

Application of Theory of Reasoned Action (TRA) to Explain Continued Intention to Adopt (CIA) MHealth Services

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Received September 29, 2021; Accepted December 21, 2021

ISSN: 1735-188X

DOI: 10.14704/WEB/V19I1/WEB19332

Abstract

MHealth is a digital healthcare technology with big data adoption. Identification of the factors that encourage consumers CIA mHealth application needs to be considered. The study aimed to describe influence of service quality perception (SQP), perceived vulnerability (PV), TRA toward CIA mHealth. Sampling was done online using an e-questionnaire and analyzed with PLS (partial Least Square) using SEM. A total of 429 respondents were involved, and 170 of them were met the inclusion criteria. The existent result implies that SQP and attitude significantly affect CIA. Meanwhile, PV and subjective norm (SN) not significantly influence the CIA. Effects of attitudes were able to partially mediate SQP and CIA. On the other hand, attitude cannot mediate perceived vulnerability and CIA. Empirical substation was expected to provide future analysis about CIA. Furthermore, improvements of service quality would induce the frequent use of mHealth application.

Keywords

Theory of Reasoned Action, Service Quality Perception, Perceived Vulnerability, Continued Intention to Adopt, Mobile Health (mHealth).

Introduction

Information and communication technology advancement is rapidly accelerating with the Covid-19 situation. The increasing number of internet users opens up opportunities in various business sectors. The improvement on internet of things (IoT) can be observed from online purchases for various commodities, especially in the e-health sector. Internet penetration in Indonesia reaches 73.7% or there are approximately 196 million internet users in Indonesia in 2019-2020 (APJII, 2020). The health sector has adapted the system to respond to these conditions with augmented digital transformation, mHealth, telemedicine, and e-pharmacy in healthcare (Rahi et al., 2021).

Smart devices (smartphones) and big data technology development have ushered in the healthcare sector into the mobile internet era. Mobile-health services (mHealth) is a form of technology adoption in healthcare services. The implementation of mHealth services has significantly impacted in expanding access to health commodity (Kaium et al., 2020; Rahi et al., 2021). MHealth is a component of eHealth, which assign to support cost-effective communications in health and communications related to the health sector (WHO., 2019). Digital health offers a better approach to provide health services. The number of health apps in Indonesia is increasing rapidly, there are seven mHealth applications from the government sector and nine applications from the private sector (Deloitte, 2019).

However, the biggest challenge faced by mHealth services was the delay in end-user adoption (Rahi et al., 2021; Zhang et al., 2020). One of the important parts of information system research was behavior to continued intentions in adopting technology. The latest research in the Jakarta area, Tangerang, Bogor, Depok, Bekasi (Jabodetabek) showed that only 40.23% of 1956 respondents used the mHealth application in Indonesia (Octavius & Antonio, 2021; Shamsurina et al., 2021). Identifying the factors that drive consumers CIA the mHealth application is necessary to be considered. Analyzing the continuing adoption of mHealth in Indonesia is needed by the reason of a high competition between the rise of mHealth expansion. This study aimed to understand the factors of SQP, PV, SN, and its influence on intention continuing to adopt mHealth services. For that reason, the current study applies integrative research model from service quality by DeLone & McLean's information success model, Protection Motivation Theory (PMT), and TRA with some modifications.

Literature Review

One of the key factors of usage application acceptance was service quality (Wang & Qi, 2021). Quality is a major issue in the success of healthcare services marketing. Service

quality is generally defined as customer ratings that serve as their perceptions of the service given. Quality of health services provides a sustainable competitive advantage. Service quality were strongly influenced on online health/telemedicine/mHealth apps intention to adopt (Kim et al., 2019; Ahmad & Zhang, 2020; Rahi et al., 2021) and patient attitudes in adopting telemedicine care (Rahi et al., 2021; Nataliia et al., 2021). Nowadays, service quality is mostly affected by attitude (Barreto & Martínez, 2018).

