A Study on Adoption of E-Health Services : Developing an Integrated Framework in a Multinational Context

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Abstract

Purpose : This study focused on adopting e-health services in a global context. Researchers intended to address three primary research questions: How do the factors affect the prospective app users' initial trust and adoption intention? Does initial trust mediate the relationship between trialability, perceived ease of use, subjective norms, and intention to adopt? Finally, how do Indian and Saudi Arabian consumers differ in their intention to adopt and the possible reasons?

Methodology : Four hundred twenty-six potential e-health services users from Saudi Arabia and India were considered as the sample. Structural equation modeling was used to analyze the same. Further, a multi-group analysis was undertaken to compare both samples.

Findings : The findings suggested that trialability (TB) had a positive and significant impact on both initial trust (IT) and intention to adopt (IA). Perceived ease of use (PEOU) had a significant and positive impact on IA; however, it was not valid for IT. Subjective norms (SN) positively and significantly impacted IT and IA. Further, IT substantially affected IA. The multi-group analysis found that in the case of India, TB had a significant and positive impact on both IT and IA. In contrast, it did not positively impact IT in the case of Saudi Arabia. PEOU had an insignificant impact on IT for both the samples, and multi-group analysis was confirmed. For both samples, SN had a significant and positive impact on IT. IT had a significant and positive impact on IA for both samples. Finally, IT was a good mediator between TB and SN with IA.

Originality : This study provided a unique futuristic e-health adoption framework tested in a multinational and emerging economy context. It combined four major theories in doing the same.

Keywords : **E-health, trialability, perceived ease of use, subjective norms, initial trust, intention to adopt, Saudi Arabia, India**

Paper Submission Date : December 16, 2021 ; Paper sent back for Revision : March 10, 2022 ; Paper Acceptance Date : March 25, 2022 ; Paper Published Online : May 15, 2022

During the COVID-19 pandemic, digital health-based tools helped organizations and societies run smoothly (Alsharif, 2021). They can help people get information quickly, track transmissions in real-time, set up virtual meeting places, and make telemedicine visits for patients (Bhavani, 2021). The health care apps have also been quite effective for treating diseases by maintaining a tab on patients' adherence to the

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DOI : https://doi.org/10.17010/ijom/2022/v52/i5/169415

treatment, providing timely advice, and even self-monitoring by the patients (Apidi et al., 2017; Izahar et al., 2017). The vital aspect of health apps is that they provide a very effective platform for dynamically exchanging information and updates (Apidi et al., 2017). Health apps can also prove to be very effective in potentially preventing the spread of diseases as the ease of communication helps in dissipating information to help people adopt a healthy lifestyle (Izahar et al., 2017).

COVID-19 has considerably impacted healthcare services (Alhazri & Bugis, 2022). As a result, there has been a significant change in how many people use healthcare services. Countries like Saudi Arabia and India have recently seen vast growth in e-health services. In Saudi Arabia, e-health initiatives have been found to cut down on the amount of time and effort it takes to care for patients while also speeding up care delivery. The Saudi Ministry of Health (MoH) has been a big fan of telehealth for a long time (Alharbe, 2021). For example, the "Sehha App" does teleconsultations through live video chats and text or voice messages to assess a patient's health and advise how to keep your body in good shape. Sehhaty App was created to make it easier for people to get health information like vital sign updates, track prescribed medicines, get and share sick leave, and encourage a healthy way of life (Booday & Albesher, 2022). An app that was made available during the pandemic was "Tawakkalna," which allows users to obtain permission to travel around while curfews are in effect (Orfali et al., 2021). Now, it has become a holistic app. The Tabaud App allows consumers to receive immediate warnings whenever they come into contact with any COVID-19 cases that have been reported and confirmed by the government (Chakraborty & Altekar, 2021a). Similarly, India also responded by introducing e-health services, especially the launch of the CoWIN app, the Arogya Setu, and the Umang app (Chakraborty & Dash, 2022; Yadav et al., 2021).

However, there is a lack of previous studies on the behavioral intention for adopting e-health services in emerging economies like India and Saudi Arabia. This study establishes the factors that significantly influence the behavioral intentions of e-health services adoption, providing valuable insights to technology professionals, specifically the marketers of mobile health apps in emerging economies. The four main theories about how people adopt new technologies have been incorporated here. These are the diffusion of innovation (Rogers, 2003), the technology acceptance model (Davis, 1989), the unified theory of acceptance and use of technology (Venkatesh et al., 2003), and DeLone and McLean's information systems success model (DeLone & McLean, 2003).

The primary objectives of this study are :

- To establish the various factors responsible for the adoption intention of e-health services.
- To perform a comparative analysis of e-health services globally.
- To provide an integrated and futuristic framework for e-health adoption with universal implications.

Hence, the research questions are outlined as follows:

- **RQ1 :** How are the factors affecting the prospective app users' initial trust and adoption intention ?
- **RQ2 :** Does initial trust mediate the relationship between trialability, perceived ease of use, subjective norms, and intention to adopt ?
- **RQ3 :** How do Indian and Saudi Arabian consumers differ in their intention to adopt and the possible reasons ?

The proposed model is unique, as no study previously happened to combine four important models on technology adoption. This particular study is crucial for consumers who are adopting or trying to adopt e-health services. This study is not only about finding the factors affecting the buying intention; it also tries to determine which factors affect the intention to recommend. No study has happened before in this context, especially adding two countries and their behavior regarding the e-health services. It also focuses on all the consumers interested in taking the help of e-health services in Saudi Arabia and India.

