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Determinants of behavioral intention toward telemedicine services among Indonesian Gen-Z and Millenials: a PLS–SEM study on Alodokter application

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Abstract

Telemedicine has become increasingly important in healthcare, especially with the COVID-19 pandemic. Despite, Younger generations are more fluent in using technology, previous study shows that older generations (Gen-X) are more satisfied in using telemedicine compared to younger generations. This study aims to identify the factors influencing user satisfaction and behavioral intention toward Alodokter's telemedicine service application usage among Millennials and Gen-Z in Indonesia. A quantitative cross-sectional study was conducted using a purposive sampling technique. A total of 160 Millenials and Gen-Z respondents who had used the Alodokter telehealth application within the past year were chosen in this study. The data were collected by means of an online questionnaire that was distributed through widely used social media platforms. The questionnaire consisted of 30 questions that assessed variables, such as performance expectancy, effort expectancy, social influence, price value, customer satisfaction, and behavioral intention. Data were analyzed using Partial Least Square–Structural Equation Modeling (PLS–SEM) with SmartPLS software version 3.2.9. The findings reveal that customer satisfaction positively affects behavioral intention. Performance expectancy, effort expectancy, price value, and social influence positively impact customer satisfaction. Price value was shown to have the most positive influence on behavioral intention. This study provides insights into the factors influencing user satisfaction and behavioral intention toward telemedicine service application usage among younger generations in Indonesia. The results can be used to improve telemedicine services and enhance the experience of users, particularly Millennials and Gen-Z.

Keywords: User satisfaction, Behavioral intention, Telemedicine, UTAUT2

Introduction

In 2022, the number of global internet users reached 4.95 billion (penetration of 62.5%), an increase of 192 million from the previous year. This trend is also evident in Indonesia, where the penetration rate is 73.7%, with a total of 204.7 million users. Thanks to the internet, rapid technological advancements have played a crucial role in the development

and growth of various aspects of life, including healthcare, which can enhance individual health status by improving the quality of healthcare services and management (Buntin et al., 2011; Eid, 2011; Kemp, 2022).

In addition to the rapid technological advancements, the COVID-19 pandemic, which has caused drastic changes and resulted in the "contactless society" initiative worldwide, has made the term "telemedicine" increasingly popular among people (Byun & Park, 2021; Wang et al., 2020). In a survey conducted by McKinsey in the United States in 2021, 46% of respondents switched to online consultations (telemedicine) compared to face-to-face consultations (Bestsennyy et al., 2021). The use of technology, including telemedicine, which has increased over the last few decades, is more preferred by younger generations (Millennials, Gen Z, and Gen X) than older ones (American Hospital Association, 2021; Vogt et al., 2022). Alodokter, which is one of the pioneering telemedicine applications in Indonesia since 2014, still ranks second as the most widely used healthcare application among urban people after Halodoc. Halodoc is the most popular application, chosen by at least 45.3% of respondents, compared to Alodokter, which is chosen by 32.3% of respondents (Pusparisa, 2019; Sari, 2021).

Several studies have examined the intention to use or behavior in using telemedicine services using the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) technology acceptance model (Baudier et al., 2021; Byun & Park, 2021; Martins et al., 2021; Melinda & Setiawati, 2022; Suroso & Sukmoro, 2021). In research conducted by Baudier et al. (Baudier et al., 2021) and Suroso and Sukmoro (2021), both eliminated the hedonic motivation and price value variables, because they were considered not suitable for the research. However, in their model, Byun and Park (Byun & Park, 2021) found that the price value factor has a positive influence on technology acceptance. Furthermore, research by Melinda and Setiawati (Melinda & Setiawati, 2022) included all seven UTAUT2 variables and found that factors influencing behavioral intention were price value, habit, facilitating condition, and effort expectancy.

Despite many studies that have evaluated technology acceptance using the UTAUT2 model, studies exploring user or customer satisfaction using this model are still rare, and there is no standard model regarding satisfaction predictors (Kalinić et al., 2019). However, satisfaction variables are essential in determining user behavior toward a technology. When users are satisfied with an information system, they tend to return the appropriate value to the information system service provider (Kim & Son, 2009). Previous research has linked UTAUT predictor variables with satisfaction variables in the field of m-Commerce and m-Health use (Kalinić et al., 2019; Lee et al., 2021). However, the model used in the acceptance of m-Health use only relates to predictor variables in UTAUT, not UTAUT2.

