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Intention to use telemedicine based on the Unified Theory of Acceptance and Use of Technology Model

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ABSTRACT

Background and purpose: Due to COVID-19 pandemic, demand for technology in daily interaction has rapidly grown to ease communication while maintaining physical distance. This study examines the determinants of the intention to use telemedicine using the Unified Theory of Acceptance and Use of Technology (UTAUT) Model.

Methods: This cross-sectional study was an online survey using Google Form application conducted from March 11 to May 3, 2021. The inclusion criteria of samples were aged 18 years or older, residing in Bali during the data collection period and knowing telemedicine health services. Variables collected include intention to use telemedicine, demographic characteristics of respondents and UTAUT variables, namely performance expectancy, business expectancy, social influences, and facilitation conditions. The statistical test used is simple and multiple logistic regression analysis.

Results: Of 458 survey respondents, 287 were included for analysis due to incomplete data. Almost half of the respondents (48.8%) was aged <25 years old, the majority were female (80.51%) and around two-thirds, were studying in university, being employed and earning income. We found most respondents (57.14%) were highly interested in telemedicine services. The logistic regression analysis showed that performance expectations, business expectations, social influence, and facilitating conditions were significantly associated with people's interest in telemedicine in Bali.

Conclusion: Telemedicine is relatively popular in Bali, Indonesia. Performance expectancy, effort expectancy, and social influence are the predominant factors influencing the intention to use telemedicine. It shows the potential to employ telemedicine service to cover the inadequate distribution of health professionals and healthcare in Indonesia.

Keywords: Telemedicine, UTAUT, Digital Health, Intention to Use

INTRODUCTION

Telemedicine is a method or application of health services provided by health professionals to the public or individuals related to the diagnosis, treatment plan, consultation, and health information exchange through information and communication technology.[1] Technological advances have improved interest in the use of telemedicine in healthcare delivery.[2] These technological advancements also make digital devices less expensive and easier to use, whilst there is an increased need for alternative healthcare delivery systems. The service using telemedicine can be more focused and shorter than in-person visits. Additionally, telemedicine can increase efficiency and provide proper space for patients and their families to share their thoughts and feelings during treatment. However, despite the benefits of telemedicine, there are obstacles faced by patients or healthcare providers; lack of internet access and technological support are some of them. It also requires robust information technology infrastructures at the initiation stage, training of nurses and doctors, and modifications to hospital workflows to run a good telemedicine system.[3]

In Indonesia, telemedicine is not completely new. It has been used since 1985; however, most of the telemedicine activities in Indonesia are not well-documented.[4] With the increasing access to smartphones, the popularity of telemedicine is rising. One of the first telemedicine launched in 2014 was Alodokter which since then has become one of the industry's leaders, followed by Halodoc in 2016.[5] In 2017, Indonesia's Ministry of Health (MoH) launched Telemedicine Indonesia (Temenin).[6] Due to COVID-19, the demand for technology in daily interaction has rapidly increased to ease communication while maintaining a physical distance.

Telemedicine users increased from 11% in 2019 to 76% in 2021.[7] A study found that during the pandemic between March - June 2020, a positive telemedicine utilization trend was observed. The MoH telemedicine (temenin.kemkes.go.id) was also accessed by the public using both desktop (71%) and mobile application (29%).[8] In another study in 2019, Halodoc application was the most used by Indonesian (45.3%), followed by Alodokter (32.3%). In addition, some hospitals and doctors are invited to cooperate in telemedicine health services. In 2020, 148 hospitals and public health centres were supported by Indonesian telemedicine facilities.[8]

The Indonesian government imposed large-scale social restrictions in response to the pandemic. Community activities were restricted from going outside their house, including restrictions on work or office activities, except for some jobs that are allowed and stated in the policy. Health services have imposed restrictions on health services, but staying at home and avoiding crowds is still advisable to prevent and overcome COVID-19. People were encouraged to use telemedicine during this period to obtain healthcare services while limiting their risk of contracting COVID-19.[9] Telemedicine is an option to provide health services to the public without making direct contact amid the COVID-19 pandemic.

Most evidence regarding determinants of telemedicine utilization is mainly from the clinical or among healthcare professionals perspectives.[4,10-13] However, end-user acceptability is limited and needs to be explored, especially in low-middle-income countries.[14,15] The Unified Theory of Acceptance and Use of Technology (UTAUT) is frequently employed in exploring the acceptance of technology.[16] Given the above advantages, the UTAUT Model is widely adopted in many cases.[17-19] The model integrated human and social factors and included four core determinants (effort expectancy, performance expectancy, social influence, and facilitating conditions). This study aims to analyse factors that determine peoples' intention to use telemedicine for healthcare services. The study's findings would advance the current understanding regarding the use of telemedicine in the Indonesian context, considering the uneven distribution of health professionals and healthcare disparities due to the vast territory and transport challenges.