Literature Review and Conceptual Model Development

Trialability (TB) and Initial Trust (IT)

Rogers (2003) propounded the diffusion of innovation where he identified five attributes: relative advantage, compatibility, complexity, trialability, and observability. On a similar note, one of the prominent researchers mentioned that this level of trust (Chakraborty & Altekar, 2021b) increases during trialability (Wang, 2014). Mehra et al. (2022) evaluated in their model that the repeated trial versions allow users to have confidence in testing and resolve any uncertainty about the use of products' real value, such as ease of use and usefulness, which in turn improves trust (Mehra et al., 2022). Trialability influences the user's expectation, and this expectation further influences the user's satisfaction and trust (Gupta et al., 2020; Moore & Benbasat, 1991).

Hence, we propose that:

- **H1(a) :** Trialability has a significant and positive impact on initial trust.

Trialability (TB) and Intention to Adopt (IA)

Trialability is a critical step toward the preadoption process (Lin & Bautista, 2017). Trialability entails users trying an innovation that is total commitment and costs (Nguyen et al., 2004), where we can understand that the more we try for innovation, the more it will bring more modified products/ services. Technology has driven mobile health services via apps where the user has fair chances for the trialability and adoption of all kinds of health services, and these mobile apps are also navigating them towards the initial trust and their intention to adopt (Chen et al., 2018; Zhang et al., 2018). The trialability of the app increases the intention to adopt it (Lin et al., 2021; Moore & Benbasat, 1991).

Hence, we hypothesize:

- **H1(b) :** Trialability has a significant and positive impact on intention to adopt.

Perceived Ease of Use (PEOU) and Initial Trust (IT)

In the assessment of the technology acceptance model (TAM) model, we got to know about the critical components, namely, perceived ease of use (PEOU) and perceived usefulness (PU), where PEOU is defined as the consumers' perception of effortless use of the services (Davis, 1989). In continuation, other researchers have also predicted that trust in technology comes with the factors like PEOU, where PEOU has played a significant role in developing confidence and further developing trust (Bhattacherjee & Hikmet, 2007; Chakraborty, 2021). In other words, trust can be understood where mobile-based health services are secured and are safe from privacy concerns (Wei et al., 2009). In other words, we can state that technology has played a significant role in PEOU, and continual use will bring trust among the users (Fan et al., 2020).

Hence, we hypothesize that :

- **H2(a) :** Perceived ease of use has a significant and positive impact on initial trust.

Perceived Ease of Use (PEOU) and Intention to Adopt (IA)

PEOU is the user's perception of the effortless use of technology-based services. If users are getting effective treatment, then they are more likely to avail the services rendered by the mobile-based health care services, and if the users are given some option, then indeed, they get encouraged towards the acceptance of technology

(Bhattacherjee & Hikmet, 2007; Dash, 2022). Finally, PEOU is one of the crucial determinants of users' intention to adopt. For example, users will not use mHealth services if they perceive them as having difficulty using a particular service or service system (Chakraborty, 2018). In addition to this, Fan et al. (2020) investigated that PEOU determines the intention to use and influences the actual usage behavior.

Hence, we propose the following hypothesis:

- **H2(b) :** Perceived ease of use has a significant and positive impact on the intention to adopt.

Subjective Norms (SN) and Initial Trust (IT)

Subjective norms are formed and used to predict individual intention to do a specific activity or adopt a particular behavior (Park, 2000). The subjective norms play an essential role in decision making and influence behavior which is difficult to ignore (Chakraborty et al., 2022). On the other hand, trust is the perception of the consequences of any happenings, and users generally do not have direct control over it. Therefore, developing subjective norms towards any system or technology is necessary for forming an initial trust. Also, positive subjective norms build trust and help users make decisions (Deng et al., 2018).

Hence, we propose :

- **H3(a) :** Subjective norms have a significant and positive impact on initial trust.

Subjective Norms (SN) and Intention to Adopt (IA)

Ajzen (1991) identified and later discussed subjective norms (SN), which is one of the six constructs of the theory of planned behavior (TPB). It states that the possibility of engaging in a particular activity or not engaging is predicted by his or her intention in a specific behavior. Subjective norms are described as factors associated with social norms and the anticipated social pressure from the behavior (Gao et al., 2017). In addition, Park (2000) explained that subjective norms are formed based on information gathered from the people and perceived social pressure. Binyamin and Zafar (2021) highlighted that subjective norms are a potentially influential factor in the intention to adopt any latest technology.

Hence, we propose the following hypothesis :

- **H3(b) :** Subjective norms have a significant and positive impact on intention to adopt.

Initial Trust (IT) and Intention to Adopt (IA)

Trust reduces uncertainty (Malaquias & Hwang, 2016), attracting new users and retaining the old users (Kim et al., 2009). Furthermore, increased trust satisfies the users, thus influencing them to adopt technology (Chakraborty et al., 2022). We can also understand that trust improves users' confidence and encourages behavioral intention to adopt (Talwar et al., 2020).

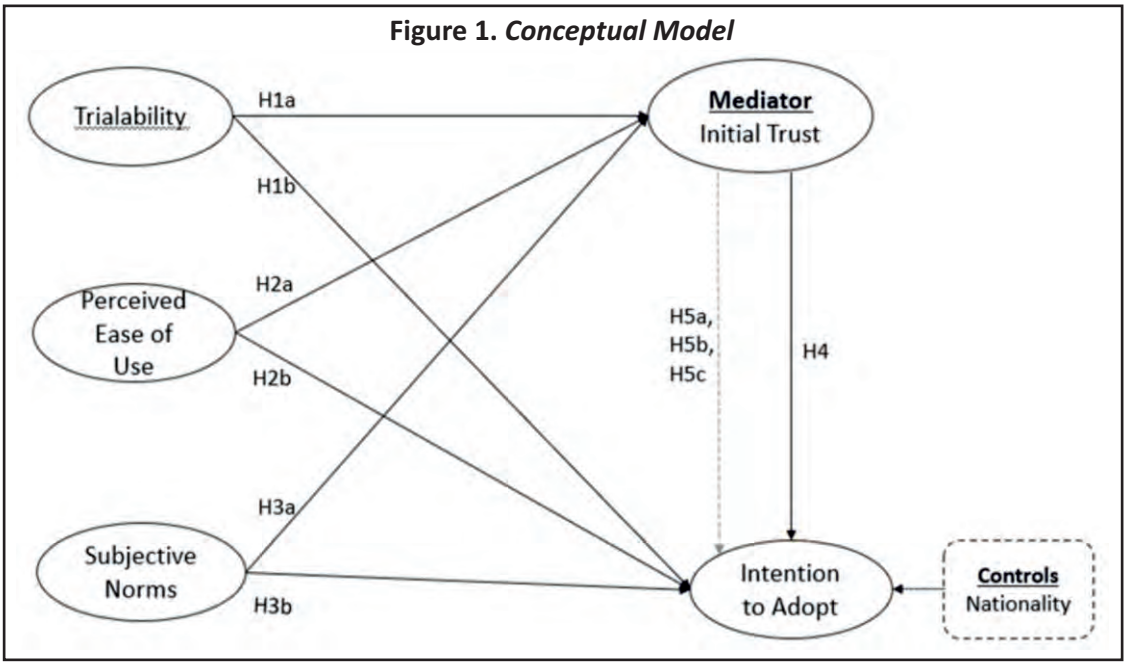
Hence, we propose the following hypothesis:

- **H4 :** Initial trust has a significant and positive impact on intention to adopt.

Mediating Effect of Initial Trust (IT)

Trialability entails users trying an innovation to bring more modified products and improve the level of trust (Nguyen et al., 2004). It is revealed that trust improves users' confidence in the system and influences users'

Figure 1. ***Conceptual Model***



behavior in adopting technology (Ha & Stoel, 2009). Researchers predicted that perceived ease of use significantly affected developing confidence and trust in the technology (Mcknight, 2005), which encourages users to adopt that technology. Thus, we can say that PEOU is one of the critical determinants of users' intention for adoption. The development of positive subjective norms builds trust and thus helps users make decisions (Deng et al., 2018). The improved trust develops confidence and influences users' behavior in adopting a particular technology. Studies suggest that subjective norms improve the confidence levels of users towards the technology, thus developing trust and motivating them to adopt the technology for a longer time (Ali et al., 2021).

Hence, we propose the following hypotheses:

- **H5a :** Initial trust mediates the association between trialability and intention to adopt.
- **H5b :** Initial trust mediates the association between perceived ease of use and intention to adopt.
- **H5c :** Initial trust mediates the association between subjective norms and intention to adopt.

The present research has conceptualized a research model with initial trust as a mediator and nationality as a control variable. Figure 1 visualizes the conceptual framework that will be tested with empirical data.

Methodology

Sample and Data

As the title suggests, two countries, India and Saudi Arabia were considered for this comparative analysis. The countries were chosen as two emerging economies showing heavy growth in the health app download and usage segment. In addition, well-educated and tech-savvy users of smartphones were the target audience for the same as the study demanded. A hybrid sampling design included a transparent snowball approach and stratified random

Table 1. ***Demographic Profile of the Survey Respondents***

		Nationality					
		India		Saudi Arabia		Total	
		Count	%	Count	%	Count	%
Gender	Female	54	32.9%	110	67.1%	164	100.0%
	Male	173	66.0%	89	34.0%	262	100.0%
	Total	227	53.3%	199	46.7%	426	100.0%
Age (years)	31–45	105	60.0%	70	40.0%	175	100.0%
	46 and above	45	42.5%	61	57.5%	106	100.0%
	Below or equal to 30	77	53.1%	68	46.9%	145	100.0%
	Total	227	53.3%	199	46.7%	426	100.0%
Qualification	Graduate	82	58.6%	58	41.4%	140	100.0%
	PG (Master)	103	53.4%	90	46.6%	193	100.0%
	PhD / PhD (pursuing)	42	45.2%	51	54.8%	93	100.0%
	Total	227	53.3%	199	46.7%	426	100.0%

sampling. We focused on the faculty members and students from five universities/ institutions for the study. Screening questions were used to filter the respondents as per objectives. A well-structured questionnaire was used to collect data: the first section covered all the socioeconomic questions, followed by the main section that included the constructs used for the study. The constructs section was made with a 7-point Likert summation scale, where 1 means *strongly disagree* to 7 is *strongly agree*. A pilot study was conducted with a selected number of participants, and the resultant changes were incorporated. Out of 800 touchpoints, 490 responses were collected. Finally, after removing partial or insincere responses, 426 responses were taken for further analysis. The data collection period was from November 1, 2021 to December 9, 2021. Table 1 provides the details of the respondents who participated in the survey.

Measurement Model Assessment

The five constructs were obtained after exploratory factor analysis as per the proposed conceptual model. EFA explained 75% variance extracted with a five-factor model. The same was rechecked with confirmatory factor analysis (CFA). All the loadings are above the threshold value of 0.7 (Dash et al., 2021; Hair et al., 2010; Malhotra et al., 2006). Other assessment criteria, e.g., reliability, normality, convergent and discriminant validity, were also

