38	0.36	0.60	0.86	0.77
Ease of use	Pearson Correlation	0.35	.587**	0.35	1.00	0.41	0.22	0.83	0.83	0.91
Entertainment	Pearson Correlation	0.35	.470**	0.38	0.41	1.00	0.36	0.66	0.69	0.81
Social- Influence	Pearson Correlation	0.26	.397**	0.36	0.2	0.36	1.00	0.68	0.71	0.82

This table shows the average variance extracted (AVE) for each structure (Usefulness, System Quality, Information Quality, Ease of use, Entertainment, Social Influence) for all are above 0.5 indicating the model scale has sufficient convergent validity. **. Correlation is significant at the 0.01 level (2-tailed).

Before continuing the analysis, we wish to assure the validity of the model using a path analysis procedure for model compatibility testing. We do this by conforming factor analysis using the AMOS application (v.26) based on the Structural Equation Model (SEM). The conformity factor analysis shows the fitness and ability of our model to test the proposed hypotheses (Chi-square=1991.106; P=0.000; CFI=0.874; RMSEA=0.071). Therefore, the analysis for testing the proposed hypotheses can be examined using AMOS software as follows: H0.1: There is no significantly statistical impact of Information Quality on the intention to use MHAs. Figure 2 shows the result of standard regression analysis.

Figure 2 The effect of Information quality on intention to use MHAs



This figure shows the results of the significant impact for information quality on the intention to use MHAs as $P < 0.05$. (***) P -value < 0.05

Results in Figure 2 show a significant impact for information quality on the intention to use MHAs. Therefore, this analysis rejects the null hypothesis and accept the alternative, which indicates a significant

impact as $P \leq 0.05$. This process is repeated for testing hypotheses H2 to H6 without taking the moderating effect into consideration. The results of the analysis are shown in Table 3.

Table 3: Results of AMOS Testing of the Research Hypotheses

Hypotheses	Factor	Supported	Not Supported	P-value *** $p \leq 0.05$
H1	Information Quality	Yes	-	Yes
H2	System Quality	Yes	-	Yes
H3	Ease of Use	Yes	-	Yes
H4	Usefulness	Yes	-	Yes
H5	Entertainment	Yes	-	Yes
H6	Social Influence	Yes	-	Yes

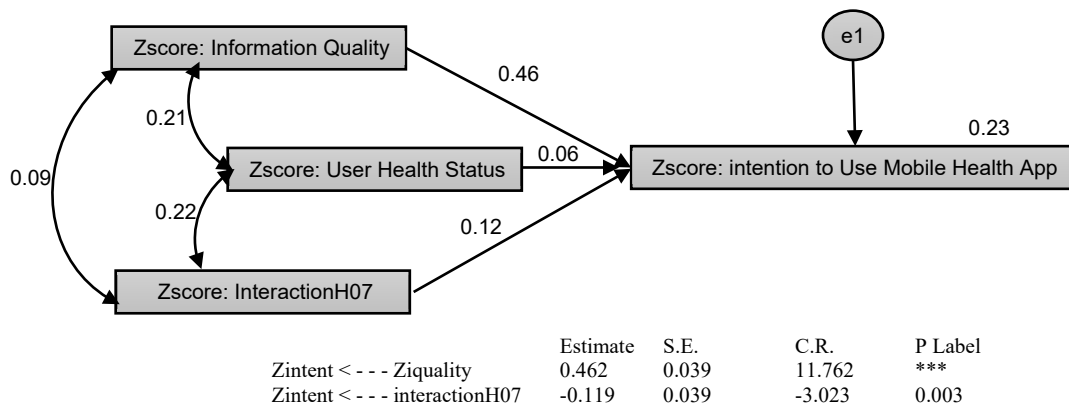
This table shows the results of relationship between all factors (independent Variables) effect on the MHAs (Dependent Variable). Results show that all factors have significant impact on the MHAs with p -value < 0.05 . *** indicate significance at the 1, 5 and 10 percent levels respectively.

