RESEARCH ARTICLE

SUCCESS FACTORS OF TELEMEDICINE STARTUP IN VIETNAM: THE ROADMAP TO TRANSFORM HEALTHCARE CUSTOMER BEHAVIOR

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ABSTRACT

INTRODUCTION & OBJECTIVE

Telemedicine has become a breakthrough solution for improving access to health care services. In Vietnam, telemedicine is a key national program developed by the Ministry of Health and the government. However, the implementation process encountered many challenges, and the number of successful businesses in this field is still limited. This study integrated the technology acceptance model and the extended valance framework to develop an efficient behavioral model for investigating the relationship between trust in provider, perceived ease of use, perceived benefit, and perceived risk on usage intention.

METHODS

The proposed framework was verified through in-depth interviews with three experts in the Vietnamese health technology market and was tested by 246 participants via a web-based survey.

RESULTS

Generally, the findings showed that perceived ease of use and perceived benefit positively and significantly affected usage intention, whereas perceived risk negatively and significantly influenced usage intention. Trust in the provider positively and significantly influenced usage intention and perceived benefit, but negatively influenced perceived risk (β = -0.677, p = 0.000). Perceived ease of use significantly and positively affected perceived benefit, whereas the effect of perceived ease of use on perceived risk was not statistically significant (p = 0.128).

CONCLUSION

The proposed hypothetical model offers empirical insights for healthcare professionals, service providers, and authorities. Moreover, it can serve as a theoretical basis for future research.

KEYWORDS

Telemedicine adoption, behavioral intention, extended valence framework, health technology startups, Vietnam

INTRODUCTION

According to the American Telemedicine Association, Telemedicine is defined as "technology-based services tailored to use for handling medical information exchanged from one location to another via electronic communication systems to improve a patient's clinical health status" [1]. A key differentiator of Direct to Customer (DTC) telemedicine, in contrast to other forms of telemedicine, is patient initiation of care, with no intermediary clinician or facilitator present.

Telemedicine encounters can be between patients and their own provider, backup provider at the same institution, or provider with whom they have no pre-established relationship. There are two types of DTC telemedicine: synchronous and asynchronous. Synchronous telemedicine involves real-time two-way video conferencing, chat rooms, or audio-only encounters, whereas asynchronous telemedicine, also referred to as "store and forward," involves information transferred between patient and provider over hours or days [2]. Asynchronous is the first format of telemedicine and is still widely used in teleradiology applications. Although startup activities are dynamic in other sectors, the healthcare startup ecosystem remains in its infancy in Vietnam. According to a report by Do Venture and NIC (2020), capital invested in the healthcare sector was just $US3mn in 2020, much less than in other areas such as payment, retail, education, or financial services (Do Ventures and NIC, 2020)

Healthcare startups in Vietnam are classified into the following areas: telemedicine (eDoctor, Jio Health, Doctor Anywhere), the pharmaceutical supply chain (thuocsi.vn), doctor bookings (Docosan, Wellcare, Bookingcare), and outpatient clinics (315 Healthcare, Careplus, Med247). Although telemedicine has huge benefits for healthcare systems, we must overcome many barriers to deploy this technology in Vietnam. The concept of telemedicine is still new with many patients and healthcare providers. Currently, most studies related to telemedicine in Vietnam have focused on the technology and operational models for healthcare providers. Traditional consultation services at hospitals, clinics and doctor's offices are still the top-of-mind choice of Vietnamese people when they have medical issues. This is the main challenge of telemedicine startups in Vietnam.

How to convince and educate the patients to use online medical services? What are the motivation factors to attract the healthcare customer? What are the main constraints which prevent the patients from changing their habits? Those are the key questions which were studied in this research. There is a lack of studies on healthcare customer behavior. This situation encouraged authors to conduct this study to identify the factors influencing healthcare customers' decisions to adopt telemedicine services and investigate the relationships among these factors. The study was conducted in private healthcare organizations operating in the Vietnam market.

LITERATURE REVIEW

THEORY OF REASONED ACTION AND THE WEB TRUST MODEL

The theory of reasoned action (TRA) is a theory based on many studies related to new technology acceptance (Al-Mamary et al., 2016). TRA provides that beliefs lead to attitudes, which leads to intentions, which then lead to behaviors [3]. Thus, to identify and interfere with the factors influencing behaviors, researchers can deeply dive into factors that can affect beliefs and attitudes. However, Davis et al. (1989) found that attitudes did not practically fit in the model. Attitudes only partially mediate the effects of these beliefs on intentions. Davis simplified the model by removing attitude, making it more parsimonious [4]. Applying the parsimonious version of TRA to investigate customer behaviors with e-commerce vendors, McKnight et al. (2002) provided a Web Trust Model including four high-level constructs: disposition to trust, institution-based trust, trusting beliefs, and trusting intentions, which are further delineated into 16 measurable, literature-grounded sub-constructs. The results showed that the trusting beliefs of specific web vendor attributes lead to trusting intention to engage in trust-related behaviors with a specific web vendor, which in turn results in trust-related behavior. The model was applied to assess the influence of trust on behaviors that are essential to the widespread adoption of e-commerce [5].