Table 2. ***Measurement Model Summary***

Construct/ Factor	Items/ Statements	FL	Adapted from	Items Retained
Trialability *(TB) (DOI)*	*TB1 :* Mobile health apps are available to me	.89	Moore & Benbasat	4 (1 dropped)
AVE = 0.76	to test run various applications adequately.		(1991)	
CR = 0.93	*TB2 :* Before deciding whether to use any mobile	.93		
α = 0.89	health apps, I can try them properly.			
	TB3 : I can experiment with mobile health apps as necessary.	.78		
	TB4 : I have adequate opportunities to try out different	.88		

	things on the mobile health apps.			
Perceived Ease of Use	*PE1 :* I find it easy to use mobile health apps	.96	Bagozzi et al. (1992) ;	3 (1 dropped)
(PEOU) (TAM)	whenever I want.		Bhattacherjee &	
AVE = 0.84	*PE2 :* I find it easy to obtain health-related information	.86	Hikmet (2007)	
CR = 0.94	in mobile health apps.			
α = 0.90	*PE3 :* Learning to operate mobile health apps will be easy for me.	.93		
Subjective Norms	*SN1 :* People who influence my behavior think	.92	Kim et al. (2009)	All 3
(SN) (TPB)	I should use mobile health apps.			
AVE = 0.81	*SN2 :* People who are important to me think	.91		
CR = 0.93	I should use mobile health apps.			
α = 0.88	*SN3 :* I think those people who are important to me would	.86		
	want me to use mobile health apps rather than other apps.			
Initial Trust *(IT)*	*IT1 :* Health apps usually fulfil their commitments.	.89	Chakraborty	3 (1 dropped)
AVE = 0.79	*IT2 :* I can trust the promises given by	.86	et al. (2022) ;	
CR = 0.92	health app service providers.		Premazzi et al. (2010) ;	
α = 0.86	*IT3 :* Health apps providers are concerned with users'	.89	Mortazavi et al. (2014)	
	present and future interests.			
Intention to Adopt *(IA)*	*IA1 :* I intend to use mobile health apps	.95	Dash et al. (2021) ;	All 3
AVE = 0.77	in the next three months.		Dash &	
CR = 0.91	*IA2 :* I predict I will use mobile health apps	.95	Chakraborty (2021) ;	
α = 0.85	in the next three months.		Johnston &	
	IA3 : I plan to use mobile health apps in the next three months.	.71	Warkentin (2010)	

Note. α : Cronbach's α ; CR : construct reliability ; AVE : Average variance extracted; FL : factor loading.

Model Fit Summary : CMIN/*DF*: 3.91, Goodness-of-fit index (GFI): 0.92, Adjusted goodness-of-fit index (AGFI): 0.88, Standardized root mean residual (SRMR): 0.04, Root mean square error of approximation (RMSEA): 0.07, Tucker – Lewis index (TLI): 0.93, Normed fit index (NFI): 0.93, Comparative fit index (CFI): 0.95.

undertaken (Chakraborty et al., 2021; Dash & Paul, 2021). Average variance extracted (AVE) values are above 0.5. Composite reliability values are above 0.9, and Cronbach's alpha values are above 0.8 (Table 2). Further, Table 2 shows a good model fit (CMIN/*DF* : 3.91 ; goodness-of-fit index (GFI): 0.92 ; standardized root mean residual (SRMR) : 0.04 ; root mean square error of approximation (RMSEA) : 0.07 ; Tucker – Lewis index (TLI) : 0.93, normed fit index (NFI): 0.93, comparative fit index (CFI): 0.95).

Analysis and Results

Hypotheses Testing

Once the measurement model is validated, the hypotheses are assessed with the help of structural equation modeling using Smart PLS 3.3.3. First, the whole sample is considered, followed by individual samples. R^2 is 0.58 for the model, which is a good score. Model fit indices (IBM SPSS Amos 26) provide the acceptable values (CMIN/*DF* : 3.78, goodness-of-fit index (GFI): 0.92, standardized root mean residual (SRMR): 0.05, root mean square error of approximation (RMSEA) : 0.08, Tucker – Lewis index (TLI): 0.93, normed fit index (NFI): 0.93, comparative fit index (CFI): 0.95).TB has a positive and significant impact on both IT and IA. Hence, H1(a) and

H1(b) are accepted. Furthermore, PEOU has a significant and positive impact on IA; however, it cannot be said about IT. Hence, H2(b) is accepted, but H2 (a) is rejected. Finally, SN has a positive and significant impact on IT and IA. Hence, H3(a) and H3(b) are accepted. Further, IT substantially affects IA. Consequently, H3 is accepted (see Table 3 and Figure 2).

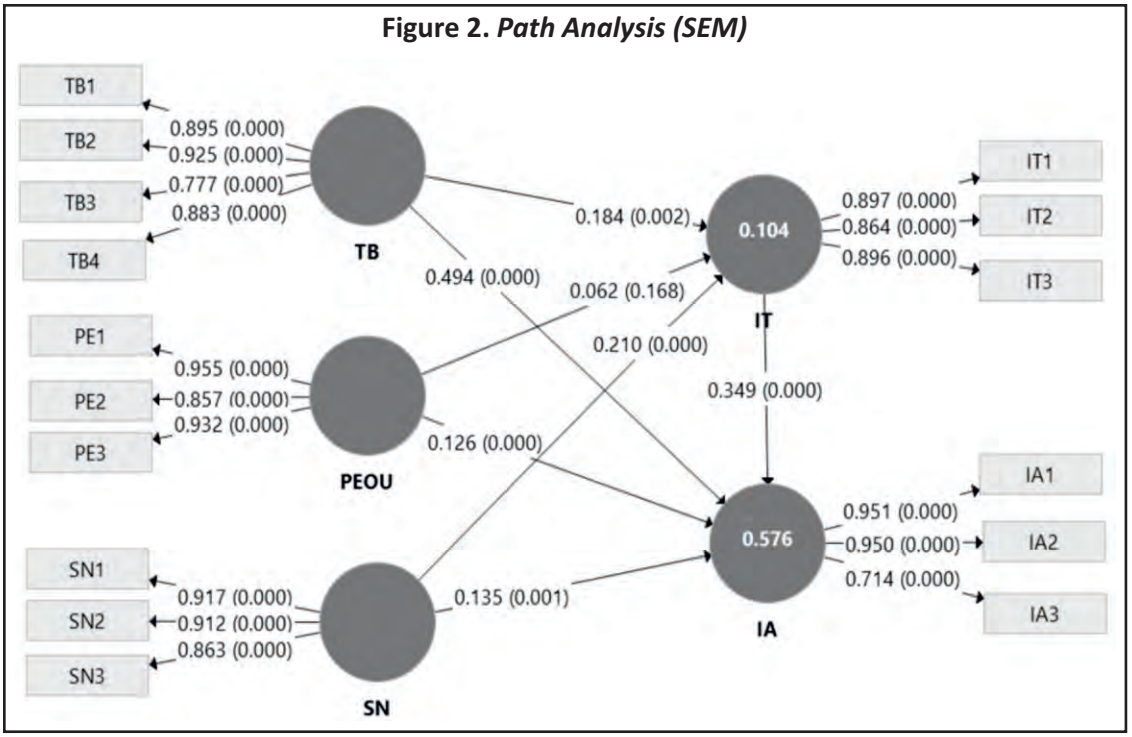
Except for the impact of PEOU on IT, all the proposed relationships are accepted. The proposed factors are established as the influencers for the IA of the consumers. RQ1 is answered with these findings, and the finding is in sync with the findings of previous studies (Bhattacherjee & Hikmet, 2007; Gupta et al., 2020 ; Mehra et al., 2022; Moore & Benbasat, 1991). The lack of significant impact of PEOU on IT is a concern. It might be a case-specific outcome, or other factors are involved. Further studies can be undertaken.