The PMT in 1975, was developed by Rogers as an extension of health belief models (HBM). PMT is interpreted as an “adaptive and maladaptive responses to health threats as a result of two assessment processes: threat assessment and coping assessment” (Seow et al., 2021). The PV is an individual evaluation in the probability of exposure to an adverse health problem (Maddux and Rogers, 1983). Studies related to mHealth usage adoption in China describe PV to disease as an individual's perception of possible health threats (Zhang et al., 2020). In previous researches related to the adoption of the use of medical tourism, PV was visualized in the requirements of a personal assessment of consequences of health threats and possible exposure to health threats substantial (Seow et al., 2021). The PV evaluation of health threats persuaded positive relationship to intention to adopt technology products (Karahoca et al., 2018). The PV will greatly affect the individual linked to the behavioral intention of users to adopt mHealth (Zhao et al., 2018). Results of meta-analysis research in China and Jordan found that PV significantly effect on attitudes (Zhang et al., 2020; Zhao et al., 2018). The PV significantly influenced patient's attitude apropos the adoption of telemedicine healthcare in Pakistan (Rahi et al., 2021).

In 1960, Fishbein proposed a TRA which is the relationship between beliefs and attitudes toward an object. In 1967, Fishbein introduces a framework of relationships between attitudes and behavioral intentions. Acceptance and adoption behavioral intention advance technology innovation were highly influenced by SN (Shiferaw et al., 2021) Previous meta-analytical studies on mHealth adoption intentions by Zhao et al. (2018) and the studies by Gong et al. (2019); Hoque, (2016); Mou et al. (2017) have found that SN has a significant positive effect to the intention to adopt online health services. SN was also shown to positively and significantly influence attitudes in related studies in Ghana, Korea, Taiwan, and the United States (Andoh, 2018; Hsu, 2012; Kim et al., 2019). Attitude is considered as a predominant determining factors of technology adoption (Ayo et al., 2016). The results show that attitude present a prominent role in determining patient behavior towards the use of the mHealth treatment website (Shiferaw et al., 2021). Attitudes also positively affects behavioral intentions to adopt health services products in Spain, Turkey, and Pakistan (Barreto & Martínez, 2018; Karahoca et al., 2018; Rahi et al., 2021).

Attitude refers to “personal positive or negative perception of behavior” (Fishbein and Ajzen, 2015:75; Ayo et al., 2016; Barreto & Martínez, 2018). Attitude regarding adoption of technology is stated as an overall affective reaction of the individual to use a system (Venkatesh et al., 2003). An earlier study shows that attitudes have a significant role in determining the patient's behavior regarding telemedicine usage (Rahi et al., 2021). Rahi et al. (2021) explained attitude can mediate quality towards behavioral intention to adopt mHealth technology and health services. E-service quality on e-banking strongly effect customer attitudes and affects the intention to use e-banking services (Ayo et al., 2016). Previous researches by Kaium et al. (2020); Rahi et al., (2021); Zhao et al. (2018); in China by Zhang et al. (2020) and in Pakistan by Shiferaw et al. (2021), elaborate that PV is mediated by attitudes that positively and significant affect behavioral intention of mHealth service adoption. Research by Andoh, (2018); Hsu, (2012); Kim et al. (2019) state that attitudes can fully mediate SN and CIA.

Research Method

The conceptual model in this research was as follows:

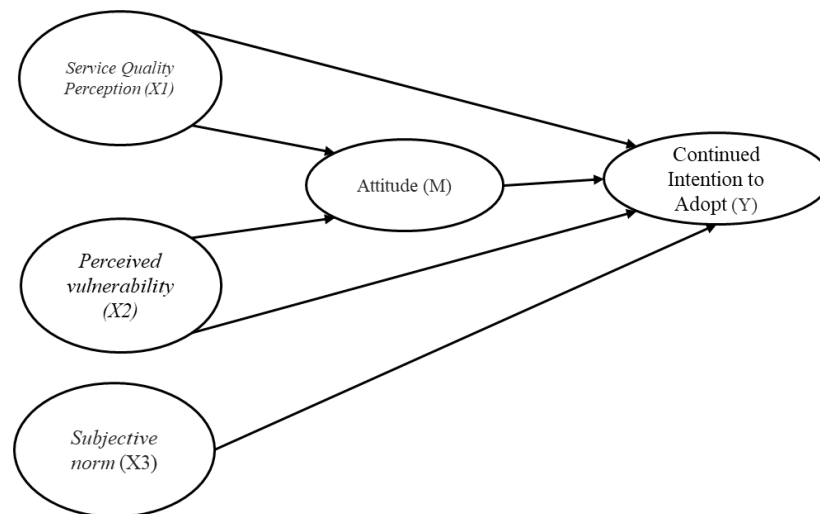


Figure 1 Research Conceptual Model

From the model above eight hypotheses were developed, such as:

- H1: SQP has a positive and significant effect on the CIA mHealth services.*
- H2: SQP has a positive and significant effect on attitudes.*
- H3: PV has a positive and significant effect on the CIA mHealth services.*
- H4: PV has a positive and significant effect on attitudes.*
- H5: SN has a positive and significant effect on CIA mHealth services.*
- H6: Attitude has a positive and significant effect on CIA mHealth services.*

H7: Attitude mediates the relationship between SQP and CIA mHealth services.

