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## Article

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## MARKETING | RESEARCH ARTICLE

# Using mobile health apps during the Covid-19 pandemic in a developing country for business sustainability

Hazem Rasheed Gaber<sup>1\*</sup> and Lamiaa Mostafa Hassan<sup>1</sup>

**Abstract:** With the outbreak of the Covid-19 pandemic, many health providers and insurance companies have faced challenges due to the high levels of uncertainty. Many of these companies have relied on mobile apps to connect with their patients and clients to ensure business sustainability during and after the pandemic. This paper examines the factors that affect the intention of the actual users of these apps to continue using them during the pandemic. Given the novelty of the adoption of these apps in developing countries and the scarcity of research investigating users' relationships with them, this research was conducted on users of mobile health apps in Egypt, which has witnessed a massive growth in the penetration of smartphones. A conceptual framework was developed based on an extensive literature review and revisiting the technology acceptance model (TAM) and the expectation-confirmation model (ECM). An online survey was used to collect the data from 442 actual users of mobile health apps in Egypt. The data were analyzed using partial least square structural equation modeling through SMART PLS 3.0. The main findings showed that continuance intention is affected by satisfaction, perceived usefulness, perceived ease of use, and attitudes. The paper contributes theoretically by introducing a multi-theoretical framework that explains users' intentions to use mobile health apps. Furthermore, it provides guidelines for healthcare providers and insurance companies when using these apps to ensure business sustainability.

**Subjects:** Management of IT; Consumer Behaviour; Internet / Digital Marketing / e-Marketing; Marketing Communications; Marketing Management

**Keywords:** health care industry; technology acceptance model; continuance intention; expectation-confirmation model; Covid-19; mobile apps; business sustainability

### 1. Introduction

There have been many significant changes in human life, economic systems, and society during the past several decades due to new information and communication technologies (ICT; McLean et al., 2020). In recent years, many businesses have stepped up their customer service efforts to serve their consumers better and ensure their satisfaction (Cobelli & Chiarini, 2020). In that context, many businesses are utilizing ICT to serve their customers better (S. M. Lee & Lee, 2020). Specifically, the growing number of smartphone users has increased the use of mobile application software for mobile devices (apps) over the past few years (Rhea et al., 2018). Individuals' lives have become more reliant on smartphones' numerous features (Cho, 2016). According to many studies, the market demand for mobile app development services in the

coming years will rise faster than internal IT firms' capabilities (Chiu et al., 2020; Zolkepli et al., 2021).

This article focuses on users' continuous intention to use mobile health apps. Mobile health apps have seen rapid penetration as the most direct tools for public personal health management, thanks to the rapid development of mobile internet technology and the popularity of intelligent terminals and mobile devices (Chakraborty et al., 2021; Hensher et al., 2021). Health apps based on mobile terminal systems such as Android and iOS that provide services such as medical information inquiry and symptom self-examination are referred to as mobile health apps, which are the most common manifestation of mobile healthcare (Wang & Qi, 2021). People are paying greater attention to health due to socioeconomic growth and increased human living conditions. Their pursuit of health has steadily shifted from treating disease to avoiding disease, increasing demand for portable medical care (Hensher et al., 2021).

Mobile health apps enable users to access healthcare, exercise and fitness, health management, and other related services at any time and location (Han & Lee, 2018). To a great extent, mobile health apps alleviate the scarcity of health information resources, provide users with a convenient means of accessing health services and information, and play an essential role in the dissemination of health knowledge and meeting the needs of users in terms of health consultation (Vaghefi & Tulu, 2019). Because mobile health apps allow users to gain health knowledge and self-management conveniently and quickly, their market is rapidly expanding. Many apps have been developed to assist people in managing their health conditions, indicating that this app has gained global attention (Schomakers et al., 2022; Yan, Filieri, Raguseo, Gorton et al.,).

During the Covid-19 pandemic, many health care providers and insurance companies have expanded the usage of health apps, intending to decrease pressure on traditional healthcare services and provide customer service to patients and users in a cost-effective and timely manner (Kapoor et al., 2020; Tseng et al., 2022; J. Wu et al., 2021). Many companies have used mobile apps to improve their business efficiency during the pandemic. These companies relied on mobile-based app services to improve their sustainability during the pandemic crisis (Rakshit et al., 2021). These apps provide a variety of services to users, such as online medical consultation, gaining approvals on lab services and medicines, and booking healthcare visits (Kasperbauer & Wright, 2020). Due to the rapid expansion in the usage of these services by patients and medical insurance subscribers, academic research that examines the factors that affect users' continuance intention to use these apps shows some shortcomings. Specifically, in developing countries, where the adoption of these apps by patients and users is still beginning, there is a need to undertake more research to investigate the factors that facilitate the usage and adoption of these apps (Wang & Qi, 2021). This would help the developers of these apps to design them better to improve the users' experience and enhance their usage. Also, organizations can better utilize IT if they understand user behavior, which includes how people use emerging technologies like mobile apps (Ming et al., 2020). This would also contribute to the sustainability of these organizations during and after the Covid-19 crisis (Rakshit et al., 2021).