Table 3 shows results of AMOS testing of the research hypotheses H1 to H6. Results indicate that all hypotheses (H1 – H6) are supported with p -values less or equal to 0.05. This implies that all independent factors (system quality, information quality, entertainment, ease of use, usefulness, social influence) have significant impact on the dependent factor (intention to use Mobile Health Applications (MHAs)).

To determine the role of the moderating variable (User Health Status) on the intention to use MHAs through the interaction with independent variables, a standardized value for each variable (Zscore) was calculated. We implement the interaction as the product of the zscore of each independent variable by zscore of the moderating variable.

H0.7: There is no significantly statistical moderating impact of User Health Status on the effect of the Information Quality on the intention to use MHAs. Figure 3 shows the result of standard regression analysis.

Figure 3: The Moderating Role of User Health Status in the Effect of the Information Quality on the Intention to Use MHAs



This figure shows the results of the moderating role of User Health Status in the effect of the Information Quality on the intention to use MHAs as P value = 0.003, $P < 0.05$ which indicate a significant impact.

Results in Figure 3 indicate that information quality has a direct and significant impact on the intention to use MHAs. However, the interaction between information quality and user health status leads to a moderate impact on the intention to use MHAs (p -value = 0.003; < 0.05). This process for testing the rest of the hypotheses H8 to H12 is repeated taken the moderating effect of User Health Status into consideration and the results are shown in Table 4 below.

Table 4 shows the results of AMOS testing of the research hypotheses H7 – H12. Results show that Hypotheses H7, H9, H10 and H12 are supported with p-values less than or equal to 0.05. This implies that independent factors including information quality, ease of use, usefulness and social influence have significant impacts on the dependent factor, intention to use Mobile Health Applications (MHAs). H8 and H11 are not supported with p-values higher than 0.05., implying that independent factors that include system quality and entertainment have no significant impact on the dependent factor, intention to use Mobile Health Applications (MHAs).

Table 4: Results of AMOS for Testing Research Hypotheses with Moderating Effect of User Health Status

Hypotheses	Factor	Moderating Factor	Supported	Not Supported	P-value p<=0.05
H7	Information Quality	User Health Status	Yes	-	0.003
H8	System Quality	User Health Status	-	Yes	0.130
H9	Ease of Use	User Health Status	Yes	-	0.025
H10	Usefulness	User Health Status	Yes	-	0.008
H11	Entertainment	User Health Status	-	Yes	0.731
H12	Social Influence	User Health Status	Yes	-	0.003

This table shows test results of the relationship between all factors (independent Variables) effect on the MHAs (Dependent Variable) with Moderating effect of User Health Status. Results show that all factors have significant impact on the MHAs with p-value <0.05 except System quality and Entertainment with p-value > 0.05.

RESULTS DISCUSSION

Based on the descriptive analysis, the results show that MHAs users believe in the importance of MHAs properties including Information Quality, System Quality, Ease of Use, Usefulness, Entertainment, and Social Influence. This can be attributed to the diversity of such applications with quality variations amongst them. Users seek those applications that maintain a higher quality level. Moreover, results show a high level of intention to use MHAs as perceived by users. They argued that MHAs will be a necessity in the near future. This result supports the extended propagation of mobile devices and its applications.

Mobile users encourage health centers to share their knowledge and products to attract an audience, which in turn allows the number of MHAs users to increase via different media such as social media and internet sites. Furthermore, results address that MHAs users have a good health status. Users state they have a moderate health status of suffering from physical/motor disabilities, psychological disorders, taking medicines regularly, performing periodic medical tests or analyses and visiting a specialist doctor for treatment at least once a month. However, MHAs users still intend to use these applications for more protection or entertainment or are socially influenced.