METHODS

Study Design and Setting

This online cross-sectional survey was conducted using the Google Form Application from March to May 2021 in Bali, Indonesia. The minimum sample required was calculated using the survey formula, and the minimum necessary size was 110 respondents. We invited respondents through a Google form link listed on a poster showing information about the study's purpose, which was shared via Facebook and WhatsApp. The poster was then shared through the researcher's networking and social media influencers. Eligibility criteria were individuals who were 18 years or older, residing in Bali during the data collection period, and willing to participate. Those who did not meet the eligibility criteria and submitted incomplete answers were excluded from the study.

Study Variables

In this study, the dependent variable was 'Intention to use telemedicine", measured by three statements. Statements 1 and 2 are positive, given a Likert ranging from 1 (strongly disagree) to 5 (strongly agree). While statement 3 is a negative item measured with the Likert scale ranging from 5 (strongly disagree) to 1(strongly agree). The categorization was done by summing the scores of the three statements, dividing by the highest score of 15, and multiplying by 100% to get the score percentage. The categories used are "low interest", where the score obtained is less than 80%, and "high interest", where the score is more or equal to 80%.

The independent variables consisted of the following factors:

(i) Demographic characteristics of respondents (i.e., age, gender, last education, occupation, income, district/city, time to access telemedicine, and online applications)

(ii) UTAUT variables namely performance expectancy, effort expectancy, social influences, and facilitation conditions. Each variable consists of 4 statements with positive and negative statements. Positive statements were given a Likert score ranging from 1 (strongly disagree) to 5 (strongly agree). On the other hand, negative statements were measured with the Likert scale ranging from 5 (strongly disagree) to 1 (strongly agree). The categories used could be more and better. If the score is smaller than the median, it falls into the less category; if the score is more or equal to the median, it belongs to the good category. The median on each variable is performance expectations=80, business expectations=80, social influences=75, and facilitation conditions=80.

The questionnaire for the UTAUT aspects is developed based on UTAUT constructs.[16] It consisted of 29 statement items adapted from research questionnaires in several studies.[20-23] The statements in the questionnaire are positive and negative to maintain the concentration of respondents. Testing the validity and reliability of the instrument with related experts was carried out before the instrument was disseminated. To strengthen this, the validity and reliability tests were carried out simultaneously following the research data collection. From a total sample, the results of validity and reliability tests with the Pearson correlation statistical test (r count >r table or ir-cor more than 0.3) and Cronbach alpha (>0.6) mean that the instrument used is valid and reliable.

Statistical Analysis

All data were checked and cleaned for analysis. Descriptive statistics were used to obtain variable distributions (i.e., frequencies, percentages, means, and standard deviations). First, we applied a bivariate regression analysis test to determine crude associations between independent and dependent variables; we nominated candidate variables with p-values <0.25. Next, a multiple logistic regression analysis with backward

technique was performed to determine which independent variables were associated with the dependent variable. Results were considered significant based on *p*-values <0.05. All data analyses were conducted using STATA 12.0.

Ethical Approval and Consent to Participants

This study received approval with Ethics Decree Number: 1139/UN14.2.2.VII.14/LT/2021 from the Ethics Commission, Faculty of Medicine, Udayana University. All respondents gave their informed consent to participate. We confirm that all methods were carried out following relevant guidelines and regulations and under the declaration of Helsinki.

RESULT

Table. 1 Sociodemographic characteristics of the study participants

Variable	Frequency	Percentage (%)
Age (years)		
18-25	140	48.78
26-35	72	25.09
36-45	46	16.03
46-55	23	8.01
56-64	6	2.09
Gender		
Male	56	19.51
Female	231	80.51
Education		
Primary education	91	31.71
University	196	68.29
Occupation		
Not employed	107	37.28
Employed	180	62.72
Earning		
No earning	85	29.62
Earning	202	70.38
Districts		
Denpasar (capital city)	183	63.76
Outside Denpasar (outside capital city)	104	36.24
Access time (minutes)		
≤15	165	57.49
16-30	104	36.24
31-45	10	3.48
46-60	3	1.05
>1 hour	5	1.74
Application		
Alodokter	90	31.36
Halodoc	145	50.52
Others	52	18.12
Application Utilisation		
Health consultation	128	44.60
Looking for health information	143	49.83
Ordering medicine	16	5.57

We initially received 458 responses, but only 287 were included in the analysis, drop out was due to

incomplete answers. Table 1 shows the demographic characteristics of respondents: almost half of the respondents (48.8%) are <25 years old. Most are women (80.51%) living in Denpasar (the capital city of Bali). Around two-thirds, were studying in university as the latest education, being employed and earning income. The most frequently accessed application for health services is Halodoc (50.5%) to seek health information and consultations.

