






FEAR OF COVID-19 AND INTENTIONS TOWARDS ADOPTING E-HEALTH SERVICES: EXPLORING THE TECHNOLOGY ACCEPTANCE MODEL IN THE SCENARIO OF PANDEMIC

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ABSTRACT

Article History

Received: 12 February 2021

Revised: 15 March 2021

Accepted: 19 April 2021

Published: 24 May 2021

Keywords

Fear of Covid-19

TAM

e-health

Technology adoption

Behavioral intentions

Perceived uses of use

Perceived usefulness.

JEL Classification:

I18: Health: Government Policy;

Regulation; Public Health.

The aim of this paper was to investigate the link between fear of Covid-19 and individuals' behavioral intentions toward adopting e-health services by expanding the technology acceptance model (TAM) to incorporate fear of the Covid-19 factor. To empirically testing our proposed theoretical model, we conducted a research survey in Pakistan and collected data from 624 individuals utilizing a non-probability convenience sampling strategy. The outcomes of our study declare that fear of Covid-19 are positively associated with individuals' attitude and their subsequent behavioral intentions towards adopting e-health services. Perceived ease of use and perceived usefulness of e-health services mediated the relationship between fear of Covid-19 and individuals' attitude towards adopting e-health services. This research is highly significant in the current scenario of Covid-19. Our study offers a theoretical model to understand why and how fear of Covid-19 is related to an individual's intentions for adopting e-health services. Moreover, this study also extends the literature of the technology acceptance model TAM by pinpoint the impact of fear of Covid-19.

Contribution/Originality: This study investigates the link between fear of Covid-19 and individuals' behavioral intentions toward adopting e-health services by expanding the technology acceptance model (TAM) to incorporate fear of the Covid-19 factor.

1. INTRODUCTION

The world is now battling the Covid-19 infectious disease that has been announced a global high-risk epidemic by the World Health Organization (aka. WHO) (Dalglish, 2020). A new kind of Corona virus initially called novel Corona virus pneumonia (NCP), and subsequently renamed the new Corona Virus in 2019 (2019-nCoV or Covid-19) has badly affected the world. It is the seventh corona virus known to be spread among humans (Zhou et al., 2020). On December 31, 2019, clusters of cases of Corona virus were formally recorded from Wuhan, Hubei Province, China (Amir, 2020). Since its first outburst in Wuhan, a highly contagious disease, the Corona virus has spread to all parts of the world. To date, the Corona virus (Covid-19) has been confirmed in 198 countries (Iriani & Andjarwati, 2020). Due to the dramatic rise in the number of cases out of doors China, on March 11, 2020, the

WHO formally announced the outburst of a pandemic (Vermeiren et al., 2020) and adopted new principles on social distancing to evade the spread of the virus.

Numerous WHO principals prevented the mass increase of the Coronavirus, such as closing institutes and areas where individuals get together as an example pub, cinemas, shopping center, gymnasiums, and different sports activities venues. The initiatives also included creating social and physical distancing, large level of social boundaries, and regional quarantine. As a result, cities were isolated and even public relations was restricted, affecting people's regular lifestyles. Due to the Covid-19 pandemic, countries have faced a range of healthcare, financial and social challenges. Overwhelmed by the rapid increase of the new Covid-19 sufferers, are facing obstacles in providing systematic health services. Such interruptions have led to exceptional consequences, such as loss of physical and mental health. For all those affected, the psychological consequences of Covid-19 should be considered as well as the physical symptoms (Shigemura, Ursano, Morganstein, Kurosawa, & Benedek, 2020; Zhou et al., 2020).

Psychological signs linked to Covid-19 have already been examined at the national level. The governments of China, Singapore, and Australia have pinpoint the psychological outcomes of Covid-19 and expressed concern about the life time side effects of isolation and that community panic has been harmed greater than Covid-19 (Lai, 2020; Zhang, Wu, & Rasheed, 2020). Patient, medical, and non-clinical personnel are also at the risk of mental distress within the absence of a medical remedy for Covid-19, as they are likely to interact with a higher risk of virus contact. It can also cause stress, anxiety, irritability, and depressive symptoms. In the early June 2020, there were more than 69,761 American healthcare providers who were confirmed positive for coronavirus with 369 deaths (Covid & Team, 2020). In the Europe such as Italy, 10% of the overall affected patients were the medical staff (Grover et al., 2020). Pappa et al. (2020) revealed that substantial levels of hopelessness, sleeplessness, and fear caused due to the Covid-19 epidemic were experienced by a high proportion of people. The situation with Covid-19 had a significant effect on medical staff, who devote much of their time with infected sufferers and are utmost prone to suicidal emotions (Drissi et al., 2020; Smith, 2020). Two health staff members in Italy committed suicide, one after testing positive for Covid-19 and the other while awaiting results (Smith, 2020). It is therefore a daunting task to preserve psychological and social well-being throughout the Covid-19 pandemic.

Coronavirus has questioned global health structure and enhanced health care delivery problems, promoted more pressure and anxiety between people. In order to solve the complex incident of the Covid-19 epidemic, technical innovation is one of the foremost strengths within the modern period. The well timed implementation of the associated technology would be crucial not only to protect but also to tackle the post- Covid-19 world. More precisely, e-health services are technically feasible and suitable during this pandemic to help patients, family members, and providers of health services (Albahri et al., 2020).

WHO explains e-health as "the leveraging of information and communication technology (ICT) to connect providers, patients and governments; to educate and inform health care professionals, managers, and consumers; to stimulate innovation in care delivery and health system management, and to improve our health care system" (Hoque, Bao, & Sorwar, 2017). E-health technology applications and tools for instance Electronic Medical Records (EMR) system, Hospital Information Systems (HIS), internet-based telemedicine (IBT), and m-health (MH) are important information technology resources that enhance the quality of healthcare delivery, increase patient safety, and minimize healthcare costs (Shekelle, Morton, & Keeler, 2006). Prior to the Covid-19 pandemic, e-health and related approaches were gradually being developed, with many reports focusing on lessons learned and barriers to implementing digital solutions (Badalato, Kaag, Lee, Vora, & Burnett, 2020; Moo, Gately, Jafri, & Shirk, 2020; O'Brien et al., 2018; Zachrison, Boggs, Hayden, Espinola, & Camargo Jr, 2020). The examples and evidence supporting e-health effectiveness are quite different, especially in the context of hopelessness (Zhou et al., 2020) fear (Rees & Maclaine, 2015) and PTSD (Turgoose, Ashwick, & Murphy, 2018) Video-conferencing (Backhaus et al., 2012) online meetings (Kauer, Mangan, & Sanci, 2014) phone applications (Kerst, Zielasek, & Gaebel, 2020)

messaging (Kauer et al., 2014) and email (Torniainen-Holm et al., 2016) have been showed to be suitable connection methods for the delivery of e-health services. Thus our contest is to provide e-health services in the situation of individual, fear of Covid-19, isolation, stress, and anxiety.