Analytical analysis results show a significant impact of information quality on the intention to use MHAs. This result can be explained by the level of awareness of health applications users, and their ability to distinguish between applications in terms of the quality of information available. Results further prove a significant impact for system quality on the intention to use MHAs which results from the importance of system properties (interface, design, and platform) and the services provided by MHAs. In addition, the factor of ease of use and usefulness significantly influences the intention to use MHAs. This agrees with the fact that users of any application prefer to deal with an easy interface and immediately learn how to use its useful information and services provided.

The intention behind using MHAs can be for fun or entertainment as there is generally no cost required and users have time to surf different applications. Therefore, results prove previous claims and show a significant impact for entertainment on the intention to use MHAs. Finally, social influences play a significant role that supports the intention to use MHAs as introduced by the results. This can be easily

justified since MHAs are widely spread and can be promoted via social media, which in turns allow posting or sharing in between friends.

Results also show the influence of the moderating factor which is user health status to examine its interacting impact with independent variables. In this context, results show that information quality has a direct significant impact on the intention to use MHAs and there is no directed significance for user health status on the intention to use MHAs. However, the interaction between information quality and user health status leads to a significant moderate impact on the intention to use MHAs. This can justify that users seek high quality health information when they feel sick or have health problem. The results of the analysis also show no significant moderate impact on the intention to use MHAs, since users with health problems would rather focus on the information quality not the system design and its interface. Furthermore, results indicate that ease of use has a direct significant impact on the intention to use MHAs and has no direct significant impact for user health status on the intention to use MHAs.

The interaction between ease of use and user health status leads to a significant moderate impact on the intention to use MHAs. Similarly, users with health problems would seek information, regardless of if the application is easy to use or not. Useful information can attract MHAs users with health problems. Therefore, results prove that usefulness has a direct significant impact on the intention to use MHAs. However, there exists no direct significant impact for user health status on the intention to use MHAs. The interaction between usefulness and user health status leads to a significant moderate impact on the intention to use MHAs. Also, results indicate that social influence has a direct significant impact on the intention to use MHAs; and there is no direct significant impact for user health status on the intention to use MHAs. However, the interaction between social influence and user health status leads to significant moderate impact on the intention to use MHAs. Finally, results indicate that entertainment has no significant direct effect on the intention to use MHAs. In addition, there is no direct significant impact for user health status on the intention to use MHAs; and even the interaction between entertainment and user health status has no significant moderate impact on the intention to use MHAs. Users with health problems have no time to trigger their intention to use MHAs for fun and entertainment.

CONCLUSION

The aim of this research is to develop a comprehensive model that highlights the most significant factors (system quality, information quality, entertainment, ease of use, usefulness, social influence) influencing the intention to use Mobile Health Applications (MHAs) within Jordanian hospitals and health centers. In addition, we analyze the moderating effect of User's health status on the adoption of Mobile Health Applications. A convenience sample that represents the population of health application users within Jordanian hospitals and health centers were chosen. An online link was provided for participants based on the period in which the poll is available and active. By distributing the questionnaires online (Google forms) the researcher assumes that respondents use a Smartphone or another form of Information and Communication Technology (ICT). Some 527 MHAs users participated in the questionnaire with a response rate of 94%.

The primary findings of the research indicate that MHAs user in Jordan are aware of the importance of mobile health applications and want to use MHAs. It also explores how their use has affected the lives of individuals and their evidence of adoption. In addition, calculating measurement levels for independent factors (system quality, information quality, entertainment, ease of use, usefulness, social influence) that affect the intention of using MHAs, showed high measurement levels for all factors on the intention to use of MHAs. With regard to the moderating effect on the factors influencing the intention to use MHAs packages, it became clear that the health status of the user had a clear impact on a number of factors that include Information quality, Usefulness, Ease of use and Social Influence did not affect each of System Quality and Entertainment.

Considering the proliferation of applications and increased adoption of ICT by individuals, mobile health applications should be given considerable attention by officials and high administration in both the public and the private sector. Administrators should stimulate the adoption of such health applications that can be beneficial for cutting budgets spent on health and regulating their use. Government officials and Hospital managers should work together on developing mobile health applications to contribute to increasing the ability of doctors to monitor the patients' medical condition and providing the ability to save and exchange information confidentially in light of developing policies that guarantee the privacy and confidentiality of user data.