The objective of this article is to investigate the factors that affect the intention of the actual users of mobile health apps to continue using them during the Covid-19 pandemic in Egypt. This country is a developing country that has witnessed massive growth in the penetration of smartphones over the past few years. According to a recent study by eMarketer (2021), 94.3% of internet users in Egypt owned a smartphone. Driven by the high internet penetration and smartphones in Egypt, many health providers and medical insurance companies have relied on health apps to connect with patients and insurance subscribers during the Covid-19 pandemic (Mansour, 2021).

In order to achieve the research objectives, a conceptual model of the factors affecting users' continuance intention to use mobile health apps was developed based on an extensive literature review and by revisiting the TAM (Davis, 1989) and the ECM (Oliver, 1980). All previous researchers

focused on post-acceptance and continuous usage of user behavior information systems (IS; Lee et al., 2019; Nikhashemi et al., 2021), as the study of IS acceptance is already approaching maturation (Lew et al., 2019; Ling et al., 2010).

This paper is structured as follows: firstly, the conceptual model and the hypotheses together with the related literature and theoretical background, are presented. It is followed by the methodology section, which discusses the research design and data collection process. After that, a section that shows the research findings are presented. Then the discussion of the theoretical as well as managerial contributions and implications are presented. Finally, the limitations and directions of future research are discussed.

## **2. Literature review**

The literature review section provides an overview of two relevant theories used in building up the conceptual model of this paper. The two theories are the expectation confirmation model (ECM) and the technology acceptance model (TAM). It is followed by a section that discusses the proposed hypotheses.

### **2.1. Expectation confirmation model (ECM)**

Several IS scholars have recently embraced the ECM to analyze post-acceptance behavior at the individual level (Albashrawi & Motiwalla, 2019; Bhattacharjee, 2001; Park, 2020; Tam et al., 2020; L. Wu et al., 2020). The ECM arose due to the expectation-confirmation theory (ECT) adaption. Expectations, and perceived expectations, lead to post-purchase satisfaction, according to the ECT (Oliver, 2020).

Negative or positive dissonance between performance and expectations might be used to quantify this impact (Oliver, 1980). Bhattacharjee (2001) proposed the ECM in order to forecast IS utilization. To forecast and explain an individual's continuing desire to use IT, this model relies on three variables: satisfaction, confirmation of expectations, and perceived usefulness. The two critical criteria to assess IS continuation intentions are confirmation and perceived usefulness, which are decided by the consumer's original expectations. Both have an impact on consumer satisfaction. In other words, an individual's intention to continue using information systems is predicted by their pleasure and perceived usefulness.

In the context of information technology, multiple studies have been conducted addressing various types of models in order to understand the idea of post-acceptance and evaluate individual behavior. A few recent studies have been published with themes similar to our research addressing mobile applications to explore the continued usage of IS. Hsu and Lin (2015), Chiu et al. (2020), and Kim et al., (2019) are one of the recent studies to recommend that ECM be incorporated into their frameworks. The ECM is an essential aspect of the research's structure and is utilized to address one of the study's primary goals: individual behavior after using mobile applications.

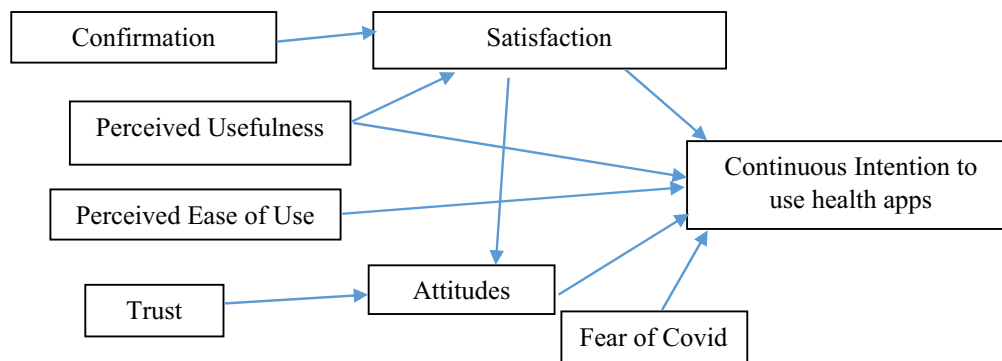
Our research uses an innovative approach to expand the ECM to better understand mobile health apps' post-adoption phenomena. It argues that the decision made after the initial acceptance stage has a higher impact on the user's intention to continue using the app, which might affect the user's long-term acceptance and usage.

### **2.2. Technology acceptance model (TAM)**

The TAM refers to a person's desire to use technologies to perform specific tasks (Dillon, 2001). The TAM has been widely used in previous empirical research to investigate customers' adoption of new technology (Davis, 1989). Fishbein and Ajzen's (1975) theory of reasoned action (TRA) is the foundation of the TAM. According to the TRA, and individual's behavioral intention is driven by their attitude toward the activity and subjective standard.

The TAM is built on two basic perceptions: perceived usefulness (PU) and perceived ease of use (PEOU). These two fundamental beliefs influence attitude development, behavioral intention to

Figure 1. Proposed conceptual model.



use, and actual usage of new technology. A person's belief in the ability of a system/technology to assist them in doing a job is measured by their PU. As a result, PU is more applicable to and symbolic of technologies with utility. PEOU refers to a person's conviction that employing a given system/technology for a specific task minimizes the necessary effort. PEOU is balanced against the cognitive and purposeful effort a person feels is required to understand how to utilize the system/technology in question (Davis, 1989). It is worth noting that the variable "attitude" was included in the TAM. It was, however, deleted due to the weak impact of attitude on behavioral intention (Davis, 1989). The TAM also explains greater diversity in behavioral intention linked to technology use than the TRA or the theory of planned behavior, which have been widely used to describe broad and basic human actions across different areas (Mathieson, 1991).