The healthcare system is a dynamic social system made up of a variety of stakeholders of varying backgrounds, perspectives, and values. It's essential to comprehend the user's viewpoint on adopting e-health and related approaches (Norman & Skinner, 2006).

Therefore, it is significant to apply technology adoption theories such as Technology Acceptance Model (TAM) to measure how practical and effective an application is and how convenient it is to use. We, therefore, utilize the technology acceptance model (TAM) to understand a connection among the fear of Covid-19 and peoples' attitude and behavioral intentions for adopting the e-health services. It has been observed that after the breakout of Covid-19 people are avoiding and are advised to avoid visiting places with the human rush. Evidence indicates that through close contact and droplets, Covid-19 is transmitted.

People are, therefore, inclined to use the e-health services which are aimed at offering medical advice and cure while staying at home. The study is highly significant as it offers a theoretical model to understand why and how fear of Covid-19 is associated to peoples' intentions for adopting e-health services. Therefore, this research explores the possible relation between fear of Covid-19, perceived ease of use, perceived usefulness, individuals' attitude, and behavioral intentions for adopting the e-health services.

Furthermore, the present research helps to the existing literature by pinpointing the mediating mechanism of perceived ease of use and perceived usefulness among fear of Covid-19 and people attitude toward adopting e-health services. We believe that perceived ease of use and perceived usefulness of the e-health services are the possible mechanisms in this possible connection between fear of Covid-19 and peoples' attitude and intentions for adopting the e-health services.

Numerous research on the implementation of e-health services in emerging countries suggests that e-health can be one of the mechanism to deliver patients with offer to improved health services while maintaining social distancing in the scenario of Covid-19 (Gadabu, Sunguh, Arkorful, Uddin, & Lukman, 2019).

Garg and Agarwal (2014) claim that there are many advantages to the use of this health application that can optimize profits, save money, boost efficiency, provide better health services, and can improve the health of patients. According to IQVIA, in 2017, the number of health applications circulating in the world surpassed 318,000 in the combined information technology and health sector, where the value reached continued to increase to almost double the number of health applications in 2015.

Another study by the WHO Global Observatory for health found that e-health resources are very beneficial in the 70% of non-OECD countries. The use of the electronic media for health purposes has been extensively applied by various people in this pandemic situation (Covid-19) (Mead, Varnam, Rogers, & Roland, 2003).

Tebeje and Klein (2020) declared that e-health tools are used as a solution for focused health care of individuals and to control the extent of Covid-19. In the same line, Wind, Rijkeboer, Andersson, and Riper (2020) claimed that through videoconferencing psychotherapy and internet interventions, the obvious way to carry on mental health treatment during a epidemic is to offer mental health care from long distance.

Figure 1 describes the theoretical construct of our research. The model explains that the fear of Covid-19 is significantly related with individuals' intentions towards adopting e-health services through the perceived ease of use of e-health services, perceived usefulness of e-health services, and attitude.

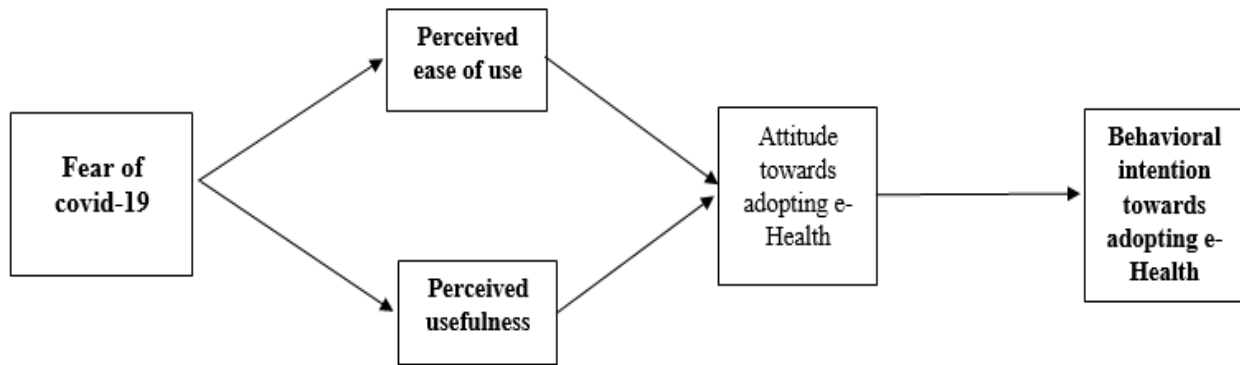


Figure-1. Theoretical framework.

Source: Technology Acceptance Model (TAM; Davis (1989))

2. THEORY AND HYPOTHESES DEVELOPMENT

2.1. Technology Acceptance Model (TAM)

Technology acceptance and its use is mainstream in the research area (Venkatesh, 2000). Reviewing the prior studies on acceptance of technologies, we construct that the Theory of Reasoned Action (TRA) (Fishbein, Ajzen, & McArdle, 1980) the Theory of Planned Behavior (TPB), and the Unified Theory of Acceptance and Use of Technology Theory (UTAUT) and TAM (Venkatesh, 2000) were commonly applied models in this discipline (Yu, 2012). Further study has shown that these models, in which UTAUT, TRA, and TPB models have alike characteristics (Kapoor, Dwivedi, & Williams, 2014). Moreover, some previous experimental studies have shown that Technology acceptance model has extra illustrative strength than Theory of Reasoned Action and Theory of Planned Behavior in anticipating individuals behavioral intentions (Zhang et al., 2020). Furthermore, TAM indicates technology adoption from individual's perspective, however it can also explore the impact of external aspects, especially consumer perspective factors, through PU and PEU. The Technology Acceptance Model (TAM) is a modern theory for using technology in different fields, including e-health services (Hoque et al., 2017; Tao et al., 2020). Therefore, in this study, we employed a TAM model to support our theoretical framework.