This research proposes the following fields for future researchers: Activating and developing information technology at all medical levels, seeking a healthy environment by highlighting the importance of healthy habits to prevent diseases, enhancing the means of obtaining reliable medical information from medical sources capable of remote inspection, reducing therapeutic costs at the individual and institutional levels. Research was conducted within a limited period of time that prevented the researcher from further investigations with more experienced people. In addition, the research sample was more comprehensive for females by more than 75%, due to the social relationships of the researcher and the ease of communication with females than males.

Appendix 1: Questionnaire – English

Part Two: Study Variables

Please indicate how much you agree or disagree with each of the following statement based on the scale ranging from strongly disagree to strongly agree:

#	System Quality Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Mobile Health Applications are user-friendly.					
2.	It will be easy to browse Mobile Health Applications					
3.	I have access to the information I need quickly.					
4.	The contents of mobile health applications are downloaded quickly upon entry.					
5.	Mobile Health Applications have attractive design.					
6.	Mobile Health Application's response time for my queries is fairly fast.					
#	Information Quality Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.	Mobile Health Applications provide the precise information I need.					
8.	I think the information provided by Mobile Health Applications meets my needs					
9.	I think information provided by Mobile Health Applications will be reliable.					
10.	I think Mobile Health Applications will provide up-to-date information.					
11.	Using Mobile Health Applications will provide appropriate answers to my questions while browsing the applications.					
12.	When comparing applications' results with medical devices, I do not notice any inconsistencies in the resulting information.					
13.	I think Mobile Health Applications will provide information in an appropriate format.					
14.	I think Mobile Health Applications will always provide Valuable information.					

#	Usefulness Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
15.	I think that the use of mobile health applications is more successful in accessing mobile health service.					
16.	I think Mobile Health Applications are useful.					
17.	Mobile Health Applications will give me more control over activities in my life					
18.	I think using Mobile Health Applications will make things. I want to accomplish easier to perform.					
19.	Mobile Health Applications will save my time when using them.					
20.	Using Mobile Health Applications will enable me to accomplish tasks more quickly.					
21.	I think using Mobile Health Applications improves the quality of life (health).					
#	Ease of Use Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
22.	Mobile Health Applications require as few steps as possible to accomplish what I want to do.					
23.	I think using Mobile Health Applications does not require any effort.					
24.	I believe that learning to operate Mobile Health. Applications will be easy for me.					
25.	I think my interaction with Mobile Health Applications will be clear and understandable.					
26.	Overall, I believe that Mobile Health Applications are easy to use.					
#	Entertainment Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
27.	I feel happy to interact with Mobile Health Applications when used.					
28.	Using graphical representations of health values and other Information in Mobile Health Applications is pleasant.					
29.	Overall, I believe that using Mobile Health Applications will be entertaining tools.					
30.	Browsing Mobile Health Applications would be an exciting way of passing time.					
31.	It will be enjoying to use Mobile Health Applications.					
#	Social Influence Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
32.	People who influence my behavior think that I should use Mobile Health Applications.					
33.	People who are important to me think that I should use Mobile Health Applications.					
34.	I would use Mobile Health Applications if my friends recommend me to do so.					
35.	I will use Mobile Health Applications when my close friends start using them.					
#	Intention to Use Mobile Health Applications Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
36.	Assuming that I have access to Mobile Health Applications, I intend to use them.					
37.	I predict that I would use Mobile Health Applications in the future.					
38.	I will try to use Mobile Health Applications					
39.	I think the use of MHA will be a necessity in the near future					
#	User Health Status Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
40.	I suffer from physical/motor disabilities.					
41.	I have psychological disorders.					
42.	I take medicines regularly.					
43.	I perform periodic medical tests or analyses.					
44.	I visit a specialist doctor for treatment at least once a month					

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