EXTENDED VALANCE FRAMEWORK

By integrating the TRA-based Web Trust Model and valence framework, Kim et al. (2009) proposed an extended valence framework as follows:

FIGURE 1. EXTENDED VALENCE FRAMEWORK
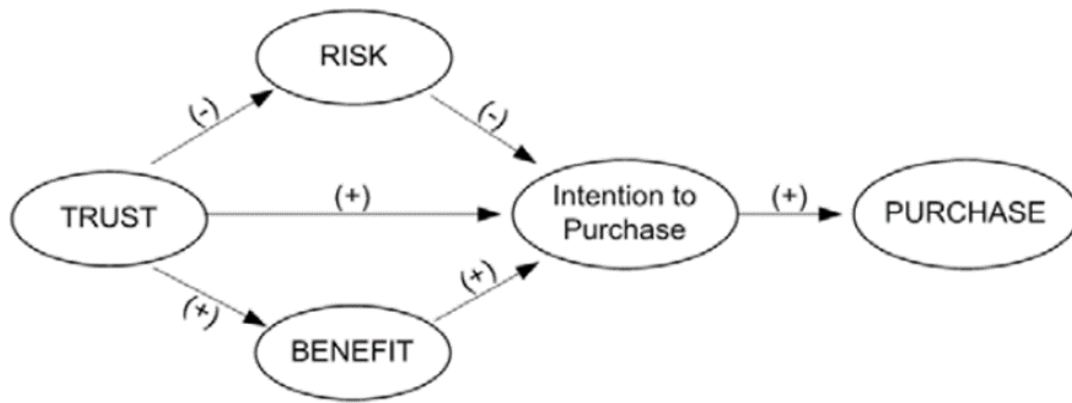
Source: [6]

The theoretical contributions of Kim et al. (2009) can be summarized into two key points: first, the extended valence framework and expectation-confirmation theory were adapted within the foundation of the theory of reasoned action to provide the basic logical sequence as follows: beliefs/attributes → transaction intention → transaction behavior → evaluation of transaction outcomes' → future intention. Second, this study bridges two important factors (i.e., trust and satisfaction) from two theories (i.e., the extended valence framework and expectation-confirmation theory) over three longitudinal phases (i.e., pre-purchase, purchase, and post-purchase) in the e-commerce context. Trust was assumed to affect purchase intention directly and indirectly through two mediators: perceived risk and perceived benefit. Consistent with the TRA, purchase intention is posited as an immediate determinant of actual purchase behavior [6]. This study emphasizes the importance of trust in customer purchase decisions in the internet environment.

Based on the extended valence framework developed by Kim et al. (2009), Gong et al. (2019) investigated factors influencing the adoption of online health consultation services (OHCS) in China. Gong modified the extended valance framework by adding subjective norms and the habit of visiting doctors in person (offline habits) to the model. The results of this study showed that trust in provider, subjective norm, and perceived benefit had a positive influence on the intention to adopt OHCS, while offline habits negatively affected OHCS. The association between perceived risk and OHCS adoption was not supported. Moreover, trust in the provider showed a mediating effect between subjective norm and the intention to adopt OHCS, while perceived benefit mediated the relationship between trust in the provider and the intention to adopt this technology [7]

TECHNOLOGY ACCEPTANCE MODEL

The Technology Acceptance Model (TAM) has often been used to explain the attitudes and behaviors of customers toward new IT products [8]. The TAM identifies two determinants of user acceptance: perceived usefulness and perceived ease of use. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance." This follows from the definition of the word useful: "capable of being used advantageously." A system high in perceived usefulness, in turn, is one for which a user believes in the existence of a positive use-performance relationship. Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort." This follows from the definition of "ease": "freedom from difficulty or great effort." An application perceived as easier to use than another is more likely to be accepted by users. [4]

TAM also has various alternative models: Lowry et al. (2013) proposed the hedonic motivation system adoption model (HMSAM) for these kinds of systems. HMSAM was designed to improve the understanding of hedonic motivation system (HMS) adoption. [9]. Scherer developed a matching person–technology model (MTP). The MPT model has accompanying assessment measures used in technology selection and decision-making, as well as outcome research on differences among technology users, non-users, avoiders, and reluctant users [10]. Moreover, several studies proposed the extension of the original TAM by adding external variables to explore the effects of external

factors on users' attitudes, behavioral intentions, and actual use of technology.

HYPOTHESES DEVELOPMENT

USAGE INTENTION

In this study, the adoption of telemedicine was investigated based on the intention to use telemedicine, rather than actual usage. To explain this matter, we saw that it was difficult to gather information about the multidimensional aspects of "use" (such as mandatory or voluntary use). Moreover, as telemedicine was a new concept in Vietnam, many people had never used the service because they did not know that the service was available, or communication about the service had not reached them. Delone and McLean (2003) suggested that "intention to use" could be a valuable alternative measure in some circumstances. Many studies have shown that the behavioral intention to use a new technology is a reasonable indicator of future system usage, especially when the technology is still being developed and has a small number of users, or when the objective of the research is to predict future use [11]. However, we understand that it is necessary to investigate actual usage behavior as a valid construct, and this could be done in future research when telemedicine becomes more popular.