H8: Attitude mediates the relationship between PV and CIA mHealth services.

Instrument Development

The research conceptual model contains five variables showed in Figure 1. This research adopted and modified all the instrument from previous studies to confirm validity and reliability of the scale. The literature review from relevant published studies was conducted for developing the self-administered questionnaire. Evaluation of each item of this instrument was carried out using a five-point Likert-scale that ranged from “strongly disagree” (one point) to “strongly agree” (five point). Three experts in the marketing management field were requested to review the content in terms of wording or format and logical consistencies of the questionnaire. A preliminary study was done by involving 30 respondents with experience in using mHealth. The SQP was assessed using five dimension and nineteen indicators (Akter et al., 2013; Lee et al., 2017). PV instrument use four indicators adopted and modified from the studies by Luo et al. (2021); Rahi et al. (2021); Zhang et al. (2020). The SN applied four indicators adapted from Gong et al. (2019); Hoque, (2016); Zhang et al., (2020). Attitude was assessed using four indicators adapted from (Karahoca et al., 2018; Zhang et al., 2020). CIA instrument was applied using four indicators adopted and modified from the studies by Akter et al. (2013); Kim et al. (2019); Luo et al., (2021).

Data Collection

A cross-sectional study was employed to explain CIA mHealth in Denpasar and Badung, Bali, Indonesia. The inclusion criteria involved in this study were adults' users' (above 18 years old), internet users who have smartphones and had used mHealth services (MHealth) at least once. A non-probability with the purposive sampling technique applied on this method to determine the sample. Questionnaire was driven via Google Form to minimize contact during the COVID-19 pandemic. A URL link was circulated using social media and WhatsApp to compile the data. Questionnaire were distributed from October to November 2021. The e-questionnaire was sent to friends, healthcare providers, and colleagues. The aim of the study was made clear with a cover in front of the Google Form Page. Confidentiality of the survey is guaranteed by mentioning that feedback would be kept confidential, for educational purposes only and informed consents were then obtained.

The Indonesian mHealth application used in this study is HaloDoc©. This application is one of the leading mHealth digital apps in Indonesia and most used mHealth application

(Octavius & Antonio, 2021). This study limits the sample population to citizen currently staying in Denpasar and Badung, Bali, Indonesia. This limitation of demographic place is because Bali has one of the highest populations with digital literation index in Indonesia. Specifically, it is since Denpasar and Badung region has the highest internet users in Bali. Therefore, reflecting the result to rural areas and nonadopters might be biased. The total respondents were 429, 78 excluded because of demographic domicile and 181 excluded because no previous use of mHealth application.

There were 170 respondents who met the inclusion criteria, the sociodemographic presented in table 1. Most of the respondents were unmarried (88.2%) and the level of health risk was low seen from the number of medical histories (78.8%). Respondents duration of using the mHealth application was less than 1 year (63.5%) with the frequency using 1 time at the last three months (71%). The favorite mHealth service used by the respondent were medicine order (70%) and online consultation (77.6%).

Table 1 Respondent Sociodemographic

Category		Count (N)	Percentage (%)
Gender	Female	127	74,7
	Male	43	25,3
Age	18-23	64	37,6
	24-29	98	57,6
	30-35	5	2,9
	>35	3	1,8
Education	High school	23	13,5
	Diploma	10	5,9
	Bachelor's degree	125	73,5
	Master's degree or higher	12	7,1
Occupation	Not work	14	8,2
	Student	41	24,1
	Civil Servant	18	10,6
	Healthcare Professional	23	13,5
	Private employees	59	34,7
	Businessman	13	7,6
	Housewife	2	1,2
Average personal income per month (Rupiah)	No income	16	9,4
	≤ Rp. 5 million	113	66,5
	> Rp. 5 to 10 million	30	17,6
	> Rp. 10 to 15 million	3	1,8
	> Rp. 15 to 20 million	5	2,9
	> Rp. 20 million	3	1,8

Data Analysis

Statistical analysis was conducted by Smart PLS operating system version (3.2.9). Evaluation of the fundamental model in the test required the outer and inner model. PLS Algorithm is used to test the outer and inner model using bootstrapping (Hair et al., 2017).