Davis (1989) described the importance of TAM as an essential model that illustrates the commitment to technology acceptance and the ability to define the user's use of technologies such as e-health services. As per TAM, patients' intent to use e-health may be influenced by their perceived usefulness (PU) and ease of use of the system (PEU) (Davis & Venkatesh, 2004). TAM is a useful theory for evaluating consumer technology adoption, and it has become an significant computational method in e-health studies (Amadu, Muhammad, Mohammed, Owusu, & Lukman, 2018; Davis & Venkatesh, 2004; Sarwar, Zulfiqar, Aziz, & Ejaz Chandia, 2019). Several experimental studies on e-health services have tested TAM, and this theory is relevant in the context of healthcare (Alsharo, Alnsour, & Alabdallah, 2020; Kang & An, 2020). For example, (Aggelidis & Chatzoglou, 2009) stated that TAM accurately estimates a portion of consumer acceptance of e-health.

This scrutinize assumes the technology acceptance model (TAM) to understand the connection between fear of COVID-19, peoples' Attitudes, and intentions for adopting the e-health system.

We believe that perceived ease of use and perceived usefulness of the e-health system are the essential mechanisms in this possibility, among fear of COVID-19 and peoples' attitude and behavior intentions for adopting the e-health system. Our research, therefore, contributes to the theoretical literature on TAM by applying this model in the context of COVID-19 and in the health care system to find out why and how fear of Covid-19 is related to peoples' attitudes and intentions for adopting e-health system. For this study reason, the research employs perceived ease of use (PEU) and perceived usefulness (PU) as research variables.

2.2. Fear of Covid-19

The novel Coronavirus Disease (Covid-19) first appeared on December 12, 2019, in Wuhan, Hubei Province, China. Scientists all over the world have attention to the symptomatic and medicinal aspects of Covid-19. Researchers confirm that Covid-19 promotes fear in individuals and infecting people in different ways. For example, (Ahorsu et al., 2020) declared that the flare-up of Covid-19 and its pandemic character had resulted in fear and anxiety. As well as Zhang, Wu, Zhao, and Zhang (2020) specified that fear and anxiety about Covid-19 could lead to the stigma social exception of patients, beneficiaries, their family members, and others related to the disease, leading to increased mental health disorder such as readjustment disorder and depression can cause danger. Covid-19 has many types of fear, such as feelings of vagueness, health concerns, danger to loved ones, and raises two important issues: a higher degree of anxiety and a greater likelihood of contracting the disease (Ahorsu et al., 2020; Gerhold, 2020). In this regard, Lin (2020) also pinpointed the effect of COVID-19 and reported that non-affected persons are afraid to contact Covid-19, infected persons. Higher echelons of fear of Covid-19 can also lead to irrational and vague opinions (Ahorsu et al., 2020) making it important to understand the effects of the crisis on people's mental health (Xiang et al., 2020). The conspicuous explication to continuing mental health care in an epidemic is to achieve e-health care at an exciting distance through videoconferences, psychotherapy, and web intercessions. A precise survey by Berryhill et al. (2019) demonstrated that videoconferencing psychotherapy shows the associated results of mood disorders and anxiety. The testimony base of therapist-facilitator Internet interference is more stronger (Andersson, Titov, Dear, Rozental, & Carlbring, 2019).

On the basis of this theoretical discussion, the present study investigates the relationship between the adoption of e-health services under the TAM and external element of fear Covid-19. Furthermore, this research seeks to conquer the limits of the TAM model, which is an application of external factor by considering the impact of Fear of Covid-19 on PU and PEU. This discussion leads us to assume that:

H1a: *Fear of Covid-19 is positively associated with individuals' perceived ease of use towards e-health services.*

H1b: *Fear of Covid-19 is positively associated with individuals' perceived usefulness towards e-health services.*

2.3. Mediating Role of Perceived Usefulness and Perceived Ease of Use

Perceived usefulness is impudent on how many characteristics of the information system (IS) appropriate with individuals and work's desires (Gürsel, Zayim, Gülkesen, Arifoğlu, & Saka, 2014). Therefore, perceived usefulness describes as "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context" (Davis, 1989). This ensures that people learn to use (or not use) information systems to the degree that they think they can help them do their work better or perform better. Perceived usefulness stands as the primary impetus for the permanent adoption of technology (King & He, 2006; Ma & Liu, 2004; Schepers & Wetzels, 2007). Perceived usefulness has also been recommended as an important commitment to doctors' adoption of health information systems; it is suggested that medical experts have a practical view of technology acceptance (Jayasuriya, 1998; Yarbrough & Smith, 2007). Similarly, Hoque et al. (2017) examined the elements affecting the acceptance of e-health in emerging countries and stated that Perceived usefulness (PU) significantly enhanced the intention to use e-health. Hoque et al. (2017) who researched communities in Bangladesh, found that perceived usefulness strongly influenced the acceptance of e-health. In the literature review of the bilateral relationship between construction work related to the adoption of technology, the strongest connotation was recognized between the perceived usefulness and the attitude towards adopting e-health services (Schepers & Wetzels, 2007; Zobair, Sanzogni, & Sandhu, 2019). As a result, the hypothesis below was proposed:

H2a: *Individuals' perceived usefulness for e-health services is positively associated with their attitude toward adopting e-health services.*