PERCEIVED RISK

Perceived risk is the negative utility associated with the adoption of telemedicine services that customers are motivated to minimize or at least reduce. In this study, we focused on the risk caused by the uncertainty and uncontrollability of medical consultations in cyberspace. Patients are afraid that the quality of the medical consultation will not meet the need for diagnosis and treatment, which adversely affects their health. Currently, in telemedicine consultations, doctors can only see patients using mobile phone cameras. They cannot touch, hear body sounds, perform diagnostic techniques, or acquire necessary preclinical data from patients. Therefore, in certain situations, doctors do not have sufficient information to make decisions. Perceived risk can be even more significant in emergency situations with time constraints. If telemedicine service does not go smoothly, the patient's condition can become more severe. Another concern of the user is the privacy risk involved in the collection, manipulation, illegal commercialization, and disclosure of health information [12]. Health information is normally considered the most sensitive source of information. Various studies have indicated a negative relationship between online cybersecurity concerns and the use of online services [13]. Thus, we hypothesized:

H1: Perceived risk negatively affects the usage intention of telemedicine.

PERCEIVED BENEFIT

Perceived benefit is the positive utility associated with the adoption of telemedicine services that the customer is motivated to maximize or at least increase. Various studies have shown that perceived benefits have a positive effect on customer behavioral intention [14]. Generally, users adopt new technology if they are convinced that the product can provide added value. With telemedicine services, patients can connect to doctors almost immediately from anywhere with an available Internet connection. Cost and time saving, the readiness of health services in underserved areas, the convenience in monitoring and managing medical records, and the possibility of maintaining social distancing during a pandemic have been identified as superior benefits compared with in-person medical visits. Thus, we hypothesized:

H2: Perceived benefit positively affects the usage intention of telemedicine.

TRUST IN PROVIDER

Trust is defined as one's willingness to rely upon another [15], and is a multi-dimensional concept related to multiple targets: salesperson, product, and company [16]. In our study, trust refers to trust in telemedicine providers, including both telemedicine and telemedicine doctors. In telemedicine, consultations, transactions, and prescriptions are implemented over long distances. A doctor is normally allocated randomly by the system, and the patient normally does not know the doctor before. Thus, the level of uncertainty and doubt is higher than in traditional health services, and trust seems to be the key driver influencing customers' decisions. Prior studies have found that trust has a positive influence on behavioral intention [17]. In addition, patients do not have the capability to evaluate the accuracy and quality of their medical services. Thus, they normally rely on beliefs, reputation, and gut feelings when making decisions. Hence, we hypothesize the following:

H3: Trust in provider positively affects the usage intention of telemedicine

INDIRECT EFFECTS OF TRUST

In addition to the direct effect of trust on usage intention, trust also operates in an indirect manner through two mediating variables, perceived risk and perceived benefit, as confirmed by Kim et al. (2009) in the context of e-commerce. When using telemedicine, patients experience some level of risk due to the nature of the internet environment. When a customer acts in situations of high uncertainty and risk, trust becomes a key factor influencing perceived risk. Moreover, customers tend to have more expectations regarding the benefits they can obtain with a reputed provider or with a provider that they had good experience with in the past. Therefore, trust also increases customers' perceived benefits before they decide to use the service. Thus, we hypothesized:

H4: *Trust in provider negatively affects the perceived risk of the customer.*

H5: *Trust in provider positively affects the perceived benefit of the customer.*

PERCEIVED EASE OF USE

According to the TAM, perceived ease of use is defined as the extent to which a person believes that using a system is free of effort [18]. Telemedicine is operated on a web-based platform or mobile application. If the customer finds that it is not convenient to use the software, or the application requires a high-speed Internet connection that they cannot access, it will become a barrier for the customer to adopt the new technology. In addition, the targeted customers of telemedicine are the mass population, including older people, people with a low educational background, and people living in rural areas who are not familiar with new technologies. Thus, telemedicine platform should be really intuitive and easy to use that everyone can adopt it. Convenience is one of the advantages of telemedicine, as defined in the SWOT analysis, and it directly affects customers' decisions. Thus, we hypothesize the following:

H6: *Perceived ease of use positively influences the usage intention of telemedicine.*

INDIRECT EFFECTS OF PERCEIVED EASE OF USE

According to the TAM, perceived ease of use also influences perceived usefulness [18], which was separated into two constructs in this study: perceived risk and perceived benefit. In common sense, not many people are patient enough to explore a new technology if it is too complicated to use, as they may stop trying and conclude that the service is not beneficial for them. Perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort". This follows from the definition of "ease": "freedom from difficulty or great effort." An application perceived to be easier to use than another is more likely to be accepted by users. [18]). As Surendran (2019), TAM identifies two determinants of user acceptance: perceived usefulness and perceived ease of use. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". This follows from the definition of the word useful: "capable of being used advantageously".