The Measurement Models Test Result

Measurement of the outer loading was used to calculate the model (Hair et al., 2017). Indicator criteria that has loading factor value above 0.50 or the t-value is above 1.96 with p-value < 0.05 were considered valid. The model shown (figure 1) was valid based on convergent validity test. Composite reliability equal or above 0.70 with Cronbach's alpha value equal or above 0.60 indicates reliability of a variable. Cronbach's alpha provides estimates based on reliability on intercorrelation of observed indicator variables (Hair et al., 2017:147). All variable instruments in this study are reliable and met the requirements of Cronbach's Alpha (α). Discriminant validity model is obtained by measuring the square root value of the average variance extracted (\sqrt{AVE}) correlations in the model. The calculated AVE values met the discriminant validity requirement (Hair et al., 2017). The measurement result model is presented in Table 2. All variable implies a relatively good result on validity and reliability.

Table 2 Cronbach Alpha, Composite reliability and AVE

Variable	Cronbach Alpha	Composite Reliability	AVE
SQP (X1)	0.965	0.968	0.614
PV (X2)	0.622	0.782	0.548
SN (X3)	0.875	0.915	0.730
Attitude (M)	0.871	0.912	0.724
CIA (Y)	0.921	0.944	0.808

R-square (R2) and Predictive Relevance Q2 of the Models

Table 3 presents the result of the effect sizes R-square. The value of (R Square) is a way to determine how large independent variable can explain a dependent variable.

Table 3 R² of Dependent Variable

Variables	R ²	Adjusted R ²
CIA (Y)	0.728	0.721
Attitude (M)	0.474	0.468

Specifically, CIA point out 0.728 of R² which illustrates that 72.8% of the variability of the research model can be elucidated by the variables of SQP, PV, SN, and attitude. As

much as 27.2% CIA is influenced by variables outside the model. Attitude variable showed 0.474 of R-square value that explaining 47.4% of the variables are explained by the SQP, PV and SN variables, while 52.6% is influenced by variables outside the model. The results show the Q^2 value of 0.847 which explains that the predictive relevance value is high, so the resulting model is feasible to use to predict CIA. The value of Q^2 means that 84.7% of the variation in CIA is influenced by variables of SQP, PV, SNs and attitudes.

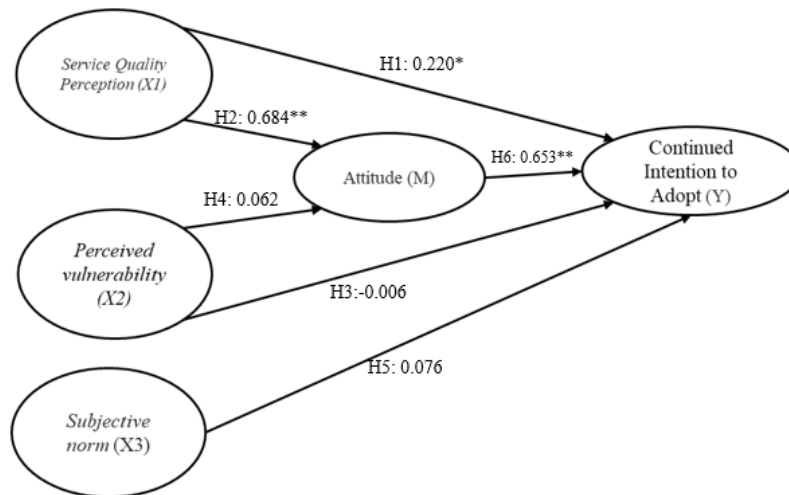


Figure 2 Model Testing results

Notes: Path significance: * $p < 0.05$; ** $p < 0.001$

Direct, Indirect and Total Effects between Variables

Hypothesis and statistic mediation test used t-test with p-value less than or equal to 0.05 stated as significant. The hypothesis model testing and Variance Accounted For (VAF) calculation results presented on Table 4 and Figure 2. Hypothesis 1, 2, and 6 were accepted through the model testing. Meanwhile, hypothesis 3, 4, and 5 were rejected. The presence result of attitude partially mediated SQP on the CIA (H7), with significant p-value. However, attitude on hypothesis 8 was not able to mediate PV to the CIA.