Table 3. ***Direct Effects - Whole Sample***

Hypothesis	Hypothesized Relationship			Estimate	Accepted/Rejected
H1(a)	*TB*	→	*IT*	0.18**	Accepted
H1(b)	*TB*	→	*IA*	0.49**	Accepted
H2(a)	*PEOU*	→	*IT*	0.06	Rejected
H2(b)	*PEOU*	→	*IA*	0.13**	Accepted
H3(a)	*SN*	→	*IT*	0.21**	Accepted
H3(b)	*SN*	→	*IA*	0.14**	Accepted
H4	*IT*	→	*IA*	0.35**	Accepted

Note. *significant at 5% ; **significant at 1%.

Figure 2. ***Path Analysis (SEM)***



Nationality as a Control Variable: Saudi Arabia vs. India (MGA)

As per the study's objective, both the countries are compared and treated as individual samples. All the direct hypotheses are assessed for both the samples and a multi-group analysis is conducted to find the significant differences (see Table 4). In the case of India, TB has a significant and positive impact on both IT and IA; whereas, it does not have a positive impact on IT in the case of Saudi Arabia. Hence, H1(a) is not accepted in Saudi Arabia. The multi-group analysis also observes that for both the hypotheses, the countries have a significant difference. Multi-group analysis (MGA) shows that TB has a high impact on IT in the case of India but not in the case of Saudi Arabia. TB as a factor is not massive in Saudi Arabia. The possible reasons might be the strict execution of laws and regulations in Saudi Arabia compared to India. A trial version of the app does not inspire trust much in Saudi Arabia compared to India. The income level of spending pattern might be the reason here. In India, consumers are price-sensitive and trust the app only after successful trialability. For both countries, TB is crucial in building IA. For Saudi Arabia, it is massive, but trust is not crucial.

PEOU has an insignificant impact on IT for both the samples, and MGA is confirmed. Hence, H2(a) is rejected for both the sample countries. However, there is a difference between both samples regarding the impact of PEOU on IA. Therefore, H2(b) is accepted for India but not for Saudi Arabia. Ease of use is not crucial for Saudi Arabia to develop trust or adopt the app. One possible reason might be that the target audience was the youth and educated, and they are already well-acquainted with smartphone apps. Another factor is that all apps in Saudi Arabia are provided in Arabic too. In India, due to multiple languages, English remains the primary language in the apps. Overall, it can be said that PEOU has a minimal influence.

For both samples, SN has a significant and positive impact on IT. Hence, H3(a) is accepted for both. However, H3(b) is only accepted in the case of Saudi Arabia. MGA is confirmed for the same. IT has a significant and positive impact on IA. Hence, H4 is accepted for both samples. However, MGA shows that it is massive for India compared to Saudi Arabia; hence, there is a significant difference (see Table 4).

Mediation Effect of IT

IT is the mediator between the independent constructs and IA in this study. Therefore, first, the mediation effect of IT is checked for the whole sample (Table 5). It is considered full mediation if only the indirect effect is significant.

Table 4. ***Multi-Group Analysis (MGA) (Direct Effects)***

Hypothesis	Hypothesized Relationship			India		Saudi Arabia		Group Differences (*p* - value)
				Estimate	Accepted/ Rejected	Estimate	Accepted/ Rejected	
H1(a)	*TB*	→	*IT*	0.23**	Accepted	–0.07	Rejected	**0.02**
H1(b)	*TB*	→	*IA*	0.24**	Accepted	0.67**	Accepted	**0.00**
H2(a)	*PEOU*	→	*IT*	0.05	Rejected	0.05	Rejected	0.96
H2(b)	*PEOU*	→	*IA*	0.22**	Accepted	0.06	Rejected	**0.00**
H3(a)	*SN*	→	*IT*	0.35**	Accepted	0.22**	Accepted	0.22
H3(b)	*SN*	→	*IA*	0.05	Rejected	0.19**	Accepted	**0.04**
H4	*IT*	→	*IA*	0.57**	Accepted	0.17**	Accepted	**0.00**

Note. *significant at 5% ; **significant at 1%.