Perceived ease of use (PEU) refers to “the degree to which a person believes using a particular information system (IS) would be free of effort” (Davis, 1989) and “easy to manage as well as the degree to which a system is considered easy to understand, learn and use” (Ali & Younes, 2013). In addition to the perception of usefulness, the TAM theory states that an important factor influencing a person to accept a certain technology is the perception of ease of use. So if the technology can be used without more effort by the individual concerned, then the degree of adoption of the technology will be high (Sun & Rau, 2015). In this same line, Gefen (2000) provide strong support for the easily understood, direct, significant impact of perceived ease of use on technology acceptance. It is evidenced by several previous research that stated that perceived ease of use (PEU) has a noteworthy impact on one's intention to take and use certain technologies. Research on the implementation of applications for health services in emerging countries has concluded that perceived ease to use has positively affected the acceptance and usage of technology by a person (Faqih & Jaradat, 2015). Chang, Pang, Tarn, Liu, and Yen (2015) have found the same thing in e-hospital acceptance research among people in Taiwan. According to the research on the acceptance of diabetes glucose monitoring technology, in which TAM is applied, one of the keys to success in adopting this technology is the perceived ease to use (Borges & Kubiak, 2016). Yarbrough and Smith (2007) also propose that Individuals' perceived ease to use for e-health systems is positively associated with their attitude toward adopting e-health services. As a consequence, the following hypothesis was proposed:

H2b: *Individuals' perceived ease of use for e-health services is positively associated with their attitude toward adopting e-health services.*

In the assessment of the TAM, PU and PEU are the leading technology acceptance components. If there are two factors in any technology, people will adopt this technology. Some external factors play an important role in technology adaptation, for example privacy, security, Trust, and information quality. According to the current scenario in this research, we analyze the impact of fear of COVID-19 on an individual's attitude and behavior intention toward adopting the e-health services. It has been observed that people are avoiding after the breakout of COVID-19, and they have been advised to avoid going to places with a human rush. Clinics such as hospitals and other medical care units are the palaces where we see the most rush. Therefore, people are inclined to use an e-health system that aims to offer medical advice and treatment at home. Furthermore, significant practical evidence has been gathered to support the concept that Individuals' perceived usefulness and Perceived ease of use for e-health system mediates the relationship among their attitudes toward adopting e-health services (Bobbitt & Dabholkar, 2001; Suh & Han, 2003; Taylor & Todd, 1995; Yang & Yoo, 2004). The following hypothesis for the present study have been proposed, based on the literature described above:

H3a: *Individuals' perceived ease of use for e-health services mediates the relationship between their fear of Covid-19 and their attitude towards adopting e-health services.*

H3b: *Individuals' perceived usefulness for e-health system mediates the relationship between their fear of Covid-19 and their attitude towards adopting e-health services.*

2.4. Attitude towards Adopting e-Health

The primary role of attitude towards adopting e-health in defining technology acceptance is extensively recognized in the prior studies (Hofstede, de Bie, Van Wijngaarden, & Heijmans, 2014; Kim, Chun, & Song, 2009). Attitude towards use can be described as "the degree to which an individual evaluates and associates the target system with his or her job" (Davis, 1993). In addition, AlBar and Hoque (2019) also explained that attitude refers to "the degree of a person's favorable or unfavorable evaluation or appraisal of the behavior in question." The fruitful acceptance of the e-health system, which is alike to the acceptance of another system, relies not only on demand as well as on the supply side (i.e., the consumer endpoint). Therefore, it is essential to comprehend the effects of human and social elements as an example, attitudes and acceptance on adoption attitudes (Chen & Hsiao, 2012; Sharifi et al., 2013) as well as fear of COVID-19. The key evidence here is that individuals can show high intention to use e-

health if they perceive its usefulness and ease of use. Hence, the more users find the technology useful and convenient, the more they have the intention to use it Aggelidis and Chatzoglou (2009); Alam, Hoque, Hu, and Barua (2020). A prior study demonstrated that the Internet efficacy, perceived capability, and PU have an effect on attitudes and use of online health record (Kim, Han, Yoo, & Yun, 2012). Our assumptions are consistent with the past research that highlights the impact of external factors on individuals' acceptance of technology (Khan, Liu, Khan, Liu, & Rasheed, 2020; Nand, Pitafi, Kanwal, Pitafi, & Rasheed, 2020).

To consider the external factors cited that fear of COVID-19 influence the individuals towards the adoption of electronic health such as telemedicine. Moreover, they also declared that tele-mental health services are flawlessly suited to this pandemic situation. Venkatesh, Thong, and Xu (2016) have shown that the attitude of individuals towards adopting e-health services is positively related to their behavioral intentions to adopt e-health services. (Gadabu et al., 2019) also stated that behavior intention has a significant influence on adopting e-health. Based on the above argument we can hypothesize that

H4: Individuals' attitude towards adopting e-health services is positively associated with their behavior intentions for adopting e-health services.

3. RESEARCH METHODOLOGY

3.1. Participants and Procedure

For the data collection, we surveyed the general public of Pakistan to empirically testing our hypothesized research model. The research utilizes a Structural Equation Modeling technique to establish and testing the research model using SPSS and Smart PLS. We created an online survey connection and distributed it to the respondents through our contacts and social media. Before filling out the survey questionnaire, all participants were told of the information's confidentiality as well as their identity's privacy. Participants were also told that the information they submitted would only be used for research purposes and that all ethical standards would be followed. These measures helped us to reduce the chances of common method variance as explained by Rasheed, Okumus, Weng, Hameed, and Nawaz (2020); Sattar, Rasheed, Khan, Tariq, and Iqbal (2017). We sent out 800 electronic questionnaires and got 624 responses (a 78 % response rate). There were no missed details because it was an online questionnaire with those settings.

3.2. Measures

All of the measurements in this theoretical construct were adapted from previous research and tweaked to fit the analysis. The TAM scales of perceived usefulness, perceived ease of use, attitude towards usage of e-health, and intentions to use e-health services were adapted from Chau and Hu (2002); Chismar and Wiley-Patton (2003); Davis (1989); Venkatesh (2000); Venkatesh and Davis (2000) and Venkatesh, Morris, Davis, and Davis (2003). The scale of fear of Covid-19 was followed by Ahorsu et al. (2020). For all items, the Questionnaire was prepared on a five-point Likert scale ranging from 1= strongly disagree to 5= strongly agree.

3.2.1. Fear of Covid-19

We measured the Fear of Covid-19 by using 7 items scale. Sample items were, for instance, ("I am most afraid of coronavirus-19", "It makes me uncomfortable to think about coronavirus-19", and "My hands become clammy when I think about coronavirus-19". The alpha value of this scale used in our study was 0.942.