In the context of telemedicine, if the users find that it is too complicated to book a consultation by using the mobile app, they can consider this a risk that telemedicine cannot meet the medical needs in urgent situations. On the other hand, a friendly user interface will give customers the perception that the technology can save time and money. Thus, based on the TAM, we hypothesized the following:

H7: *Perceived ease of use negatively influences the perceived risk of the customer.*

H8: *Perceived ease of use positively influences the perceived benefit of the customer.*

Overall, we integrated the web trust model, valence framework, and the technology acceptance model into the hypothetical framework of this study. The framework is illustrated in Figure 2.

FIGURE 2. HYPOTHETICAL FRAMEWORK OF THE STUDY
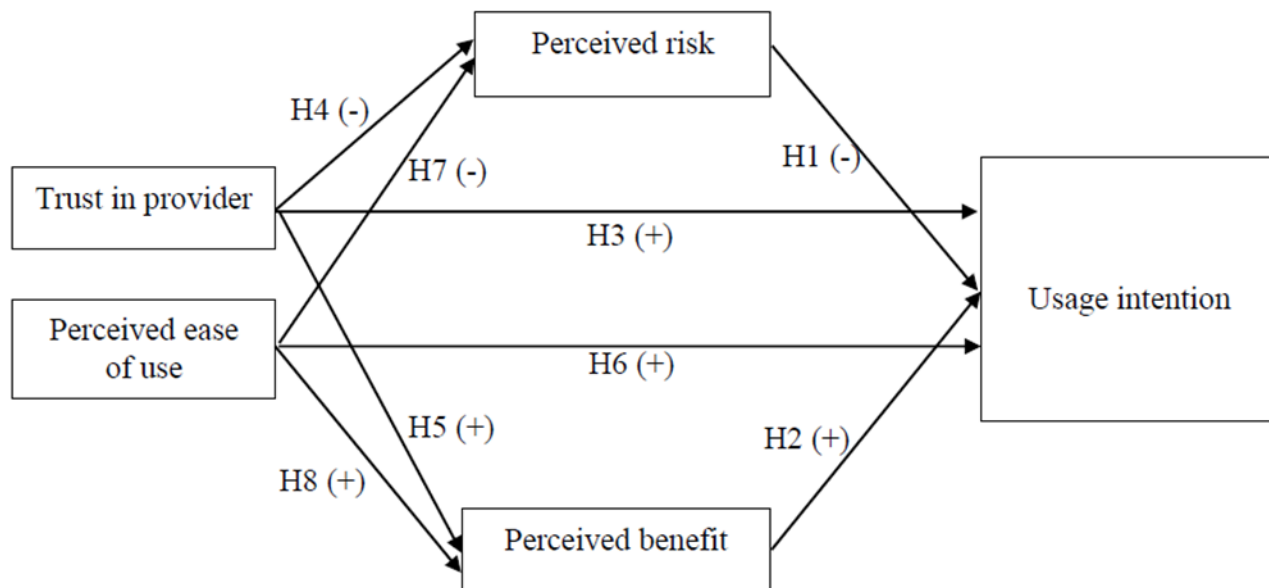
Source: By Authors, 2023

MEASUREMENT AND SURVEY

The measurement scale for each construct was designed based on previous studies and rationales initiated by the authors. This study's instruments were validated in a number of ways.

The measurement items were verified by experts in health technology through in-depth interviews before testing the participants. Usage intention (UI) was measured using three items adapted from a study conducted by Venkatesh et al. [19]. Trust in provider (TP) was measured using three items adapted from Gong et al. (2019) and a self-developed item. Perceived ease of use (PE) was measured using four items adapted from Davis et al. (1989). Perceived risk (PR) was measured using three items adapted from McKinght et al. (2002) and Yi et al. (2013) and one initiated item. Perceived benefit was measured using two items adapted from Gong et al. (2019) and the two items that we initiated.

QUALITATIVE RESEARCH

After f developing the hypothetical model, we conducted in-depth interviews with three experts in health technology to verify our assumptions. These interviews were conducted with a small number of participants, but over a longer time (more than 1 hour), following a planned program to explore the personal ideas and perspectives of the experts. The purpose of the interviews was to obtain more insight from the Vietnamese healthcare market and to evaluate whether the hypotheses were relevant. The interviews were organized in a semi-structured format that allowed both the interviewer and interviewee to have more freedom, so they could change the directions and explore additional rationales if necessary. From this, the researchers could adjust the hypothetical model and survey questionnaires that would be implemented with a number of study participants.

QUANTITATIVE RESEARCH

We designed a web-based self-reporting questionnaire. The questionnaire was delivered to the participants via social media and email. Participants were Ho Chi Minh citizens who had exposed to telemedicine before, or at least, had heard and understood the telemedicine concept on media. The survey included an introduction to the purpose of the study, guidance to perform the survey, and questions about the hypothetical constructs. The participants did not need to provide their personal information. Research participants consisted of more than 300 citizens with different demographic characteristics (age, income, education, etc.). The questionnaires were designed to investigate the impact of hypothetical constructs on patients' decision to adopt telemedicine services, the relationship among these constructs and the impact level of each construct. Each construct consisted of various indicators which were assessed by the questionnaires in the survey. The measurement items were designed based on the results of previous studies and adapted to the research objectives and situation in Vietnam. Responses to the questions related to perceptions of the individual items were measured by 5 points Likert

type scales, ranging from 1 (totally disagree) to 5 (totally agree).