Considering the high number of telemedicine users from younger generations, Alhajri et al. (2022) found that patients from Generation X—those born between 1960 and 1980—are the most satisfied with telemedicine, even though Millennials and Gen Z are generations that heavily rely on technology platforms and social media to communicate and fulfill their needs (Alhajri et al., 2022; Ng et al., 2010). Furthermore, a study on the acceptance of telemedicine in Indonesia found that most Gen Z respondents were not affected by facilitating conditions, possibly because Gen Z is self-taught through the internet (Alexandra et al., 2021; Rettig & Rina, 2020). Gen Z has also been found to face

financial challenges which may affect their decision-making in using commercially available telemedicine services (Ozkan & Solmaz, 2015). This research aims to explore the factors influencing behavioral intention mediated by customer satisfaction among young adults (Gen Z and Millennials) in using Alodokter telemedicine services.

This study contributes to existing knowledge by examining factors influencing young adults' (Gen Z and Millennials) behavioral intention and satisfaction when using Alodokter telehealth services. While numerous studies have evaluated technology acceptance using the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model, little research has focused on user satisfaction within this framework. This study fills a gap in the literature and provides valuable insight into the adoption and use of telehealth services by examining the relationship between technology acceptance factors and user satisfaction. In addition, this study extends the applicability of the UTAUT2 model to the context of telemedicine and contributes to a more comprehensive understanding of users' attitudes and intentions in the area of health technology.

To provide a coherent and informative presentation of the study, the overall structure of this paper follows a comprehensive framework in addition to the aforementioned sections. This paper begins by exploring the theoretical and empirical foundations related to study. Following this, hypotheses and the research model are developed based on the insights gained from the previous literature. The next section presents the methodology, which includes the research design, sampling, data collection procedures, operational definitions of variables and the chosen data analysis technique. In the results section, the findings obtained through the analysis are presented, followed by a detailed discussion of the results. The article then concludes with a section summarizing the main conclusions of the study and their implications for both theory and practice. In addition, this article critically discusses the limitations encountered during the research and offers recommendations for future research to address these limitations.

Literature review

For over decades, healthcare practitioners, health researchers, and others have been continuously searching for and innovating the use of cutting-edge telecommunications and computer technology to improve healthcare services. One result of these efforts is telemedicine, which is defined as the use of information and electronic communication technology to provide and support healthcare when distance separates participants. Many efforts have been made, ranging from communication through telephone to video conferences, enabling doctors to see, hear, examine, interview, and advise distant patients for diagnostic and therapeutic purposes directly or in real-time (Institute of Medicine (US) Committee on Evaluating Clinical Applications of Telemedicine, 1996).

Since the COVID-19 pandemic, the term telemedicine has become more popular among the public. This is due to the pandemic requiring people to implement social distancing or maintaining distance to reduce the transmission of the highly contagious COVID-19 virus through direct contact (Wang et al., 2020). In response to this, both the government and private companies in Indonesia have joined forces to develop telemedicine services to address COVID-19 (Gandhawangi, 2021). One of the companies that has played a role in this is Alodokter.

Despite numerous studies on the adoption or acceptance of telemedicine using the UTAUT2 model, there are limited studies that explore user satisfaction with telemedicine (Lee et al., 2021; Tiara & Antonio, 2022; Wijaya & Wardani, 2022). In the two studies, the original TAM model was used for analysis, while Lee et al. (2021) employed the UTAUT model. On the other hand, technology acceptance theories have developed well, with many important theories and models presented, including the theory of planned behavior (TPB), the diffusion of innovation (DOI), the technology acceptance model (TAM), and the unified theory of acceptance and use of technology (UTAUT). Although initially developed for use in organizational contexts (Venkatesh et al., 2003), UTAUT is considered the most comprehensive theory of technology acceptance and use in various contexts. UTAUT initially emerged as a method to explain predictors of adoption and use of information and communication technology by employees in specific contexts, but it has since been successfully implemented in various studies on the adoption of services and specific applications by organizations and consumers (Sheikh et al., 2017). To adapt UTAUT to the context of consumer use, Venkatesh et al. (2012) expanded it by adding three additional contextual variables, namely, hedonic motivation, price value, and habit, thus creating the UTAUT2 model. UTAUT2 model is considered comprehensive and provides better explanations of technology acceptance compared to other technology adoption models (Macedo, 2017). This model has been successfully tested in the context of online shopping acceptance (Tandon et al., 2017), m-commerce (Chopdar et al., 2018), internet banking (Alalwan et al., 2018), mobile applications (Gupta et al., 2018), mobile social networking games (Baabdullah, 2018), m-health (Dwivedi et al., 2016), and telemedicine (Baudier et al., 2021; Byun & Park, 2021; Martins et al., 2021; Melinda & Setiawati, 2022; Suroso & Sukmoro, 2021).