Perceived Ease of Use:

We measured the Perceived Ease of Use by using 4 items scale. For example, Sample items were, "My interaction with the e-health system would be clear and understandable," "Interacting with the e-health system would not require a lot of my mental effort." The alpha reliability of this scale used in our study was 0.893.

3.2.2. Perceived Usefulness

We measured the Perceived Usefulness by using 4 items scale. Sample items were, for example, “Using the e-health services will improve my life quality,” “Using the e-health services will make my life more convenient.” The alpha reliability of this scale used in our study was 0.91.

3.2.3. Attitude towards Usage:

We measured the Attitude towards Usage by using 3 items scale. The sample items include (“Using the e-health system would be a good idea,” “Overall, my attitude towards the use of the e-health system is positive,” “Using the e-health system would be unpleasant”). The alpha reliability of this scale used in our study was 0.865.

3.2.4. Behavior Intention to Use

We measured the Intention to Use by using 3 items scale (“I have high intention to use the e-health service,” “I intend to learn about using e-health services,” and “I plan to use e-health services to manage my health”). The alpha reliability of this scale used in our study was 0.877.

4. DATA ANALYSES AND RESULTS

Keeping in view complex relationships, a survey method was used to gather the data analyzed using SPSS and Smart PLS version 3. Normality tests and descriptive statistics of all latent variables were analyzed using SPSS. The main analysis of this study was conducted through PLS, and results of PLS path modeling were presented in two models, i.e., measurement model and structural model (Anderson & Gerbing, 1988). In addition, model fit tests were performed for measurement model analysis (Henseler et al., 2014; Lohmöller, 1989). The structural model measures significance level of path coefficients, coefficient of determination (R^2), effect size (f^2), and model predictive relevance (Q^2) (Shmueli, Ray, Estrada, & Chatla, 2016; Shmueli et al., 2019).

4.1. Normality Test

The researchers were advised to check the normality of data before performing their analysis on PLS-structural equation modeling (Hair, Sarstedt, Ringle, & Mena, 2012). As Tabachnick, Fidell, and Ullman (2007) said, data normality is an important notion of multivariate analysis. Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to test the normality of data. The significance level of less than 0.05 indicated that the data of this study normally spreader. The researcher conducted the Kolmogorov-Smirnov and Shapiro-Wilk test of all latent variables to analysis the normality of data. The results of the normality test are given below in Table 1.

Table-1. Tests of Normality.

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Perceived usefulness	0.222	624	0.000	0.783	624	0.000
Perceived ease of use	0.213	624	0.000	0.811	624	0.000
Attitude towards usage	0.288	624	0.000	0.842	624	0.000
Intention to use	0.257	624	0.000	0.769	624	0.000
Fear of covid19	0.156	624	0.000	0.878	624	0.000

Note: a. Lilliefors Significance Correction.

As shown in Table 1, the Kolmogorov-Smirnov and Shapiro-Wilk test indicated that the significance level for all variables is less than 0.05 and showed that the data is normally distributed.

4.2. Descriptive Statistics of Constructs

This section deals with the descriptive statistics of all latent variables. For all latent constructs, maximum and minimum scores mean and standard deviation was computed. The descriptive statistics of all variables of the study are given in [Table 2](#) below.

Table-2. Descriptive Statistics.

	N	Minimum	Maximum	Mean	Std. Deviation
Perceived usefulness	624	1.00	5.00	4.4	0.80677
Perceived ease of use	624	1.50	5.00	4.3	0.80851
Attitude towards usage	624	1.33	5.00	3.7	0.59050
Intention to use	624	1.00	5.00	4.4	0.81773
Fear of covid19	624	1.00	5.00	3.8	1.16442
Valid N (listwise)	624				

4.3. Measurement Model

The measurement model is examined using five criteria (i.e., indicator reliability of observed variables/items, internal consistency reliability, discriminant validity, convergent validity, and model fit evaluation ([Hair, Risher, Sarstedt, & Ringle, 2019](#); [Henseler et al., 2014](#); [Henseler, Ringle, & Sinkovics, 2009](#); [Sarstedt, Ringle, & Hair, 2017](#)). Construct reliability was measured via Cronbach's Alpha and composite reliability ([Bacon, Sauer, & Young, 1995](#)) whereas indicator reliability was assessed based on outer loadings.

On the contrary, validity was calculated in two aspects: average variance extracted (AVE) and outer loadings ([Chin, 2010](#); [Mela & Kopalle, 2002](#)) were used for convergent validity ([Elenkov, 1997](#)) and discriminant validity was measured via cross-loadings, and [Fornell and Larcker \(1981\)](#) Criteria ([Hult et al., 2018](#)).

In smart PLS, two measures are composite reliability (CR) and Cronbach's alpha, commonly employ to calculate latent variables' internal consistency. Both of these measures' recommended value is above 0.7 and below 0.95 ([Hair Jr, Hult, Ringle, & Sarstedt, 2017](#)).

Following to the criteria of [Hair, Hult, Ringle, Sarstedt, and Thiele \(2017\)](#) all constructs of this study confirming the internal consistency reliability. The outcomes of Cronbach's alpha and composite reliability are provided in [Table 3](#) below. By considering the standards of [Hair, Sarstedt, Ringle, and Gudergan \(2017\)](#); [Hair, Ringle, and Sarstedt \(2011\)](#) the outer loadings of 19 items are above 0.70 and below 0.95 and hence representing the reliability of indicators. Two items were deleted, that were FC3 and AU3, due to either low loading value or the need to improve the composite reliability. The result of indicator loadings is given in [Table 3](#).

All value of construct's average variance extracted (AVE) from 0.758 to 0.881, which is greater than the 0.5 criteria. These outcomes declared that the convergent validity of our measurement model is no problem. In addition, Fornell-Larcker is used to examine the discriminant validity of latent variables of this study.

According to this criteria, it is essential for a latent variable; its average variance extracted must be greater than the variable's highest correlation with all other variables ([Fornell & Larcker, 1981](#); [Hair et al., 2011](#)). Besides the Fornell-Larcker criteria, the latent variable's discriminant validity could be estimated by comparing a latent variable's items loading with its cross-loadings. [Chin \(1998\)](#) suggested that all item's values must be greater than their cross-loadings.