STATISTICAL ANALYSIS

In this study, a two-step approach consisting of measurement modeling and structural equation modeling (SEM) was utilized for data analysis (Weston and Gore, 2006). Initially, exploratory factor analysis (EFA) was performed to verify the independence and distinctiveness of latent variables. EFA was conducted to test whether the indicators measured more than one construct. Convergent, composite, and discriminant validity were evaluated to confirm the measurement model. Composite reliability (CR) and Cronbach's alpha (CA) analyses were conducted to measure the degree to which responses were consistent across items within a construct (internal consistency). The CA and CR should be higher than the cutoff value of 0.7 [20]. Factor loadings and average variance extracted (AVE) were used to assess the convergent validity. The AVE and factor loadings of all the constructs should be higher than the suggested value of 0.5. Discriminant validity was evaluated by comparing whether the square root of the AVE of each construct was higher than its correlation coefficient with any other construct [21]. Path coefficients with p-values and goodness-of-fit indices were calculated. The ratio of Chi square values (CMIN) to degrees of freedom (CMIN/df) was recommended to be <3. The values of the goodness of fit index (GFI), Tucker-Lewis fit index (TLI), and comparative fit index (CFI) were suggested to be higher than 0.9, while the root mean square error of approximation (RMSEA) was recommended to be more than 0.08 and the root mean square residual (RMR) should be less than 0.05 [22]. AMOS 24 was used for SEM and SPSS 22 was used for all other analyses.

RESEARCH RESULTS

QUALITATIVE RESEARCH RESULTS

After conducting the in-depth interview with the experts, the study found that the hypothetical model and measurement were relevant with the local market. In Vietnam, telemedicine startups are still in the early stage of development. Thus, it is difficult for the customers to have really all perceived benefits and risks on something that they have never experienced. In general, people are aware that telemedicine can save time and cost of transportation. Moreover, many people agree that telemedicine is beneficial in cases they need urgent medical support or in remote areas where medical facilities are not available.

RESEARCH SAMPLE DESCRIPTION

A total of 285 participants agreed to participate in this study. They received online links and completed the survey. Then, 39 surveys were eliminated, as the participants did not complete all the compulsory questions or the results differed significantly from other observations (outliers). Finally, 246 valid survey forms were accepted for further analysis. Among the participants, 134 were women (54,5%), 110 were men (44.7%), and two were other (0.8%). Most of the participants were young – middle age, the 30–40 years old group contributed the majority (55.3%), 20 to 30 years old (23.6%), and the rest were more than 40 years old. Most of the participants had a higher educational background than the social average, 61.8% were at the bachelor's level, and 36.6% were at the post-graduate level. Most of the participants lived in municipal cities (such as Ho Chi Minh City and Ha Noi) (77.2%). The respondents' monthly income varied from 10 to 100 million VND, and 98.4% participated in at least one health insurance programme. Although all participants knew about telemedicine, only 33.3% had used these services previously. Most participants did not visit doctors too often, which could be due to their young age. Only 6.5% needed to visit a doctor every month, 35.7% of them went to see the doctors once every 3 to 6 months, and the rest rarely sought medical services. Detailed information is presented in Table 1.

Table 2 presents the descriptive statistics for the five constructs used in this study. The mean scores of Usage Intention, Trust in Provider, Perceived Ease of Use, and Perceived Benefit were higher than three points on the Likert-type scale, while Perceived Risk was lower than three. The results suggested that more participants had a positive perception of telemedicine services. It seemed to be beneficial and easy to use with these participants, and they were willing to adopt it.

TABLE 1. CHARACTERISTICS OF RESPONDENTS

ITEMS		FREQUENCY	PERCENT %
Age	20 to 30 years old	58	23.6
	30 to 40 years old	136	55.3
	40 to 50 years old	24	9.8
	50 to 60 years old	28	11.4
Gender	Male	110	44.7
	Female	134	54.5
	Other	2	0.8
Education	Post graduate	90	36.6
	Bachelor's Degree/College	152	61.8
	High School	4	1.6
Monthly Income	Less than 10 MM VND	18	7.3
	10 to 30 MM VND	88	35.8
	30 to 50 MM VND	80	32.5
	50 to 100 MM VND	54	22.0
	More than 100 MM VND	6	2.4
Place of Residence	Municipal cities	190	77.2
	Provincial cities	42	17.1
	Other area	14	5.7
Telemedicine service experience	Already used	82	33.3
	Not used yet	164	66.7
Frequency of seeing the doctors	Have chronic diseases, need to see doctors every month.	16	6.5
	Have chronic diseases, need to see doctors every 3 to 6 months.	36	14.6
	Do not have chronic diseases, need to see doctors every 3 to 6 months for regular health issues.	52	21.1
	Rarely go to see doctors.	142	57.7
Health Insurance	Participate in compulsory health insurance program only.	108	43.9
	Participate in commercial health insurance program.	134	54.5
	Do not participate in any health insurance program.	4	1.6