### 2.3. Model conceptualization and hypotheses development

Figure 1 shows the proposed conceptual model that was built to show the factors that affect users' continuance intention to use mobile health apps during the Covid-19 pandemic.

### 3. Perceived usefulness, continuous intention and satisfaction

Perceived usefulness is related to an individual's belief that the system will enhance task performance (Davis, 1989). Many prior studies have confirmed the significant impact of the perceived usefulness of a system on individuals' intention to use the system (Gupta et al., 2021; S. Lee & Kim, 2021; Liu et al., 2021). Since Bhattacharjee (2001) introduced the ECM, a combination of the TAM and the ECT, it has been proven that perceived utility influences not only the initial acceptance of an IS but also the user's happiness and intention to continue using it. Much prior research (Baker-Eveleth & Stone, 2020; Li & Fang, 2019; Yan, Filieri, Raguseo, Gorton et al.,) has found a link between perceived usefulness, satisfaction, and continued use intention. This article predicts a positive influence of perceived usefulness on user satisfaction and continuous use intention, similar to the findings of previous studies. As a result, we propose the following hypothesis:

H1: Perceived usefulness has a significant effect on continuance intention to use mobile health apps.

H2: Perceived usefulness has a significant effect on users' satisfaction with mobile health apps.

### 4. Perceived ease of use and continuous intention

According to a review of previous studies, some factors are critical to understanding the reasons for the ongoing desire to utilize mobile apps. It has been established that perceived ease of use is one of the most significant aspects of consumers' continuous-use intentions, according to the technology acceptance model proposed by Davis (1989). Perceived ease of use refers to an individual's belief that using a specific technology does not need much effort (Davis, 1989). Since mobile apps are generally easier to use than company websites (McLean et al., 2020), perceived

ease of use is expected to play an important role in users' intention to use them. The extant literature on mobile apps provides evidence of the significance of perceived ease of use on individuals' continuous intention to use them (Foroughi et al., 2019; Gupta et al., 2021; Hanjaya et al., 2019; Lee et al., 2019). As a result, we propose the following hypothesis:

H3: Perceived ease of use has a significant effect on continuance intention to use mobile health apps.

### **5. Satisfaction, attitudes and continuous intention**

Consumer satisfaction can be described as a consumer's perception of the degree to which their needs have been met (Horváth & Michalkova, 2012). According to Keiningham et al. (2003) concept of satisfaction, customer satisfaction influences consumer behavior patterns. In addition, they discovered that high consumer satisfaction leads to increased consumer loyalty and repurchase intentions (Keiningham et al., 2003). Furthermore, marketing research has indicated that a consumer's degree of happiness is the most critical factor in his or her decision to repurchase a product or intend to use it again (Nobar & Rostamzadeh, 2018). Bhattacharjee (2001) demonstrated empirically that an IS's degree of pleasure is a crucial element influencing the system's desire to be used indefinitely. The direct link between satisfaction and continuation intention is at the basis of the IS continuance model, according to Bhattacharjee (2001), and it is experimentally confirmed. According to Wani et al. (2017), users with greater satisfaction levels have stronger intentions to use.

On the other hand, the relationship between satisfaction and attitude has been confirmed in the marketing literature. Weng et al. (2017) and Weng et al. (2017) found that satisfaction plays a vital role in predicting customer attitudes and actions. Another research by Al Amin et al. (2021) indicated that consumers' attitudes towards mobile apps are strongly associated with their attitudes towards these apps and their continuous intention towards using them. As a result, this article predicts that users' satisfaction with mobile health apps will lead to positive attitudes towards health apps and continuous intention to use them. Based on these assumptions, we introduce the following hypothesis:

H4: Satisfaction has a significant effect on attitudes toward mobile health apps.

H5: Satisfaction has a significant effect on continuance intention to use mobile health apps.

### **6. Confirmation and satisfaction**

According to the ECM, a user's confirmation of expectations of an IS's perceived utility and user happiness (Bhattacharjee, 2001). Tolman (1932) introduced the term "expectation," defining it as "consumers' conviction that a product or service would meet their expectations." Based on that definition, Oliver (1980) included the notion of expectation in his marketing strategy. He devised a model that depicts the stages of customer satisfaction development. Using the model, he suggested that the amount of expectancy confirmation determines pleasure (Oliver, 1980). Bhattacharjee (2001) proposed a theory on the relationship between confirmation and satisfaction based on these previous findings. In other words, he claimed that confirmation had a favorable effect on an IS's perceived utility. Many researchers found a link between confirmation and satisfaction in mobile app research when these relationships were validated (Chou et al., 2013 June, June; Hsu & Lin, 2015). As a result, we propose the following hypothesis:

H6: Confirmation has a significant effect on satisfaction with mobile health apps.