This study selected both measures, Fornell-Larcker, and cross-loading to measure the discriminant validity. [Tables 4 and 5](#) presents the result of variables discriminant validity using Fornell-Larcker and items loadings and cross-loadings.

Table-3. Constructs indicator's loadings, cronbach's alpha, composite reliability, and average variance extracted.

Constructs	Indicators	Outer loadings	Cronbach's Alpha	CR	AVE
Fear of covid-19	FC1	0.868	0.942	0.943	0.775
	FC2	0.858			
	FC4	0.888			
	FC5	0.892			
	FC6	0.872			
	FC7	0.889			
	Perceived ease of use	PEU1			
PEU2		0.851			
PEU3		0.883			
PEU4		0.907			
Perceived usefulness	PU1	0.901	0.91	0.937	0.787
	PU2	0.874			
	PU3	0.895			
	PU4	0.879			
Attitude towards adopting e-health	AU1	0.938	0.865	0.937	0.881
	AU2	0.939			
Behavioral intention towards adopting e-health	IU1	0.916	0.877	0.924	0.802
	IU2	0.891			
	IU3	0.880			

Table-4. Fornell-Larcker.

Constructs	Attitude towards adopting e-health	Behavioral intention towards adopting e-health	Fear of covid-19	Perceived ease of use	Perceived usefulness
Attitude towards adopting e-health	0.9				
Behavioral intention towards adopting e-health	0.8	0.896			
Fear of covid_19	0.4	0.532	0.88		
Perceived ease of use	0.8	0.78	0.542	0.871	
Perceived usefulness	0.8	0.785	0.504	0.821	0.887

Table-5. Items Loadings & Cross Loadings.

	Attitude towards adopting e-health	Fear of covid_19	Behavioral intention towards adopting e-health	Perceived ease of use	Perceived usefulness
ATU1	0.938	0.399	0.717	0.735	0.75
ATU2	0.939	0.374	0.737	0.696	0.763
FC1	0.393	0.868	0.502	0.501	0.465
FC2	0.385	0.874	0.471	0.461	0.439
FC4	0.352	0.888	0.452	0.432	0.455
FC5	0.376	0.892	0.476	0.482	0.448
FC6	0.333	0.872	0.464	0.507	0.424
FC7	0.335	0.889	0.44	0.474	0.43
IU1	0.718	0.521	0.916	0.766	0.777
IU2	0.691	0.44	0.891	0.63	0.657
IU3	0.672	0.467	0.88	0.698	0.671
PEU1	0.599	0.448	0.617	0.839	0.691
PEU2	0.627	0.465	0.678	0.851	0.711
PEU3	0.717	0.502	0.705	0.883	0.721
PEU4	0.702	0.468	0.712	0.907	0.737
PU1	0.717	0.502	0.723	0.729	0.901
PU2	0.698	0.413	0.648	0.691	0.874
PU3	0.732	0.424	0.722	0.75	0.895
PU4	0.714	0.446	0.689	0.743	0.879

4.4. Assessment of Model Fit

The Smart PLS has a Standardized Root Mean Square (SRMR) for model fit assessment. The recommended range for the acceptance of SRMR is 0 to 1.

Table-6. Model Fit Assessment.

	Saturated Model	Estimated Model
SRMR	0.044	0.076

Above Table 6 shows that SRMR estimated value is 0.076, which is above 0.05 and lower than 0.08, shows that the theoretical model of this research is good and fits with the data (Henseler et al., 2014; Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999).

4.5. Structural Model

After evaluating the measurement model, the next step of PLS-path modeling is to evaluate the structural model. Structural model evaluation is performed in four steps. These steps are (1) evaluation of path coefficients, similar to regression coefficients, (2) assessment of R^2 (coefficient of determination), (3) assessment of f^2 (effect size), and (4) assessment of Q^2 (predictive relevance) (Shmueli et al., 2016; Shmueli et al., 2019). Before examining the path coefficients for structural relations, it is important to assess the collinearity among the exogenous variables to make sure it doesn't bias the path coefficient results (regression coefficients). VIF is used to evaluate the collinearity. Table 7 shows the examination of collinearity among the independent variables of this research.

Table-7. Assessment of Collinearity among exogenous Constructs.

Exogenous Constructs	VIF Values			
	Perceived ease of use	Perceived usefulness	Attitude	Behavioral intention
Fear of covid_19	1	1		
Perceived ease of use			2.944	
Perceived usefulness			2.944	
Attitude towards adopting e-health				1

The above table represents that multicollinearity is not an issue among the exogenous latent variables, as all the values of VIF are less than 3.

4.6. Assessment of Path Coefficients

The path coefficients are used to analyze the hypotheses of the present study. For that purpose, bootstrap technique with 5000 samples and 264 cases run in smart PLS in assessing the significance path coefficients of the structural model (Hair et al., 2011; Hair, Ringle, & Sarstedt, 2013). T-statistics (> 1.96) and p-values (< 0.05) are used to examine the significance of path coefficients (Hair et al., 2011; Preacher & Hayes, 2004). Table 8 is given below, demonstrating the results of path coefficients for the study's direct and indirect hypotheses.

Table-8. Assessment of Path Coefficients for Direct Hypotheses.

Direct Relations	B	SD	T	P	Results
Fear of covid_19 ---> Perceived ease of use	0.544	0.033	16.12	0*	Accepted
Fear of covid_19 ---> Perceived usefulness	0.505	0.034	14.791	0*	Accepted
Perceived usefulness ---> Attitude towards adopting e-health	0.584	0.055	10.668	0*	Accepted
Perceived ease of use ---> Attitude towards adopting e-health	0.273	0.052	5.209	0*	Accepted
Attitude towards adopting e-health ---> Behavioral intention towards adopting e-health	0.775	0.03	25.641	0*	Accepted

Note: *significant at 0.05 (1-tailed).

Table-9. Assessment of Path Coefficients for Indirect Hypotheses.

Indirect Relations	B	SD	T	P	Results
Fear of covid_19 ---> Perceived ease of use ---> Attitude towards adopting e-health	0.148	0.030	4.919	0*	Accepted
Fear of covid_19 ---> Perceived usefulness ---> Attitude towards adopting e-health	0.295	0.028	8.182	0*	Accepted

Note: *significant at 0.05 (1-tailed).