Table 4 The hypothesis (H) model testing and VAF

H	Direct Relationship between Variables	T Statistics	P Values	Description
1	SQP (X1) -> CIA (Y)	3.126	0.002	Significant
2	SQP (X1) -> Attitude (M)	10.964	0.000	Significant
3	PV (X2) -> CIA (Y)	0.095	0.925	Not Significant
4	PV (X2) -> Attitude (M)	0.982	0.327	Not Significant
5	SN (X3) -> CIA (Y)	1.619	0.106	Not Significant
6	Attitude (M) -> CIA (Y)	10.120	0.000	Significant
	Variable Mediation (Indirect effect)	Total Effect		
7	SQP (X1) -> Attitude (M) -> CIA (Y)	0.668	0.000	Partial mediation VAF (0,671) (67,1%)
8	PV (X2) -> Attitude (M) -> CIA (Y)	0.035	0,359	No Mediation

Research Findings and Discussions

The essence research prompt the following result. Initially, hypothesis one was accepted that mHealth SQP significantly affected CIA. Service quality was identified as a prominent antecedent of user intention to adopt health services (Rahi et al., 2021). This current research is aligned with the studies conducted by (Ahmad & Zhang, 2020; Akter et al., 2013; Rahi et al., 2021; Zhang et al., 2020). MHealth SQP was also found to have frequent effect on attitudes. Similar result was reported on e-banking apps studies and other mHealth applications (Ayo et al., 2016; Barreto & Martinez, 2017; Mangkunegara et al., 2018; Rahi et al., 2021). Respondents stated that the health service features on mHealth application were easy to understand, attractive, and helpful in meeting health needs such as medicines, multivitamin supplements, practical and fast consultations. MHealth application makes it easier to provide information and registration services for COVID-19 antigen or PCR tests. The service quality that are offered and the benefits provided by mHealth apps are the strongest reasons why respondents are comfortable, continuing to adopt mHealth services again to meet their health needs. This result aligned with Lee et al. (2017) indicate that mHealth applications were very convenient and helpful considering that people can manage their health flexibly everywhere at home or at the office, even when they cannot go to a healthcare facility.

Second, PV in this current study did not significantly affect attitude and CIA mHealth services. Karahoca et al. (2018); Seow et al. (2021); Zhang et al., (2020); Zhao et al. (2018) reported inconsistent results on individual PV to CIA in different region. The role of PV may decrease, when threats were judged to be of high severity and preventive behavior was complex or unknown (Walrave et al., 2020). The past study in Belgium 2020 regarding the adoption of the use of the contact tracing App application in patients affected by Covid-19 stated that an individual's PV to Covid-19 disease cannot predict the CIA mHealth services (Walrave et al., 2020). The insignificant outcome in this study can be influenced by the majority of the age characteristics of the respondents were teenagers who have a lower susceptibility to disease than adults/elderly. Age was determinant factor for PV to disease. The category of elderly age (parents and the elderly) has a higher and positive PV effect than individuals with young age (Deng, 2013; Guo et al., 2015; Zhao et al., 2018). Respondents perspective said that degenerative and chronic diseases may only tend to be suffered by the elderly (elderly age). This perception explains that susceptibility to disease did not significantly influence respondents CIA mHealth services. Currently, mHealth facilitate the process of registering for antigen tests and COVID-19 PCR. Upgrading the services makes it easier to access medicines, vitamin supplements, health

care facilities and speeding up the clarification of health information respondents wish to now.

Third, SN in this present study did not significantly affect CIA mHealth services. Previous studies found another perspective that contradicts the findings of this study. The result showed that SN have a positive and significant influence on the CIA online health services (Gong et al., 2019; Hoque, 2016; Mou et al., 2017; Zhao et al., 2018). Meanwhile, this finding is in line with Deng, (2013); Hsu, (2012); Kim et al., (2019) regarding SN that have no effect on career planning behavioral intentions research. Studies by Deng, (2013); Mangkunegara et al. (2018); Walrave et al., (2020) found that SN did not significantly affect the CIA, because most people's views stated that online health services seemed too far from the reality of the medical environment and its complex use. This outcome may be caused by the free flow of information in the current era, which made other people's considerations not so important for the teens. The perspective of patients living in Indonesia as a developing country explains that health awareness is still low and rarely becomes a priority in daily life. This condition causes the influence of other people to rarely have a significant impact on consumer intentions to adopt m-health applications (Mangkunegara et al., 2018). Karahanna et al. (1999) stated that the relationship between SNs on users had no significant effect on behavioral CIA compared to potential adopters.