Table 5. ***The Summary of the Mediation Effects (Whole Sample)***

IT as a Mediator				
Relationship	**Hypothesis**	**Direct Effect**	**Indirect Effect**	**Result**
TB → IT → IA	H5(a)	0.49**	0.07**	Partial
PEOU → IT → IA	H5(b)	0.13**	0.02	No
SN → IT → IA	H5(c)	0.14**	0.08**	Partial

Table 6(a). ***The Summary of the Mediation Effects (India)***

IT as a Mediator				
Relationship	**Hypothesis**	**Direct Effect**	**Indirect Effect**	**Result**
TB → IT → IA	H5(a)	0.24**	0.13**	Partial
PEOU → IT → IA	H5(b)	0.22**	0.03	No
SN → IT → IA	H5(c)	0.05	0.20**	Full

Table 6(b). ***The Summary of the Mediation Effects (Saudi Arabia)***

IT as a Mediator				
Relationship	**Hypothesis**	**Direct Effect**	**Indirect Effect**	**Result**
TB → IT → IA	H5(a)	0.67**	–0.01	No
PEOU → IT → IA	H5(b)	0.06	0.00	No
SN → IT → IA	H5(c)	0.19**	0.04*	Partial

It is a zero mediation case if the indirect effect is not significant, even if the direct effect is significant. If both the effects are significant, it is considered partial mediation (Cheung & Lau, 2008 ; Dash & Paul, 2021). H5(b): PEOU→ IT → IA is not accepted for the whole sample as the indirect effect is insignificant. The other two hypotheses are accepted as partial mediation is found (Table 5).

Again, individual samples are assessed to check the mediating role of IT. In the case of India, H5(a): TB→ IT → IA is accepted as the mediation effect is partial. H5(b): PEOU→ IT → IA is rejected as the indirect effect is insignificant. However, IT is found to be a potent mediator between SN and IA, and hence, H5(c) is accepted (see Table 6(a)). Similarly, in the case of Saudi Arabia, H5(a) and H5(b) are not accepted. However, IT is found to be a mediator between SN and IA, and hence, H5(c) is accepted (see Table 6(b)).

Implications

Our study has numerous theoretical and managerial implications. First, we provide a holistic model of e-health adoption by combining factors from four significant theories. It will help future theory-building efforts. Second, we provide a comparative multi-group analysis between two emerging economies, which is of its kind for the first time. It powerfully makes a case for universal application. A considerable difference is found between the two countries, opening avenues for new studies at the micro-level. Third, users, especially patients, will garner the maximum benefit from this initiative as they are the most crucial stakeholders and the ultimate user of these services. Fourth, it will help the healthcare providers design a holistic model to understand the needs of the potential consumers and execute their plans accordingly. Hence, the unnecessary burden of ill-informed patients

will be minimized. Fifth, this multinational study will help policymakers and governments make plans, vision documents, and allot budgets accordingly. Digital transformation of the health services helps in cost minimization and maximizes the reach to the last person. Ultimately, the pandemic hit economies will get a new and replicable model that is universally used.

Limitations of the Study and the Way Forward

Although our honest efforts went into this study, it has a few limitations that can provide future directions. First, the model can be extended with a few more factors from the mentioned theories, e.g., habits and hedonic motivation as influencers. Even more antecedents and consequents can be added to have an expanded version. Second, we did not take any moderator in this framework. Future explorers can use constructs like consumer involvement and consumer innovativeness. Third, more countries can be compared, especially in a developed vs. developing economy context, to make it a truly global framework. Fourth, we did not dive enough into the individual countries. Country-specific model validation can be undertaken. Finally, we used only a quantitative approach. We strongly recommend that future researchers adopt a mixed-methods approach with qualitative data, e.g., focus group, scenario building, and testing, to be specific. Health is the real wealth in this digital world, and e-health services are the perfect medicines to enrich our lives.

Authors' Contribution

Dr. Ganesh Dash generated the quantitative design for the empirical investigation of the study. He chalked out the methodology and conducted the formal analysis and validation, including project administration. Dr. Syed Akmal was involved in performing the literature review. Finally, Dr. Debarun Chakraborty was involved in the conceptualization, drafting, and revision of the manuscript.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Acknowledgment

The authors extend their appreciation to the Deputyship for Research & Innovation, Ministry of Education in Saudi Arabia, for funding this research work through Project Number 7980.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Alharbe, N. (2021). Security and privacy of telehealth apps in the era of COVID-19 pandemic: Saudi Arabia perspective. In, *iiWAS2021: The 23rd International Conference on Information Integration and Web Intelligence*, 467– 472. https://doi.org/10.1145/3487664.3487729

Alhazri, W. A., & Bugis, B. A. (2022). Electronic healthcare applications and programs among healthcare workers in Riyadh and conflict management. *Journal of Taibah University Medical Sciences*. *In Press,* 1–9. https://doi.org/10.1016/J.JTUMED.2021.11.016

Ali, S., Khalid, N., Javed, H. M. U., & Islam, D. M. (2021). Consumer adoption of online food delivery ordering (OFDO) services in Pakistan : The impact of the COVID-19 pandemic situation. *Journal of Open Innovation: Technology, Market, and Complexity, 7*(10), 1–23. https://doi-org.sdl.idm.oclc.org/10.3390/joitmc7010010

Alsharif, A. H. (2021). Cross sectional e-health evaluation study for telemedicine and m-health approaches in monitoring COVID-19 patients with chronic obstructive pulmonary disease (COPD). *International Journal of Environmental Research and Public Health, 18(16)*, 8513. https://doi.org/10.3390/IJERPH18168513

Apidi, N. A., Murugiah, M. K., Muthuveloo, R., Soh, Y. C., Caruso, V., Patel, R., & Ming, L. C. (2017). Mobile medical applications for dosage recommendation, drug adverse reaction, and drug interaction : Review and comparison. *Therapeutic Innovation & Regulatory Science, 51*(4), 480–485. https://doi.org/10.1177/2168479017696266

Bagozzi, R. P., Davis, F. D., & Warshaw, P. R. (1992). Development and test of a theory of technological learning and usage. *Human Relations*, *45*(7), 659 – 686. https://doi.org/10.1177/001872679204500702

Bhattacherjee, A., & Hikmet, N. (2007). Physicians' resistance toward healthcare information technology : A theoretical model and empirical test. *European Journal of Information Systems*, *16*(6), 725 – 737. https://doi.org/10.1057/palgrave.ejis.3000717