Table 2 shows the distribution of interest in using telemedicine and UTAUT variables. More than half of respondents (57.14%), reported a high interest in using telemedicine to access health services. For the UTAUT indicators, the respondents' perspectives on the performance expectancy, effort expectancy and facilitation condition were good among 197 respondents (68.64%), 192 respondents (66.90%), and 177 (61.67%), respectively.

Table 2. Overview of UTAUT variables and interest in using telemedicine

Variable (n=287)	Frequency	Percentage (%)
Interest in Using Telemedicine		
Low interest	123	42.86
High interest	164	57.14
Performance Expectancy		
Less	95	33.10
Good	192	66.90
Effort Expectancy		
Less	90	31.36
Good	197	68.64
Social Influence		
Less	170	59.23
Good	117	40.77
Facilitation Conditions		
Less	110	38.33
Good	177	61.67

The result of the bivariate regression analysis is displayed in Table 3. The analysis showed that socio-demographic variables did not have a significant relationship to the interest in telemedicine because the p-value of each variable was ≥0.05. Meanwhile, the UTAUT variables were statistically associated with the intention to use telemedicine.

From the multivariate analysis, variables that have p-value of ≤0.2 were the UTAUT variables. The final model showed performance expectancy, effort expectancy, and social influences are collectively associated with the intention to use telemedicine (Table 4).

From the final model, an assessment of the model's fit with the post-estimation of Goodness of Fit (GOF) was carried out. The model fits with a double logistic regression model if the GOF has a p-value of >0.05. The results in this study show that the value of p=0.834, so the model fits with the Logistic Regression Model. The magnitude of the influence of performance expectancy, effort expectancy, and social influences together, assessed by the coefficient of determination (R^2) on intention to use telemedicine, was 33%.

Table 3. Intention to use telemedicine based on sociodemographic and UTAUT variables

Variable	High Intention f (%)	Low Intention f (%)	OR	95%CI	p
Age (years)					
18-25	81 (57.9)	59 (42.1)	Reff		
26-35	44 (61.1)	28 (38.9)	1.14	0.64–2.04	0.640
36-45	24 (52.2)	22 (47.8)	0.79	0.40–1.55	0.500
46-55	10 (43.5)	13 (56.5)	0.56	0.23–1.36	0.201
56-64	5 (83.3)	1 (16.7)	3.64	0.41–31.99	0.240
Gender					
Woman	132 (57.1)	99 (42.9)	Reff		
Man	32 (57.1)	24 (42.9)	1	0.55–1.80	1.000
Education					
Primary education	49 (53.8)	42 (46.2)	Reff		
University	115 (58.7)	81 (41.3)	1.21	0.73–2.00	0.770
Occupation					
Not employed	59 (55.1)	48 (44.9)	Reff		
Employed	105 (58.3)	75 (41.7)	1.13	0.70 –1.84	0.590
Earning					
No earning	46 (54.1)	39 (45.9)	Reff		
Earning	118 (58.4)	84 (41.6)	1.19	0.71–1.98	0.500
Performance Expectancy					
Less	25 (26.3)	70 (73.7)	Reff		
Good	139 (72.4)	53 (27.6)	7.34	4.21–12.79	<0.001
Effort Expectancy					
Less	24 (26.7)	66 (73.3)	Reff		
Good	140 (71.1)	57 (28.9)	6.75	3.85–11.81	<0.001
Social Influence					
Less	53 (39.0)	83 (61.0)	Reff		
Good	111 (73.5)	40 (26.5)	4.35	2.64–7.16	<0.001
Facilitation Conditions					
Less	42 (38.2)	68 (61.8)	Reff		
Good	122 (68.9)	55 (31.1)	3.59	2.17–5.91	<0.001

Table 4. Factors associated with the intention to use telemedicine with Multiple Logistic Regression

Variable	OR	95%CI	p
Performance Expectancy			
Less	Reff		
Good	3.29	1.73–6.25	<0.001
Effort Expectancy			
Less	Reff		
Good	3.29	1.74–6.21	<0.001
Social Influence			
Less	Reff		
Good	2.33	1.32–4.12	0.004