### **7. Attitude and continuous intention**

Davis (1989) defines attitude as “the degree of a person’s positive or negative viewpoint as it relates to the execution of the desired behavior.” According to the TAM, consumer attitudes may predict user behavior regarding technology. Fishbein & Ajzen, (1975) further described the attitude as the degree of positive or negative feelings about a targeted behavior. According to the extant literature, an attitude has a substantial influence on the use and acceptability of technological innovations such as mobile apps (Weng et al., 2017; Yoon, 2016). People are more motivated to use a new system and technology if they have a good attitude toward it (Weng et al., 2017). Attitude is a different concept than satisfaction, where attitude is a belief emerging out of the personal evaluation of a system, service, and product satisfaction is an evaluation occurring after purchasing a service or product (Venkatesh & Davis, 2000). From the previous discussion, this hypothesis is proposed:

H7: Attitude has a significant effect on continuance intention to use mobile health apps.

### **8. Trust and attitude**

In recent years, trust in electronic commerce and other online domains has received much attention (Lăzăroiu et al., 2020). According to Al-Debei et al. (2015), trust is highly linked to attitudes toward products and services and purchase behaviors. According to Gefen et al. (2008) and Zhao et al. (2018), trust is highly crucial to network merchants, it is not only a vital component affecting users’ adoption of information technologies but it is also a critical factor in recruiting customers. Van der Heijden et al. (2003) investigated consumer trust characteristics in Holland). They discovered that trust influenced the propensity to utilize electronic websites. Trust benefits consumers’ desire to utilize online shopping (Qalati et al., 2021). They concluded that trust might significantly indicate customer behavior in the internet context. From these discussions, the following hypothesis is included:

H8: Trust has a significant effect on attitudes toward mobile health apps.

### **9. Fear of covid and continuance intention**

Consumers’ fear of COVID-19 has driven them to adjust their purchasing patterns, according to some recent publications published in response to the emergence of COVID-19 (Sheth, 2020; Zwanka & Buff, 2021) due to the rapid growth in the number of diseases and ongoing government initiatives urging people to stay at home in order to avoid infection transmission (Ahmed et al., 2020).

Recent studies have indicated that fear of COVID-19 negatively influences life satisfaction and is positively linked to depression, anxiety, and stress (Satici et al., 2020). Barbosa et al., (2020October, October) are one of the few researchers that looked at consumers’ concerns about COVID-19 on their adoption of mobile apps. They discovered that customers’ concern about COVID-19 substantially impacted their use of food-ordering applications during the pandemic. According to them, customers saw these applications as safe modes of transportation. In this study, we expect that users of health apps might have the intention to use the health apps to avoid infection with Covid-19. Thus, we propose the following hypothesis:

H9: Fear of Covid-19 has a significant effect on continuance intention to use mobile health apps.



## 10. Methodology

### 10.1. Sampling and data collection

The population of this study is the actual users of mobile health apps in Egypt. Several healthcare providers and insurance companies have introduced these services in Egypt over the past five years. Especially after the pandemic, several companies have developed these apps to connect with patients and clients to improve their services and decrease the pressure on traditional physical healthcare services (Elsafty et al., 2020). These apps provide several services to their users, such as gaining medical approvals, booking medical appointments, online medication ordering, and virtual medical consultations.

This study adopted a quantitative approach, where a questionnaire was developed based on previously validated measures from the literature. A pilot study was conducted by distributing the questionnaire to a sample of users of health apps in Egypt. The pilot study involved 80 participants and aimed to eliminate any difficult questions and to examine the reliability and validity of the items in the questionnaire. For conducting the main study, a link to an online questionnaire was posted on several Facebook pages of healthcare providers and insurance companies that introduced health apps in Egypt. After multiple postings over two months, 442 complete questionnaires were collected. The data were analyzed using partial least square structural equation modeling (PLS-SEM) through SmartPLS 3.0. PLS-SEM has the advantage of dealing with complex models and does not require normal data distribution (Hair et al., 2019).

### 10.2. Measures

The questionnaire consisted of three parts. The first part contained an introduction about the research objectives. This introduction asked the respondents to answer the questionnaire if they have actually used the mobile health apps. The second part consisted of some questions about the demographic characteristics of the respondents. Finally, the last part consisted of items that aimed to assess the theoretical constructs of the study. To assess the confirmation, three items were adapted from Bhattacharjee (2001). To assess the continuance intention, three items were adapted from Bhattacharjee (2001) and Zhao et al. (2018). Furthermore, perceived usefulness was measured using five items adapted from Venkatesh and Davis (1996). Additionally, perceived ease of use was measured using three items adapted from Zhao et al. (2018). On the other hand, satisfaction was assessed using four items adapted from Bhattacharjee (2001). Attitude was measured using four items from Zhao et al. (2018). The fear of Covid-19 was assessed by using five items adapted from Ahorsu et al. (2020) and Gaber and Elsamadicy (2021). Finally, trust was measured using five items adapted from Delgado-Ballester (2004) and Zhao et al. (2018). The questionnaire depended on a five-point Likert scale ranging from strongly disagree to strongly agree to measure the study's constructs. The Likert scale is considered user friendly, and is suitable for a variety of statistical analysis methods (Rasmussen, 1989). The items of the questionnaire are displayed in Table 1.