TABLE 2. SAMPLE DEMOGRAPHICS

CONSTRUCT	N	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
Usage Intention	246	1	5	4.1238	0.89776
Trust In Provider	246	1	5	3.4014	0.72996
Perceived Ease of Use	246	2	5	3.9228	0.63457
Perceived Risk	246	1	4	2.9461	0.79469
Perceived Benefit	246	2	5	4.1616	0.67541

EXPLORATORY FACTOR ANALYSIS – EFA

For data analysis, a two-step approach consisting of measurement modeling and structural equation modeling was conducted [23]. Initially, exploratory factor analysis (EFA) was performed to verify the independence and distinctiveness of latent variables. It was observed in Table 3 that KMO = 0.878 was higher than the cut-off value of 0.8 [24] and Barlett's test was statistically significant (p = 0.000). The results supported the validity of the data, indicating that they could be used for factor analysis.

TABLE 3. KMO AND BARTLETT'S TEST

Kaiser Meyer Olkin Measure of Sampling Adequacy.		0.878
Bartlett's Test of Sphericity	Approx. Chi-Square	2786.519
	df	171
	Sig.	0.000

Source: By Authors, 2023

Principal component analysis was conducted. Five factors were extracted, with cumulative sums of squared loadings of 71.663%, as shown in Table 4.

TABLE 4. TOTAL VARIANCE EXPLAINED

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.622	40.116	40.116	7.622	40.116	40.116	4.467
2	2.199	11.572	51.689	2.199	11.572	51.689	4.620
3	1.485	7.814	59.503	1.485	7.814	59.503	3.952
4	1.343	7.071	66.574	1.343	7.071	66.574	4.450
5	0.967	5.089	71.663	0.967	5.089	71.663	5.677
6	0.727	3.828	75.491				
7	0.629	3.313	78.804				
8	0.541	2.849	81.653				
9	0.519	2.730	84.382				
10	0.483	2.541	86.924				
11	0.415	2.185	89.108				
12	0.391	2.060	91.169				
13	0.350	1.843	93.012				
14	0.316	1.666	94.677				
15	0.281	1.479	96.156				
16	0.261	1.373	97.529				
17	0.219	1.151	98.680				
18	0.166	0.872	99.552				
19	0.085	0.448	100.000				

Extraction Method: Principal Component Analysis.

Source: By Authors, 2023

MEASUREMENT MODEL

The measurement model aimed to evaluate validity and reliability. Convergent reliability was evaluated by examining the composite reliability (CR) and Cronbach's alpha (CA). The results of all the CA tests ranged from 0.803 to 0.924, and the CR values ranged from 0.803 to 0.931 (Table 5). Both parameters were above the acceptable value of 0.7 [25]. Regarding validity, we evaluated both discriminant and convergent validity. Convergent validity was assessed using the average variance extracted (AVE) and factor loadings. The factor loading and AVE of each construct were higher than the cutoff value of 0.5 [26], showing high convergent validity. In addition, the square root of AVE for each construct was higher than its correlation coefficient with any other construct. Thus, the discriminant validity was acceptable.

TABLE 5. VALIDITY AND RELIABILITY OF VARIABLES

	CA	CR	AVE	PB	PE	PR	TP	UI
PB	**0.813**	0.819	0.531	**0.729**				
PE	**0.809**	0.814	0.523	0.528***	**0.723**			
PR	**0.803**	0.803	0.507	-0.435***	-0.236**	**0.712**		
TP	**0.836**	0.837	0.565	0.631***	0.555***	-0.592***	**0.751**	
UI	**0.924**	0.931	0.818	0.668***	0.664***	-0.534***	0.728***	**0.905**

CA, Cronbach's alpha; CR, composite reliability, AVE, average variance extracted. The bold diagonally are the square root of AVE. ** $p < 0.010$; *** $p < 0.001$

Source: By Authors, 2023

CONFIRMATORY FACTOR ANALYSIS – CFA

Subsequently, structural modeling was performed based on the measurement model. Several parameters were used to assess the overall goodness-of-fit of the hypothetical model [26]. As shown in Table 6, the results of structural equation modeling acquired from the proposed theoretical model revealed that CMIN/DF = 1.883 (p=0.000), GFI = 0.914, RMSEA = 0.060, RMR = 0.04, TLI = 0.944, CFI = 0.960. These fit statistical indices were all better than the recommended cutoff values, as shown in Table 6. The CMIN/DF ratio was lower than the recommended threshold value of 3. RMSEA was less than the recommended cutoff value of 0.08, and the RMR value was less than the recommended threshold of 0.05. Accordingly, most of the overall fit indices showed a good fit between the data and model.