Lastly, the current findings stated that attitude has a positive and significant influence to CIA. This current finding align with the studies by Deng *et al.* (2014); Chang *et al.* (2015); Kim *et al.* (2019); Guo *et al.* (2015); Barreto & Martinez, 2017; Karahoca *et al.* (2017); Zhao *et al.* (2018); Mangkunegara *et al.* (2018); Rahi *et al.* (2021); Binyamin S & Zafar B (2021). This study also introduced that attitude of respondents significantly and partially mediated the SQP on CIA. This result is in concordance to Fishbein and Ajzen (1975), Barreto and Martinez, (2017), Rahi et al. (2021) and Ayo et al. (2016). Additionally, present outcome found that there was no direct significant relationship between PV to the CIA. The respondent attitude was not able to mediate both variables. The result was not in line with the findings by Kaium et al. (2020), Zhao et al. (2018), Rahi et al. (2021); in China by Zhang et al. (2020) and in Pakistan by Shiferaw et al. (2021). PMT normally induced fear, it does not always lead to protective behavior, but rather the opposite (Ruth, 2020). Individuals with a young age have a low susceptibility to disease (Deng, 2013; Zhao et al, 2018; Guo et al., 2015). This event may be caused by the majority of respondents in this research were in the young age range. Respondents susceptibility perception to disease was low due to them has a stronger immune system than the elderly.

Implications, Limitations, and Further Research

Theoretical Implications

Present study set up an integrative conceptual model. The findings of this research contribute to the existing literature, especially those related to PMT, TRA, SQP, PV, SN, attitudes and CIA mHealth services. Current research initially consider vulnerability to diseases and service quality perception which still rarely studied in the continued intention to adopt mHealth application. This presence study is expected to provide findings and become empirical evidence for future research. Existence results were also proposed to enrich the development of marketing management related to mHealth continued adoption.

Managerial Implications

The managerial implications present in this study refers to online health service managers on the MHealth application, especially in the Bali area. First, the results showed that service quality was the strongest factor in forming positive attitudes towards online health services on the MHealth application. Provider should improve and elaborate service quality in health services available on mHealth. This feature will provide a positive attitude and encourages consumers' continued intention to adopt online health services again. Reliability as one of the dimensions in service quality has the highest score which explains that the reliability of the mHealth application is the main point of interest by consumers. According to that, mHealth service apps need endeavor to improve simplicity accesses of all the health needs. Second, PV as the susceptibility felt by consumers to their health does not strongly affect attitudes and CIA. Third, SN as a consideration of other people have no significant effect on the CIA. The majority of consumers who are healthy teenagers and do not have a history of serious illness, do not consider that susceptibility to disease was a serious influence. In spite of PV and SN havings no significant effect, teenagers had a high continued intention to adopt mHealth. Providers may emphasize and promote the assistance of the application advantages to adjust inattentive attitude of certain individual apropos mHealth.

Limitations and Further Research

The extent of the exploration in this study was simply restricted to the city of Denpasar and Badung Regency, Bali Province, Indonesia. It reveres that the outcomes can't be summed up to different regions. This examination was just directed in a specific time span. Technology has a dynamic improvement so future study is needed in different situation. This research is limited to only assessing SQP, PV, SN, attitudes and CIA

mHealth services. Other limitations of this study were not being able to analyse and examine extensively related factors outside the research. Other affecting factors such as system quality, information quality, perceived severity, satisfaction, response efficacy and response cost need to be considered in the future study.

Conclusion

This study has empirically analyzed the factors affecting CIA mHealth services by focusing on TRA and the integration of two variables form (PMT and SQP). The result revealed that SQP positively affects attitude which turns out to positively influence CIA mHealth. Contrastingly, PV has negatively affected attitude and does not significantly affect CIA mHealth. The SN also has no significant effect to CIA mHealth. This current research is beneficial as we extend new perspective and proceed deepen the understanding of CIA mHealth services.

Acknowledgments

This study was supported by the University of Udayana Bali, Indonesia. The authors deeply appreciate and express recognition to all associate lectures in Management Study Program at faculty of Economics and Business who were associated with the process until the fulfillment of this scientific manuscript.

Conflicts of Interest

The authors have no conflict of interest to disclose.

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