## 11. Findings

### 11.1. Sample characteristics

Most were males (248 respondents, 56.1%), while 194 were females (43.9%). Regarding the age of the respondents, most of them were aged between 18–34 (142 respondents, 32.1%), 123 respondents were aged between 34–45 (27.9%), 106 respondents were aged between 46–59 (24%), while only 71 respondents were 60 years and above (16%). The analysis of the respondents' monthly income showed that 28.1% of the respondents had an income below 10,000 LE, 41.8% had an income between 10,001 and 20,000 LE, 20.4 % of respondents had an income between 20,001 and 40,000 LE. In comparison, only 9.7% of the respondents had an income above 40,000 LE. Regarding the educational level of the respondents, 25.8% of them had a secondary school degree, 60.2% of them had a college degree, and only 14 % had a postgraduate degree. Table 2 lists the demographic characteristics of the respondents.

**Table 1. Items of the questionnaire**

<b>Construct</b>	<b>Manifest Variable</b>	<b>Questionnaire Items</b>
Confirmation	CONF1	My experience with mobile health apps was better than my expectations.
	CONF2	The services provided by mobile health apps were better than what I predicted.
	CONF3	I think that my expectations were confirmed when I used the mobile health apps.
Continuance Intention	CI1	I have an intention to use the mobile health apps in the future.
	CI2	I will continue to use the mobile health apps more than traditional health services.
	CI3	I would recommend the mobile health apps to my family and friends.
Perceived Usefulness	PU1	Mobile health apps are a useful tool to access health services.
	PU2	Mobile health apps provide a convenient service.
	PU3	Mobile health apps provides an easier experience than traditional health services.
	PU4	Mobile health apps are fast.
	PU5	Mobile health apps are cheaper than traditional health services.
Perceived Ease of Use	PEOU1	Learning how to use the mobile health apps would be easy for me
	PEOU2	Using mobile health apps take less effort and time.
	PEOU3	The mobile health apps provide clear and easy communication.
Satisfaction	SAT1	I am very satisfied from the usage of mobile health apps.
	SAT2	I am very pleased from the usage of mobile health apps.
	SAT3	I am very contented from the usage of mobile health apps.
	SAT4	I am very delighted from the usage of mobile health apps.
Attitude	ATT1	Using mobile health apps is a good idea.
	ATT2	I enjoy using mobile health apps.
	ATT3	Using mobile health apps would bring me a pleasant experience.
	ATT4	I am positive about using mobile health apps.
Trust	TR1	The mobile health apps meet my expectations.
	TR2	I feel confident in the mobile health apps.
	TR3	The mobile health apps takes my needs into consideration.
	TR4	I can rely on the mobile health apps when I need medical services.
	TR5	The mobile health apps are trustworthy.
Fear of Covid	FOC1	I feel afraid from Covid-19.
	FOC2	Thinking about Covid-19 makes me uncomfortable.
	FOC3	I don't sleep well because I think about Covid-19.
	FOC4	I am afraid to die from Covid-19 infection.
	FOC5	Watching the news about Covid-19 makes me nervous.

**Table 2. Demographic characteristics of the respondents**

Demographic characteristic		Frequency	Percentage
<b>Gender</b>	Male	248	56.1%
	Female	194	43.9%
<b>Age</b>	18–34	142	32.1%
	34–45	123	27.9%
	46–59	106	24%
	60 and Above	71	16%
<b>Monthly Income</b>	Below 10,000 LE	124	28.1%
	10,001–20,000 LE	185	41.8%
	20,001–40,000 LE	90	20.4%
	40,000 and above	43	9.7%
<b>Frequency of Usage</b>	Once per month	245	55.4%
	2–3 times per month	111	25.1%
	More than 3 times per month	86	19.5%
<b>Education</b>	Secondary School	114	25.8%
	College	266	60.2%
	Postgraduate Degree	62	14%

### 11.2. Measurement model

The statistical analysis was performed using SmartPLS 3.0 on an empirical sample of 442 users of health apps. Before testing the research hypotheses, it is essential to evaluate the reliability and validity of the study's constructs. In order to evaluate the internal consistency of the study's constructs, the researchers examined the composite reliability (CR) and the Cronbach's alpha of these constructs to make sure that it exceeds the required threshold of 0.7 recommended by Peterson (1994). It is essential to examine the composite reliability (CR) before conducting PLS-SEM analysis as pointed out by Henseler et al. (2009). The analysis showed that CR values were between 0.881 and 0.942, while Cronbach's alpha ranged between 0.751 and 0.908. These values were above the required threshold of 0.7 and indicated the strong reliability of all the study's constructs.

Moreover, the items' loadings were examined to ensure that they exceeded the required threshold of 0.7 (Chin, 1998). Hence four items were dropped as they had poor items loading. These items are CONF3, SAT3, ATT4, and TR4.

On the other hand, to assess the convergent validity of the study's constructs, the AVE values were checked, where their values range between 0.648 and 0.845, which is above the required threshold of 0.5 (Fornell & Larcker, 1981). Table 3 displays the outer loadings, Cronbach's alpha, Composite reliability, and AVE values of the study's items and constructs

On the other hand, to ensure discriminant validity of the constructs, the recommendations of Fornell and Larcker (1981) were followed. The analysis indicated that all construct possessed a high discriminant validity, where the findings showed that the square root of AVE of each construct is higher than the correlations between the construct and all other constructs. Table 4 shows the results of discriminant validity assessment.