Bhavani, B. G. (2021). A study to assess the knowledge and opinion of mid-level health providers of Chittoor District regarding m-health. In, S. Jyothi, D. M. Mamatha, Y. D. Zhang, & K. S. Raju (eds), *Proceedings of the 2nd International Conference on Computational and Bio Engineering. Lecture Notes in Networks and Systems* (Vol. 215, pp. 85 – 91). Springer. https://doi.org/10.1007/978-981-16-1941-0_10

Binyamin, S. S., & Zafar, B. A. (2021). Proposing a mobile apps acceptance model for users in the health area: A systematic literature review and meta-analysis. *Health Informatics Journal, 27*(1), 1–27. https://doi.org/10.1177/1460458220976737

Booday, M., & Albesher, A. (2022). Evaluating the usability of mobile applications: The case of Covid-19 apps in Saudi Arabia. In, *22nd International Arab Conference on Information Technology (ACIT)*, 1–7. https://doi.org/10.1109/ACIT53391.2021.9677200

Chakraborty, D. (2018). Impact of celebrity endorsed advertisements on rural consumers' purchase intention towards mobile SIM cards: A study conducted in West Bengal. *Indian Journal of Marketing*, *48*(10), 52 – 63. https://doi.org/10.17010/ijom/2018/v48/i10/132335

Chakraborty, D. (2021). Factors influencing passengers' purchase intention towards app-cab services in metro cities of India: A study on smartphone users. *Indian Journal of Marketing*, *51*(1), 41–54. https://doi.org/10.17010/ijom/2021/v51/i1/156933

Chakraborty, D., & Altekar, S. (2021a). What drives people to use grocery apps ? The moderating & mediating role of customer involvement and trust. *Indian Journal of Marketing*, *51*(11), 23–37. https://doi.org/10.17010/ijom/2021/v51/i11/166734

Chakraborty, D., & Altekar, S. (2021b). Work from home (WFH), COVID-19, and its impact on women. *Prabandhan: Indian Journal of Management*, *14*(9), 22 – 29. https://doi.org/10.17010/pijom/2021/v14i9/166294

Chakraborty, D., & Dash, G. (2022). 'The New Normal' and the strategies of marketers to attract consumers. *Indian Journal of Marketing*, *52*(1), 58 – 62. https://doi.org/10.17010/ijom/2022/v52/i1/167652

Chakraborty, D., Bhatnagar, S. B., Biswas, W., & Khatua, A. K. (2022). What drives people to adopt grocery apps ? The moderating role of household size. *Business Perspectives and Research*, 1–23. https://doi.org/10.1177/22785337221091640

Chakraborty, D., Biswas, W., & Dash, G. (2021). Marching toward "heart work": Connecting in new ways to thrive amidst COVID-19 crisis. *Conflict Resolution Quarterly, 39*(1), 7–27. https://doi.org/10.1002/crq.21313

Chakraborty, D., Siddiqui, A., Siddiqui, M., Rana, N. P., & Dash, G. (2022). Mobile payment apps filling value gaps : Integrating consumption values with initial trust and customer involvement. *Journal of Retailing and Consumer Services*, *66*, 102946. https://doi.org/10.1016/j.jretconser.2022.102946

Chen, Y., Yang, L., Zhang, M., & Yang, J. (2018). Central or peripheral? Cognition elaboration cues' effect on users' continuance intention of mobile health applications in the developing markets. *International Journal of Medical Informatics*, *116*, 33 – 45. https://doi.org/10.1016/j.ijmedinf.2018.04.008

Cheung, G. W., & Lau, R. S. (2008). Testing mediation and suppression effects of latent variables : Bootstrapping with structural equation models. *Organizational Research Methods*, *11*(2), 296–325. https://doi.org/10.1177/1094428107300343

Dash, G., & Paul, J. (2021). CB-SEM vs. PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change, 173,* 121092. https://doi.org/10.1016/j.techfore.2021.121092

Dash, G. (2022). Pandemic induced e-learning and the impact on the stakeholders: Mediating role of satisfaction and moderating role of choice. *Athens Journal of Education, 9*, 1–22. https://www.athensjournals.gr/education/2021-4492-AJE-Dash-05.pdf

Dash, G., & Chakraborty, D. (2021). Transition to e-learning: By choice or by force – A cross-cultural and trans-national assessment. *Prabandhan: Indian Journal of Management*, *14*(3), 8–23. https://doi.org/10.17010/pijom/2021/v14i3/158151

Dash, G., Kiefer, K., & Paul, J. (2021). Marketing-to-millennials: Marketing 4.0, customer satisfaction and purchase intention. *Journal of Business Research*, *122*, 608 – 620. https://doi.org/10.1016/j.jbusres.2020.10.016

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319 – 340. https://doi.org/10.2307/249008

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748

Deng, Z., Hong, Z., Ren, C., Zhang, W., & Xiang, F. (2018). What predicts patients' adoption intention toward mHealth services in China: An empirical study. *JMIR mHealth and uHealth, 6*(8), 1–14. https://doi.org/10.2196/mhealth.9316

Fan, W., Liu, J., Zhu, S., & Pardalos, P. M. (2020). Investigating the impacting factors for the healthcare professionals to adopt artificial intelligence-based medical diagnosis support system (AIMDSS). *Annals of Operations Research, 294*(1/2), 567–592. https://doi-org.sdl.idm.oclc.org/10.1007/s10479-018-2818y

Gao, L., Wang, S., Li, J., & Li, H. (2017). Application of the extended theory of planned behavior to understand individual's energy saving behavior in workplaces. *Resources, Conservation and Recycling, 127*, 107–113. https://doi.org/10.1016/j.resconrec.2017.08.030

Gupta, A., Dhiman, N., Yousaf, A., & Arora, N. (2020). Social comparison and continuance intention of smart fitness wearables: An extended expectation confirmation theory perspective. *Behaviour & Information Technology, 4*(2), 1–14. https://doi-org.sdl.idm.oclc.org/10.1080/0144929X.2020.1748715

Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010*). Multivariate data analysis: A global perspective* (Vol. 7). Pearson Education.