Above [Tables 8 and 9](#) indicate that all the study's direct and indirect hypotheses are accepted. The first hypothesis (H1a) of the study postulated that fear of Covid-19 is significantly linked with individuals' perceived ease of use for e-health services. This hypothesis is accepted as t-statistics is 16.12, which is more than 1.96, and the p-value is 0, which is less than 0.05, indicating that H1a is accepted. The hypothesis H1b was that: fear of Covid-19 is significantly related with individuals' perceived usefulness for e-health services, and the hypothesis is accepted as the p-value is 0 and t-statistics is 14.791. As hypothesis H2a hypothesized that; individuals' perceived usefulness for the e-health system is positively associated with their attitude toward adopting e-health services. The result in [table 8](#) supports the hypothesis as ($t = 10.668$, $p = 0$). H2b postulated that: individuals' perceived use of ease for e-health system is positively associated with their attitude toward adopting e-health services, and the hypothesis is also accepted as having acceptable ($t = 5.209$, $p = 0$).

As per the mediating hypotheses, H3a articulated that: individuals' perceived ease of use for e-health systems mediates the relationship among their fear of Covid-19 and their attitude toward adopting e-health services. The result of H3a in [Table 9](#) supports this hypothesis as having ($t = 4.919$, $p = 0$). In contrast, H3b proposed that: individuals' perceived usefulness for e-health systems mediates the relationship among their fear of Covid-19 and their attitude toward adopting e-health services. This hypothesis is such that ($t = 8.182$, $p = 0$), which strongly supports the hypothesis.

The last hypothesis (H4) of the study postulated that: individual's attitude for adopting e-health services is positively associated with their behavior intention for adopting e-health services, which is also supported by results as ($t = 25.641$, $p = 0$).

4.7. Assessment of Coefficient of determination (R^2)

The second step of the structural model is evaluating the coefficient of determination ([Hair et al., 2011; Henseler. et al., 2009](#)). [Hair, Black, Babin, Anderson, and Tatham \(2006\)](#) documented that the variance in an endogenous variable is caused by an exogenous variable is measured by R^2 (coefficient of determination). The higher value of R^2 indicates the sample's higher predictive power, and it ranges from 0 to 1. As a recommendation, R^2 categorized into three values, as 0.25 (weak), 0.50 (moderate), and 0.75 (substantial) ([Hair et al., 2011](#)). The coefficient of determination of the whole model is given in [Table 10](#).

Table-10. Assessment of R^2 .

Endogenous Constructs	R^2	Results
Perceived ease of use	0.295	Weak
Perceived usefulness	0.254	Weak
Attitude towards adopting e-health	0.675	Moderate
Behavioral intention	0.600	Moderate

4.8. Assessment of Effect Size (F^2)

Effect size measures the specific change in the coefficient of determination- R^2 in endogenous latent variables caused by exogenous construct ([Hair et al., 2011](#)). [Cohen \(1988\)](#) documented the effect size as 0.02 small, 0.15 medium, and 0.35 strong.

Table-11. Assessment of f^2

Endogenous Constructs	f^2	Results
Fear of covid-19 ---> Perceived ease of use	0.418	Strong
Fear of covid-19 ---> Perceived usefulness	0.340	Moderate
Perceived ease of use ---> Attitude towards adopting e-health	0.077	Weak
Perceived usefulness ---> Attitude towards adopting e-health	0.359	Strong
Attitude towards adopting e-health ---> Behavioral intention	1.501	Strong

The above Table 11 indicates that the fear of Covid-19 has a strong size impact on perceived ease of use with the value of 0.418, whereas fear of Covid-19 has a mediating impact on perceived usefulness with the value of 0.340. Perceived ease of use on attitude towards adopting e-health displaying the weak effect size as its value is 0.077 while perceived usefulness on attitude towards adopting e-health demonstrating the strong effect size as has the value of f^2 is 0.359. Attitude towards adopting e-health representing the strong effect with the value of 1.501 on behavioral intention.

4.9. Assessment of Q^2

In this step, the model's predictive accuracy is evaluated through the value of Q^2 (Geisser, 1974; Stone, 1974). The blindfolding technique is used to obtain the Q^2 value. For interpretation, the value Q^2 is categorized as small (above 0), medium (greater than 0.25), and large (greater than 0.5) (Chin, 1998). The results of Q^2 are given in Table 12 below.

Table-12. Assessment of Q^2 Through Cross validate Redundancy.

	SSO	SSE	$Q^2 (=1-SSE/SSO)$
Perceived ease of use	1872	1458.364	0.221
Perceived usefulness	2496	2005.018	0.197
Attitude towards adopting e-health	1248	513.326	0.589
Behavioral intention towards adopting e-health	1872	978.885	0.477

The above table displays the predictive accuracy of the structural model of the present study. Perceived ease of use has a value of Q^2 is 0.221, showing that the exogenous construct has a weak relevance to the endogenous latent construct. Perceived usefulness also demonstrated a weak predictive accuracy. Whereas attitude towards adopting e-health displayed the medium and behavioral intention towards adopting e-health demonstrating the large predictive accuracy for the structural model for that latent variable

5. DISCUSSION

This research study was conducted to explain the effect of the coronavirus pandemic on individuals' adoption of technology related to health. This research utilized an extended TAM model to define an individual's attitude and behavioral intention toward the adoption of e-health services in the situation of fear of Covid-19. This research aimed to explore how fear of coronavirus was linked with peoples' attitudes and behavioral intentions for adopting e-health services. This study explores the probable relations among fear of Covid-19, perceived ease of use, perceived usefulness, attitude, and behavioral intentions for adopting e-health services. The theoretical mechanism was tested via SPSS and Smart PLS, and path analysis demonstrated that all the hypotheses we established are accepted.

We theorized that fear of Covid-19 is significantly associated to individuals' perceived ease of use and individuals' perceived usefulness. Our study results reveal that the fear of Covid-19 has a significant relationship with perceived ease of use and perceived usefulness of e-health services in this pandemic. This means that when individuals are affected by fear of Covid-19, they have an attitude and subsequent behavioral intentions for adopting e-health services. This finding supports previous studies and reveals that e-health services are used to solve

individual health issues in the dissemination of Covid-19 (Tebeje & Klein, 2020). Pappot, Taarnhøj, and Pappot (2020) demonstrated that e-health services resolve patients' desires for information and continuing social connection throughout isolation.