### 11.3. Assessment of the structural model

The model was examined using bootstrapping resampling procedures using PLS-SEM to test the research hypothesis, as Kock (2018) recommended. The researchers examined the values of path

coefficient  $\beta$ , t-values, and significance p values. The findings showed that H1 was supported, where perceived usefulness had a positive significant impact on continuous intention ( $\beta = 0.283$ ,  $t=4.846$ ,  $p=0.000$ ). H2 was also supported, where perceived usefulness had a positive significant impact on satisfaction ( $\beta = 0.166$ ,  $t=5.847$ ,  $p=0.000$ ). H3 was further supported, where perceived ease of use was found to have a significant positive impact on continuous intention ( $\beta = 0.296$ ,  $t=4.841$ ,  $p=0.000$ ). The positive significant effect of satisfaction on attitudes was confirmed. Thus H4 was supported ( $\beta = 0.479$ ,  $t=3.877$ ,  $p=0.000$ ). The findings further indicated that satisfaction has a positive significant impact on continuous intention ( $\beta = 0.361$ ,  $t=3.794$ ,  $p=0.000$ ). Thus H5 was supported. Moreover, H6 was supported where the confirmation had a significant relationship with satisfaction ( $\beta = 0.841$ ,  $t=42.608$ ,  $p=0.000$ ). H7 was also supported since the findings indicated the positive significant impact of attitudes on continuous intention ( $\beta = 0.205$ ,  $t=2.342$ ,  $p=0.020$ ). H8 was supported, where trust was found to have a positive significant impact on attitudes ( $\beta = 0.488$ ,  $t=3.878$ ,  $p=0.020$ ). On the other hand, H9 was rejected, where the findings showed the fear of Covid had an insignificant effect on continuous intention to use the health apps ( $\beta = 0.031$ ,  $t=0.704$ ,  $p=0.482$ ). Table 5 summarizes the findings. On the other hand, Appendix shows the SmartPLS output of the model assessment.

The R2 of users' continuous intention to use the health apps was 0.393, which indicates that 39.3 % of the change in the continuous intention is explained by satisfaction, attitudes, perceived usefulness, and perceived ease of use. The R2 of satisfaction is 0.827, which indicates that 82.7 % of the change in satisfaction is explained by confirmation and perceived usefulness. Finally, the R2 of attitudes is 0.889, which indicates that 88.9% of attitude is explained by trust and satisfaction.

## 12. Discussion and theoretical contributions

The research study in this article aimed to examine the factors that impact the intention of actual users of mobile health apps in Egypt to continue using them during the Covid-19 pandemic. H1 was supported, where the results indicated that the perceived usefulness of the mobile apps is a strong indicator of users' intention to use them in the future continuously. These findings have been supported in the extant marketing literature. For instance, Foroughi et al. (2019) found that perceived usefulness is a significant determinant in the usage of mobile banking apps. Similarly, Hanjaya et al. (2019) argued that consumers' perceived usefulness of mobile apps significantly affects their purchase intention. Our findings underscore the importance of perceived usefulness, which is critical for the health care providers and insurance companies who depend on health apps to announce the benefits t users can get from using them. It is also essential for these companies to ask users for suggestions that allow these companies to introduce more services on these apps that are important for these users.

H2 was supported, where our results showed that users' satisfaction largely depends on the perceived usefulness of the mobile health apps. The findings are similar to the findings of Li and Fang (2019), which showed that satisfaction is essential in creating users' intention to use mobile-branded apps continuously. They argued that the apps' developers should ensure the users' high satisfaction to get users' loyalty to these apps.

H2 was supported, where our findings showed that perceived ease of use is an important element that affects the users' intention to use mobile health apps continuously. The marketing literature extensively cited the relationship between perceived ease of use and continuous intention. For instance, Ozturk et al. (2016) argued that when consumers find that hotel booking apps are easy to use, they tend to have a strong continuous intention to use them. Similarly, Hamid et al. (2016) found the same when examining users' intention to use e-government services. Based on our findings, we argue that mobile health apps should be very user-friendly to ensure that they are easy to use by all demographic segments.

**Table 3. Outer loadings, CR values, Cronbach's alpha, and AVE) of the study's constructs**

Constructs	Item	Loading	Cronbach's alpha ( $\alpha$ )	Composite reliability (CR)	AVE
Confirmation	CONF1	0.883	0.751	0.859	0.675
	CONF2	0.916			
	CONF3	0.638			
Continuance Intention	CI1	0.897	0.908	0.942	0.845
	CI2	0.935			
	CI3	0.925			
Perceived Usefulness	PU1	0.838	0.899	0.926	0.714
	PU2	0.908			
	PU3	0.822			
	PU4	0.774			
	PU5	0.877			
Perceived Ease of Use	PEOU1	0.880	0.872	0.922	0.797
	PEOU2	0.901			
	PEOU3	0.896			
Satisfaction	SAT1	0.882	0.813	0.881	0.655
	SAT2	0.896			
	SAT3	0.577			
	SAT4	0.841			
Attitude	ATT1	0.856	0.818	0.884	0.661
	ATT2	0.885			
	ATT3	0.896			
	ATT4	0.571			
Trust	TR1	0.910	0.877	0.914	0.688
	TR2	0.872			
	TR3	0.868			
	TR4	0.522			
	TR5	0.909			
Fear of Covid	FOC1	0.767	0.871	0.902	0.648
	FOC2	0.771			
	FOC3	0.797			
	FOC4	0.827			
	FOC5	0.861			

H4 and H5 were supported, where our findings showed that satisfaction is an important factor that affects users' attitudes and continuous intention to use mobile health apps. These findings are similar to the findings of Al-Emran et al. (2020), which showed satisfaction is an important factor that affects users' continuous intention to use m-learning. Also, our findings are consistent with Al Amin et al. (2021) argued that customers' satisfaction with food ordering apps significantly influences their continuous intention to use them. Thus, based on our results and the support in the extant literature, we recommend that mobile app developers continuously monitor users' satisfaction. It can be done through surveys and effective customer service.