TABLE 6. FIT INDICES FOR STRUCTURAL MODEL

Structural Model Statistic	Fit Indices	Recommended Threshold (Hooper et al., 2007)
CMIN	231.669	-
CMIN/DF	1.883	<3
GFI	0.914	>0.9
RMSEA	0.060	<0.08
RMR	0.04	<0.05
TLI	0.944	>0.9
CFI	0.960	>0.9

Source: By Authors, 2023

STRUCTURAL EQUATION MODELING – SEM ANALYSIS

Table 7 and Figure 3 present the results of the Structural Equation Modeling and hypothesis testing. Perceived ease of use (β = -0.344, p = 0.000) and perceived benefit (β = 0.227, p = 0.002) positively and significantly affected usage intention, whereas perceived risk negatively and significantly influenced usage intention (β = -0.189, p = 0.004). Trust in the provider positively and significantly influenced usage intention (β = 0.281, p = 0.000) and perceived benefit (β = 0.510, p = 0.000), but negatively influenced perceived risk (β = -0.677, p = 0.000). Perceived

ease of use significantly and positively affected perceived benefit (β = 0.241, p = 0.004), whereas the effect of perceived ease of use on perceived risk was not statistically significant (p = 0.128).

Overall, perceived ease of use, trust in provider, perceived benefit, and perceived risk significantly affected usage intention, and the structural model explained 68.4% of the variation in usage intention (R2 = 0.684). Trust in provider and perceived benefit significantly affected perceived benefit, and the structural model explained 45.5% of the variation in perceived benefit (R2 = 0.455). Only trust in the provider significantly affected perceived risk, which could explain 37.5% of the variation in perceived risk (R2 = 0.375).

TABLE 7. PATH COEFFICIENTS AND THE RESULT OF HYPOTHESES TEST

Hypotheses	Path coefficients	Significance	Findings
PE → UI	0.344	0.000	Supported
TP → UI	0.281	0.000	Supported
PB → UI	0.227	0.002	Supported
PR → UI	-0.189	0.004	Supported
PE → PB	0.241	0.004	Supported
PE → PR	0.135	0.128	Not Supported
TP → PB	0.510	0.000	Supported
TP → PR	-0.677	0.000	Supported

Source: By Authors, 2023

FIGURE 3. THE STRUCTURAL MODEL AND R2 VALUES
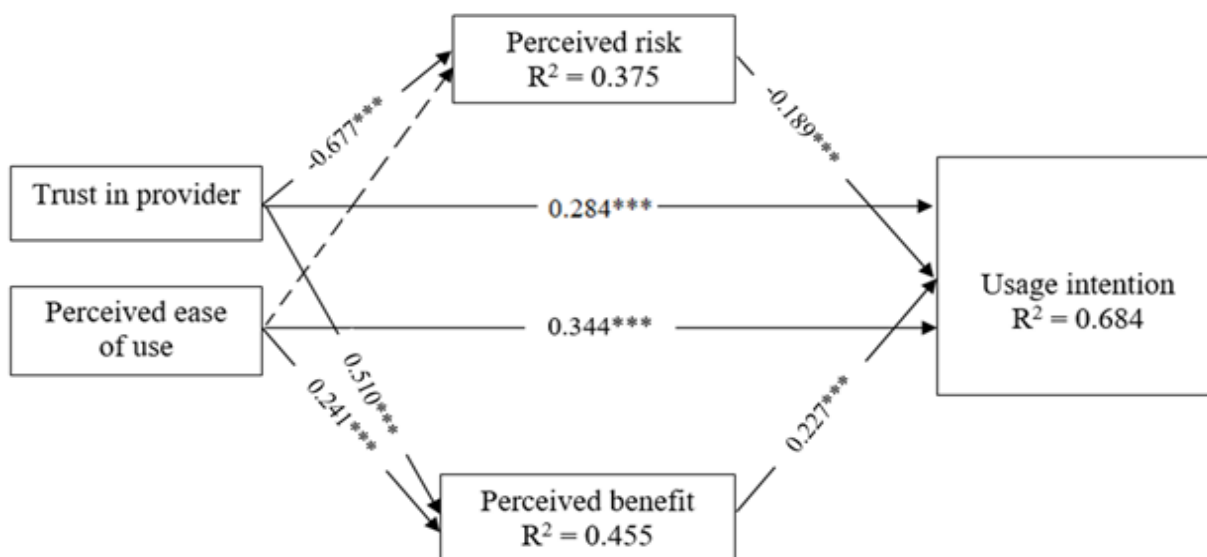
Dashed lines represent unsupported paths. *p < 0.05, **p < 0.01, *** p < 0.001.   Source: By Authors, 2023

RESEARCH RESULTS DISCUSSION

This research investigated the factors influencing the behavioral intention of customers to accept and use telemedicine services. To the best of our knowledge, this is the first study on customer behavior toward adopting telemedicine services in Vietnam. The data collected significantly supported the proposed hypothetical model and provided a valuable understanding of the interdependence among trust in the provider, perceived ease of use, perceived risk, perceived benefit, and behavioral intention to adopt a new format of medical service. According to the SEM results, the model demonstrated a good fit and was beneficial for assessing and predicting customers' behavioral intentions.