In addition, we originate a possible substantial connection between an individual's attitude and behavioral intentions for adopting e-health services after the breakout of Covid-19 (Kim et al., 2009). To better understated, Zayyad and Toygan (2018) also claim that technical underpinning, IT knowledge and experience, and the attitudes, beliefs, and desires of health professionals have a significant impact on their intention to use e-health technology applications. Our findings are novel and significantly contribute to the areas of e-health by considering TAM. For instance, we also found significant links between PEU, PU, and individuals' use of electronic tools and applications. Our results revealed that individual's perceived usefulness and ease of use for e-health services are positively associated with their attitude toward adopting e-health services. In the same line of inquiry (Purwanto & Budiman, 2020) recognized a noteworthy relationship and illuminated that an individual's perceived usefulness and ease of use are positively connected with their attitude toward adopting e-health services.

Likewise, we conceptualize Individuals' PEU and PU mediates the association among their fear of coronavirus and attitude toward adopting e-health services. Statically outcomes of this study also assisted the mediating role of PEU and PU among fear of Covid-19 and their attitude and behavioral intention for adopting e-health services. We agree with the findings of prior researches on the use of TAM in e-health adoption (Chen & Hsiao, 2012; Wu, Wang, & Lin, 2007). The results of our research are consistent with previous literature; as an example, Davis and Venkatesh (2004) revealed that PU and PEU are expected to predict the sufferers intention to use e-health. Zobair et al. (2019) claim that PU was a noteworthy predictor of individuals' intention to use e-health services. As a result, if e-health seems to be beneficial, people are more likely to use it. In a similar context, Wilson and Lankton (2009) applied TAM in a study to examine patients' adoption of e-health; the outcome of this study showed that PU and PEU are the significant antecedents of individuals intentions to utilize e-health. Consistent with this, Davis and Venkatesh (2004) reported that the important argument here is that individuals can demonstrate higher intention to use e-health if they recognize its usefulness and ease of use. Therefore, the more users perceived technology as useful and easy, the more they have the intention to use that technologically designed health services.

Several analytical additions have been made to the literature as a result of this study. For instance, our primary motivation was to investigate the connection among fear of Covid-19 and with individuals' attitude and behavioral intentions towards adopting e-health services. Additionally, we explored individual motivation's mechanism with adopting e-health services after the break out of Covid-19. Moreover, the present research contributes to the prevailing literature by pinpointing the mediating mechanism of PEU among fear of Covid-19 and attitude towards adoption of e-health services and the mechanism of PU between Fear of Covid-19 and attitude towards adoption of e-health services. Many electrical applications and tools are being built in today's digital age that are beneficial and practical for e-health services. All in all, this research concludes that e-health services help as a dynamic tool for individuals in the context of Covid-19.

5.1. Practical Implications

We utilize the TAM model to consider the relationship among fear of Covid-19, PU, PEU, peoples' attitude, and intentions towards adopting e-health services. As a result, our research adds to the theoretical literature on TAM by putting this model to work in the form of Covid-19 and the health-care system to see why and how fear of Covid-19 affects people's perceptions and behavior when it comes to accepting e-health services. Even though, our study offers several practical implications for the patient, doctors, administrators and policymakers of the e-health services. For instance, our model helps them to understand that PEU and PU are the two possible underlying mechanisms in the connection among fear of Covid-19 and peoples' attitude and intentions for adopting the e-health services. In the situation of Covid-19, the policymakers and administrators can work on enhancing perceived ease of

use and perceived usefulness to further boost peoples' intentions and attitude towards adoption of e-health system, when peoples are afraid of physically visiting hospitals, and they prefer to stay at home. Results from this study indicated that IT structure is an important technological resource in the adoption of e-health services. Therefore, the government and IT professionals should develop e-health applications and their related tools, which are very easy to use. While the architecture of technology offers a forum for e-health, IT human capital has the expertise and skills necessary for e-health implementation. So the administration should develop a platform where people can be learned and guided associated to the accomplishment of e-health. The government should control and eliminate the barriers between the adoption of e-health. Simultaneously, the government should develop IT infrastructure, and the hospital administration should organize workshops for awareness of doctors and patients regarding enhancing the perceived ease of use and perceived usefulness of e-health services. We believe that our study will help administrators and policymakers to further enhance peoples' intentions for using the e-health care system.

6. LIMITATIONS AND FUTURE DIRECTIONS

We have tested an exhaustive model of e-health and found that perceived ease of use and perceived usefulness are the possible mechanisms in the relationship between fear of Covid-19, peoples' attitude, and behavioral intentions toward adopting e-health. However, our findings must be seen in the context of their limitations. First, the data were gathered from the general public. Therefore, it is strongly suggested to gather information from Covid-19 patients and physicians to investigate the effect of the e-health system on patient care and relationships between doctors and patients. As mentioned by Chauhan and Jaiswal (2017) sufferers and the local population developed diverse views and practices regarding the use and benefits of e-health systems. Second, the model was validated using data obtained in Pakistan, which could be considered a research constraint (Zhang, Rasheed, & Luqman, 2019). As a result, future research could concentrate on gathering data from other regions and parts of the world. It is expected that such practice will help to improve the generalizability of findings and gaining more insight into available behaviors and possible variations due to different nations and diverse contexts (Shachak, Kuziemy, & Petersen, 2019). Next, a cross-sectional survey was designed to gather the information from respondents however which may be affected by the common method biases (Yousaf, Rasheed, Hameed, & Luqman, 2019) future researchers may design different longitudinal or experimental research to study our proposed model (Rasheed, Jamad, Pitafi, & Iqbal, 2020). Lastly, the current research only tested the relationship among fear of Covid-19 and individuals' attitude toward adoption of e-health while considering the mediating effect of PU and PEU. Thus, we call for future research to extend our study by observing the other moderator-mediator variables.

Funding: This study received no specific financial support.

Competing Interests: The authors declare that they have no competing interests.

Acknowledgement: All authors contributed equally to the conception and design of the study.

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