**Table 4. Discriminant validity assessment**

Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,	Arab Academy for Science,
ATT	<b>0.813</b>								
CI	0.401	<b>0.919</b>							
FOC	0.256	0.176	<b>0.805</b>						
PEOU	0.457	0.548	0.318	<b>0.893</b>					
PU	0.482	0.529	0.266	0.586	<b>0.845</b>				
TR	0.635	0.421	0.329	0.469	0.417	<b>0.829</b>			
CONF	0.512	0.419	0.254	0.493	0.435	0.776	<b>0.822</b>		
SAT	0.469	0.428	0.261	0.489	0.438	0.628	0.560	<b>0.809</b>	

**Table 5. Summary of findings**

Hypotheses	Path coefficient (β)	Significance (p)	t-values	Conclusion
H1	0.283	0.000	4.846	Supported
H2	0.166	0.000	5.847	Supported
H3	0.296	0.000	4.841	Supported
H4	0.479	0.000	3.877	Supported
H5	0.361	0.000	3.794	Supported
H6	0.841	0.000	42.608	Supported
H7	0.205	0.020	2.342	Supported
H8	0.488	0.020	3.878	Supported
H9	0.031	0.482	0.704	Rejected

H6 was supported since our findings confirmed the significant relationship between confirmation and satisfaction. These findings can be revisiting the ECM model (Bhattacharjee, 2001), which argues that when the expectations of the system’s performance confirm to users, they tend to be satisfied. These findings are similar to the findings of Hsu and Lin (2015), which empirically proved the relationship between confirmation and satisfaction of users of mobile paid apps. Thus, we strongly recommend that health providers deliver the user’s expectations to ensure their satisfaction.

H7 was supported since our findings confirmed the significant effect of attitudes on continuous intentions to use mobile health apps. The positive relationship between attitude and continuous intention has been confirmed in many studies in the marketing field. For instance, McLean et al. (2020) found that consumers’ attitudes toward m-commerce apps significantly impact their loyalty to these apps. Thus, marketers of mobile health apps should study the factors that affect users’ attitudes to ensure their continuous intention.

H8 was supported, and our findings indicated that users’ trust in mobile apps is important in building positive attitudes. These findings have been supported in the previous literature. For instance, Cheung and To (2017) found that trust is important in users’ willingness to engage with the advertisements in the apps. Thus, based on these findings, the health providers that have built a strong trust with their customers and patients should rely on this trust in building positive attitudes towards mobile health apps.

Finally, according to our data, our empirical investigation did not support H9, where customers’ concern about COVID-19 had no effect on their continued desire for mobile health apps. It indicates that the health providers did not succeed in convincing customers that the usage of the health apps prevented the infection. Our findings are consistent with those of Barbosa et al., (2020October, October) and Gaber and Elsamadicy (2021). They found that consumers’ concern about COVID-19 did not influence their willingness to utilize food delivery applications. Our findings are intriguing since these applications, with their high social distancing characteristics, enabled consumers to access health services during the pandemic.

Our article contributes theoretically by developing a multi-theoretical framework based on the ECM and the TAM to explain users’ continuance intention of mobile health apps. Prior research has only used a single theory, such as the ECM (Tam et al., 2020) and the technology readiness index (TRI; Humbani & Wiese, 2019). Furthermore, our article contributes by focusing on users’ continuance intention in the context of mobile apps. Earlier research has focused on the intention of users to use mobile apps, which is a different concept than continuance intention (Munoz-Leiva et al., 2017). Thus our article is structured around post-acceptance behavior, where researches about



acceptance behavior have approached maturation (Lew et al., 2019). Finally, our article contributes theoretically by testing a newly developed construct: the fear of Covid-19 on the continuance intention to use mobile health apps during the Covid-19 pandemic. This construct has only appeared in a few recent studies investigating customers' behavior during the Covid-19 pandemic (Ahorsu et al., 2020; Gaber & Elsamadicy, 2021).

### **13. Managerial implications**

The research study's findings in this article provide significant recommendations for decision-makers in health care and health insurance industries to use health apps during the Covid-19 pandemic to ensure business sustainability. The findings highlighted the factors affecting patients' and medical insurance subscribers' continuous intention to use health apps during the Covid-19 pandemic. For instance, the findings underscored the importance of perceived usefulness and perceived ease of use in influencing users' continuance intention to use these apps during the pandemic. Therefore, the developers of these apps need to add useful features such as online medical consultation, approval of medications, booking of health consultations, and enabling users to access useful information about maintaining a healthy lifestyle. Also, these apps need to provide these services promptly and instantly. It is considered important, especially during the Covid-19 pandemic, where the healthcare sector suffered immense pressure and increased demand (Abdelghani et al., 2021). Another recommendation for the developers of these apps is to introduce the apps in a user-friendly way to make these apps easy to use. They can provide these apps with multiple languages to appeal to patients and insurance subscribers from various educational backgrounds and ages. Since the major advantage of smartphone apps is the ease of use compared to websites (Humbani & Wiese, 2019), the apps need to be designed attractively and easily to enhance the users' continuance intention to use them.