DISCUSSION

The telemedicine utilization trend in Indonesia is related to consumer behavior which is boosted by the shifting of activities from desktops to smartphones. The COVID-19 pandemic has also affected the significant increase in telemedicine utilization.[24,25] Our study found people's interest in using telemedicine was quite high, and the Halodoc application was the most popular channel. Meanwhile, we also found three direct determinants of behavioral intention to use technology, namely performance expectancy (PE), effort expectancy (EE), and social influence (SI), significantly influence the intention to use telemedicine in Bali. This finding aligns with the findings from several previous studies, suggesting PE, EE, and SI substantially impacted people's choice to adopt technology.[26-28]

The UTAUT model has primarily been applied in an organisational context, and PE is the principal driver of the intention to use.[29,30] Studies suggest that performance expectancy refers to how technology benefits consumers in performing specific activities.[24,31,32] Our study confirmed that those who believe telemedicine will help them are more likely to have higher interest to use telemedicine. Previous studies suggested that PE significantly affects behavioral intention to use digital services.[24,29,33]

We found effort expectancy was the second element of UTAUT that highly influenced the intention to use of telemedicine in Bali. Individuals who need assistance to use internet and are less sure of the benefits of e-health were less likely to use e-health applications in the future.[24,34] People need an easy-to-use health consultation application with the features they need and be equipped with guidance on how to use it. An easy-to-use application by service providers is needed with the hope that the public will get a good experience using the health applications, so in turn it may change people's confidence around the easiness of the application.

Our study also found that social influence contributed to the intention to use telemedicine in Bali. Venkatesh et al. (2003) argue that social influence is mandatory in behavioral intention.[16] When individuals need health services more often, they tend to become more open to the power of others.[35] Those who experienced the environment of people who have used telemedicine will have increased telemedicine literacy and individual interest in telemedicine. This finding aligns with the result by Neslin and Shankar that social influence is significantly associated with the customer's behavioral intention.[35] People with insufficient experience in technology usage are believed to be more inspired by social influence.[27,36] However, this finding contradicted a study by Napitupulu et al.[24] The study found that social influence has the weakest impact on behavioral intention to use telehealth. This discrepancy might occur due to different contexts and research settings.

The result of this study may enrich the body of knowledge of people's intention to use telemedicine in Bali. This study produced valuable findings and advanced current knowledge about telemedicine in Indonesia as a low-middle-income country; this study gave healthcare providers and digital health developers a clearer understanding of users' behaviors regarding telemedicine. Since the intention to use telemedicine is high, more information is needed to promote telemedicine, primarily the one belonging to the government. Information dissemination may improve telemedicine literacy in the community. The efforts should be focused on specific benefits of telemedicine and easiness of use.

Telemedicine has the potential to continue growing to support equal access to healthcare due to the uneven distribution of health professionals and healthcare disparities in Indonesia and other similar setting. In China, telemedicine offers a viable solution to improve distribution and allocation of healthcare resources, hence, telemedicine is a potential alternative to closing the gap between rural and urban areas regarding medical service capabilities and quality.[37] Telemedicine also seems to be a feasible solution to health inequity in Indonesia,

considering the inadequate distribution of health professionals and healthcare disparities, the vast territory and transport challenges.

LIMITATION

While the study produced valuable findings, there were also several limitations. There is a potency of information biases due to the nature of online surveys where we cannot verify the responses. In addition, the representativeness of the sample may be low, so the generalizability of the finding should be carefully made. There were low participation of the older people who were generally less comfortable using technology and the online survey.[34,38,39] The relatively high number of drop-outs may influence the representativeness of the samples as well as the majority of samples were reside in Denpasar. Moreover, this study was a cross-sectional exploration, so causal relationships could not be made. Lastly, there are other potential factors associated with intention to use telemedicine which should be explored in the future such as computer anxiety[24] and trust[28]. A longitudinal study is required to investigate experiences and intentions to use telemedicine using a nationally representative sample.

CONCLUSION

The findings from this study indicated that telemedicine is relatively popular in Bali, Indonesia and has increased its popularity due to the pandemic. In Bali, the intention to use telemedicine were higher when the participants perceived the technology benefits their everyday lives and is easy to use, and many peoples in their surrounding use such technology. It is thus imperative for governments to support and monitor the implementation of telemedicine as it offers a viable solution to the uneven allocation of healthcare resources in Indonesia.

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AUTHOR CONTRIBUTION

AI, VJ and SU conceptualised the study: data curation, AI, VJ, EP. VJ and EP carried out a formal analysis. The study's methodology was taken care of by AI, VJ, SU, and EP. SH, KM, and SN did validation. AI, VJ, and SU carried out the investigation. Writing the original draft was done by AI. Writing review and editing were done by SU, SH, KM, and SN.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest concerning this article's research, authorship, and publication.

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