Ha, S., & Stoel, L. (2009). Consumer e-shopping acceptance: Antecedents in a technology acceptance model. *Journal of Business Research, 62*(5), 565 – 571. https://doi.org/10.1016/j.jbusres.2008.06.016

Izahar, S., Lean, Q. Y., Hameed, M. A., Murugiah, M. K., Patel, R. P., Al-Worafi, Y. M., Wong, T. W., & Ming, L. C. (2017). Content analysis of mobile health applications on diabetes mellitus. *Frontiers in Endocrinology, 8*, 1 – 8. https://doi.org/10.3389/fendo.2017.00318

Johnston, A. C., & Warkentin, M. (2010). Fear appeals and information security behaviors: An empirical study. *MIS Quarterly, 34*(3), 549 – 566. https://doi.org/10.2307/25750691

Kim, H. - B., Kim, T. T., & Shin, S. W. (2009). Modeling roles of subjective norms and eTrust in customers' acceptance of airline B2C eCommerce websites. *Tourism Management*, *30*(2), 266–277. https://doi.org/10.1016/j.tourman.2008.07.001

Lin, J., Carter, L., & Liu, D. (2021). Privacy concerns and digital government: Exploring citizen willingness to adopt the COVIDSafe app. *European Journal of Information Systems, 30*(4), 389–402. https://doi.org/10.1080/0960085X.2021.1920857

Lin, T. T., & Bautista, J. R. (2017). Understanding the relationships between mhealth apps' characteristics, trialability, and mhealth literacy. *Journal of Health Communication, 22*(4), 346 – 354. https://doi-org.sdl.idm.oclc.org/10.1080/10810730.2017.1296508

Malaquias, R. F., & Hwang, Y. (2016). An empirical study on trust in mobile banking: A developing country perspective. *Computers in Human Behavior, 54*, 453 – 461. https://doi.org/10.1016/j.chb.2015.08.039

Malhotra, N. K., Kim, S. S., & Patil, A. (2006). Common method variance in IS research : A comparison of alternative approaches and a reanalysis of past research. *Management Science, 52*(12), 1865–1883. https://doi.org/10.1287/mnsc.1060.0597

McKnight, D. H. (2005). Trust in information technology. In G. B. Davis (ed.), *The Blackwell encyclopedia of management. Management information systems* (pp. 329 – 331). Blackwell.

Mehra, A., Rajput, S., & Paul, J. (2022). Determinants of adoption of latest version smartphones : Theory and evidence. *Technological Forecasting and Social Change, 175*, 121410. https://doi.org/10.1016/j.techfore.2021.121410

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192–222. https://doi.org/10.1287/isre.2.3.192

Mortazavi, M., Rahim Esfidani, M., & Barzoki, A. S. (2014). Influencing VSN users' purchase intentions : The roles of flow, trust and eWOM. *Journal of Research in Interactive Marketing, 8*(2), 102–123. https://doi.org/10.1108/JRIM-08-2013-0057

Nguyen, H. Q., Carrieri-Kohlman, V., Rankin, S. H., Slaughter, R., & Stulbarg, M. S. (2004). Supporting cardiac recovery through eHealth technology. The *Journal of Cardiovascular Nursing, 19*(3), 200 – 208. https://doi.org/10.1097/00005082-200405000-00009

Orfali, R., Perveen, S., Aati, H. Y., & Al-Taweel, A. M. (2021). nCOVID-19 outcomes on curfews and lockdown: Precautionary decisions in Saudi Arabia. *Health Policy and Technology*, *10*(3), 100538. https://doi.org/10.1016/j.hlpt.2021.100538

Park, H. S. (2000). Relationships among attitudes and subjective norms : Testing the theory of reasoned action across cultures. *Communication Studies, 51*(2), 162 – 175. https://doi.org/10.1080/10510970009388516

Premazzi, K., Castaldo, S., Grosso, M., Raman, P., Brudvig, S., & Hofacker, C. F. (2010). Customer information sharing with e-vendors: The roles of incentives and trust. *International Journal of Electronic Commerce*, *14*(3), 63 – 91. https://doi.org/10.2753/JEC1086-4415140304

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Simon and Schuster.

Talwar, S., Dhir, A., Khalil, A., Mohan, G., & Islam, A. N. (2020). Point of adoption and beyond. Initial trust and mobile-payment continuation intention. *Journal of Retailing and Consumer Services, 55,* 102086. https://doi.org/10.1016/j.jretconser.2020.102086

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology : Toward a unified view. *MIS Quarterly*, *27*(3), 425 – 478. https://doi.org/10.2307/30036540

Wang, E. S. (2014). Perceived control and gender difference on the relationship between trialability and intent to play new online games. *Computers in Human Behavior, 30*, 315–320. https://doi.org/10.1016/j.chb.2013.09.016

Wei, T. T., Marthandan, G., Chong, A. Y. - L., Ooi, K. - B., & Arumugam, S. (2009). What drives Malaysian m-commerce adoption? An empirical analysis. *Industrial Management & Data Systems, 109*(3), 370 – 388. https://doi.org/10.1108/02635570910939399

Yadav, S. K., Mishra, A., & Mishra, S. K. (2021). Telemedicine : History and success story of remote surgical education in India. *Indian Journal of Surgery*, 1–5. https://doi.org/10.1007/S12262-021-03020-9/FIGURES/1

Zhang, X., Yan, X., Cao, X., Sun, Y., Chen, H., & She, J. (2018). The role of perceived e-health literacy in users' continuance intention to use mobile healthcare applications: An exploratory empirical study in China. *Information Technology for Development*, *24*(2), 198–223. https://doi.org/10.1080/02681102.2017.1283286

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