Since the findings also showed the importance of users' satisfaction and attitudes in enhancing their continuance intention to use the health apps, it is critical for the developers of these apps to enhance their customer service and improve their user experience. It could be done through continuous surveys and market research to get feedback from the users of these apps and ask them how to improve the service performance. Another recommendation to enhance customer satisfaction is ensuring that the health apps' performance confirms their expectations. Therefore, healthcare providers and insurance companies should be very careful when setting users' expectations about the performance of their apps. In other words, they should not promise services are not provided by these apps to avoid customer dissatisfaction. Finally, the findings did not prove the relationship between the fear of Covid-19 and users' continuous intention. These findings underscored the importance of these apps to provide medical services to patients and medical insurance subscribers during the pandemic, which will decrease pressure on traditional healthcare services and can be considered a good way of decreasing infection. There is a rapid acceptance of mobile health apps in Egypt. Healthcare providers should start introducing innovative technologies to facilitate the interaction between patients and health providers (Jenkins, 2022).

### **14. Limitations and directions for further research**

Despite the theoretical and managerial implications of the research study in this paper, it is not without limitations. The study examined only the continuance intention to use mobile health apps, which limits the findings to actual users. Future research can examine the factors that encourage non-users to adopt these apps. Another limitation is that the study was conducted only in Egypt as an example of a developing country. Future studies can examine the usage of mobile health in other developing countries and provide a cross-cultural comparison between the motives, usage rates, and intentions across countries and cultures. Another limitation is that the study did not examine the influence of demographic factors on users' intention to continue using health apps.

Further research is needed to examine the impact of demographic factors such as age, gender & education on the intention to use these apps. A further limitation is that our model could only explain 39.3% of users' continuous intention to use health apps; future research can examine more factors to explain that continuance intention. Finally, this depended on the satisfaction-confirmation model and TAM to build a conceptual model. Future research can examine other factors using other theories, such as the theory of planned behavior.

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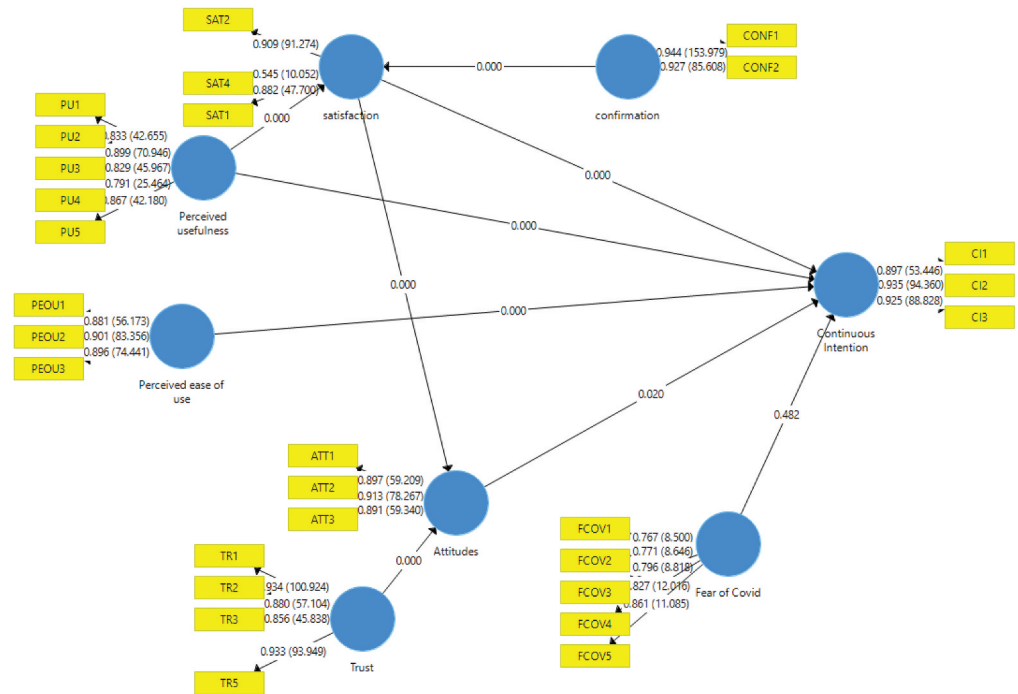
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**Appendix SmartPLS output of the bootstrapping approach**

This article examines the factors that affect the intention of actual users of the mobile health apps in Egypt to continue using them during the Covid-19 pandemic. Through an online survey of 442 actual users of these apps, we found that users are mainly affected by satisfaction, perceived usefulness, perceived ease of use and attitudes. Our article provides some guidelines for the health providers and insurance companies who use these apps to connect with customers and patients. They should make sure that the health apps contain a variety of services such as online medical consultations, booking of health appointments, and other health related services. These apps can provide an opportunity to decrease the pressure on the health industry that faced big challenges during the pandemic.





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