The results supported the direct impact of trust in provider, perceived ease of use, perceived risk, and perceived benefit on usage intention, the direct influence of trust in provider on perceived risk and perceived benefit, and the direct impact of perceived ease of use on perceived benefit. However, the results showed that perceived ease of use affected perceived risk nonsignificantly. This unexpected finding could be attributed to the popularity

of smartphones and mobile technology in the society nowadays. The average perceived ease of use survey score was 3.9 (Table 2), which showed that most of the participants were capable of using telemedicine applications on smartphones and computers. Moreover, most attendants had a high educational background and lived in large cities. This explains why they learned how to use new mobile technology faster than average. Thus, perceived risks related to ease of use were not significant in the investigated population. However, perceived risks from other causes, such as doctor quality and security, were much more obvious for these people.

The results also indicated that well-educated and young people generally had positive perceptions of perceived ease of use (mean 3.9), perceived benefit (mean 4.2), and usage intention (mean 4.1). These results imply that a group of potential customers who appreciate the benefits of telemedicine and are ready to adopt this service has been formed in society. They are urban residents in the age range of 20 to 40 years, with a high educational background, busy lifestyle, and above-average income. Thus, service providers should target the customer segment based on these demographic characteristics.

Perceived ease of use and trust in the provider were the most significant direct antecedents of usage intentions. The empirical results of this study indicate that service providers need to build solid customer trust. Moreover, investing in technology platforms to improve the user experience (UX) and user interface (UI) should be prioritized to enhance customer acceptance [27]. In addition, consistent with previous studies, the positive effect of trust in a provider on usage intention is partly mediated by perceived benefit and perceived risk. Trust in the provider strongly influenced perceived risk and perceived benefit, whereas perceived ease of use only significantly affected perceived benefit. In addition, Davis et al. (1989) also found that users are more likely to accept a new IT product if they think that the system is useful regardless of whether they like it. These findings also imply that trust in a provider plays a key role in customers' decision-making process. Accordingly, the service provider should focus on improving customer trust through appropriate practices, such as publicizing doctor information, cultivating doctor - patient and service provider - patient relationships through communication and media activities, in-person consultation events, and CSR activities. The service provider must strictly comply with the regulations and ethical standards in telemedicine to avoid harmful consequences and mitigate the risk of losing trust from the customer.

RESEARCH LIMITATIONS AND FURTHER RESEARCH DIRECTIONS

In this study, we used behavioral intention as the dependent construct instead of actual usage behavior. Although this approach is appropriate for investigating new technologies that have not been popular in society, it cannot explain actual usage behavior. Theoretically, this study integrated the technology acceptance model (TAM) and the extended valence framework to provide an efficient behavioral model for understanding customer's intention to use telemedicine service. The hypothetical framework went further than the original TAM by integrating the relationships among trust in providers, technological factors (perceived ease of use), perceived risk - benefit and usage intention. The proposed model was indicated to be valuable for assessing and finding solutions to positively influence the usage intention of telemedicine service as it provided a theoretical model that helps to understand the relationships among these constructs. The results indicated statistically significant causal effects of trust in provider, perceived ease of use, perceived risk and perceived benefit on usage intention; influence of trust in provider on perceived risk and perceived benefit, and also direct impact of perceived ease of use on the perceived benefit. The participants of this study mostly belonged to the middle – high social class who were well educated, young – middle age (< 40 years old), lived in big cities, and had middle – high income. Thus, they have more capabilities to adopt new technologies than the average population. Further research should include populations with more diversified demographic characteristics, especially older people, residents living in rural areas, lower income, and educational background. Telemedicine service providers can target the middle – high social class in the early stages. However, they also need to cover the lower class in society because they are more crowded and more likely to benefit from telemedicine services. Future research investigating actual telemedicine usage in real business circumstances will provide more comprehensive insights into this model for evaluating and predicting the level of customer acceptance. These studies could be implemented when telemedicine services become more popular in society.

The provision of medical services is being transformed by advanced technologies such as e-health, telehealth, and

telemedicine. The increasing adoption of telemedicine is in light of the big trends of digitalization and globalization in medicine. Telemedicine not only represents the future of medical practicing, it is currently a primary means of expanding care to those with limited access to physicians. To be truly patient centered, healthcare must be affordable and accessible. Growing evidence of telemedicine's effectiveness is encouraging; however, more research is needed on the impact of telemedicine on cost, quality, access, and patient experience. There is no doubt that telemedicine will continue to increase in popularity. Technically, IT platforms and infrastructure dedicated to telemedicine are underdeveloped in Vietnam. Although this kind of medical service is very popular worldwide, its social acceptance in Vietnam is still limited. Telemedicine providers need to overcome existing barriers and improve the business model, service design, technology, marketing strategy, and customer relationships to be successful in this business field. This study can serve as a foundation for further action to build, develop, and popularize telemedicine services in Vietnam. Future research could continue to explore other factors that influence customers' decisions to adopt telemedicine. We hope that this research will provide realistic values to practitioners, service providers, and scholars.

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