Although there have been numerous studies that evaluate technology acceptance using the UTAUT2 model, studies that explore user satisfaction using this model are still limited, and there is no standard model for predicting satisfaction (Kalinić et al., 2019). While TAM provides insight into the cognitive processes underlying technology acceptance and customer satisfaction index (CSI) offers a comprehensive approach to measuring customer satisfaction, the UTAUT has the most comprehensive understanding and model, because it combines eight pre-existing theories and models of technology acceptance, including TAM (Lee & Kim, 2022; Venkatesh et al., 2003, 2012). UTAUT is one of the most widely used models in the acceptance of technology or information systems (Dwivedi et al., 2020). UTAUT originally stated that four independent variables directly influence behavioral intention (Venkatesh et al., 2003). However, it is argued that information system users' cognitive and affective perceptions first form an attitude toward the information system and then affect behavioral intention based on the TPB in UTAUT(Ajzen, 2002; Lee & Kim, 2022). Thus, it can be reasonably concluded that the independent variables affect the attitude of information system users and influence behavioral intention (Lee & Kim, 2022). Several previous studies also confirm that there is an effect of attitude on behavioral intention, which contradicts the opinion of Venkatesh et al. where the effect of attitude on behavioral intention is spurious (Jairak et al., 2009; Nassuora, 2013; Thomas et al., 2013). Satisfaction with the use of information systems is one of the most commonly used attitude variables (Bhattacherjee, 2001; Lee & Kim, 2022).

In their study titled "Determinants Impacting User Behavior toward Emergency Use Intentions of m-Health Services in Taiwan," Lee et al. (2021) used the original UTAUT model adapted to the context of user satisfaction. Furthermore, Kalinic et al. (2019) were the first to adopt UTAUT2 and adapt it to the context of customer satisfaction in m-commerce. The integration of the UTAUT2 adoption model with customer satisfaction in the context of telemedicine is still lacking. However, the three additional variables in UTAUT2 provide a comprehensive understanding of a customer's use of information systems or technology.

Based on previous research on UTAUT2 and telemedicine, Baudier et al. (2021) and Suroso and Sukmoro (2021) did not include hedonic motivation and price value (PV) variables in their studies, stating that they were not relevant to their research. However, Melinda and Setiawati (2022) and Byun and Park (2021) found that price value factor has a positive influence on technology acceptance. This can be assumed due to the fact that during the COVID-19 pandemic, telemedicine services were provided for free by the government, but considering the current situation where telemedicine services are becoming paid and there are many complaints about pricing (play.google.com, 2022), it is important to include this variable in this study. On the other hand, hedonic motivation and habit variables were not included, as the individual level of technological support is not expected to significantly influence or delay consumer's use of telemedicine (Byun & Park, 2021). In the context of telemedicine services offered for healthcare, consumers' intention to use it is not routine but rather depends on the unique healthcare needs of each individual (depending on their health condition) (Lee et al., 2021). Moreover, considering the critical characteristics of medical care directly related to human health and the situational characteristics of the commercialization stage of telemedicine, these two variables were not included. Furthermore, a study on telemedicine acceptance among Generation Z respondents in Indonesia found that facilitating conditions did not influence their acceptance, which could be due to Gen Z's tendency to learn everything independently through the internet (Alexandra et al., 2021; Rettig & Rina, 2020).

Hypothesis development and research model

This study aims to investigate the factors influencing user satisfaction and behavioral intention (BI) of telemedicine services among Gen-Z and Millennials user in Indonesia. Based on the review above, modified UTAUT2 model was selected as the basis conceptualized framework by adding user satisfaction dimension to it. Therefore, four main factors, namely, performance expectancy (PE), effort expectancy (EE), social influence (SI), and price value (PV), were selected to influence user satisfaction affecting BI. The factor facilitating conditions, habit, and hedonic motivation were not included as mentioned before.

In the context of telemedicine, PE refers to the perceived effectiveness of telemedicine services among users. Therefore, if users perceive telemedicine services as effective in improving their healthcare experience, they are likely to be satisfied with the service, which will influence their intention to use it. Research has found that PE significantly influences user satisfaction in the use of m-Health (Lee et al., 2021) and m-commerce (Kalinić et al., 2019).

PE is often associated with perceived usefulness (PU) in the TAM and is a strong predictor of technology acceptance (Venkatesh et al., 2003). An et al. (2021) conducted a study on factors affecting the use of telehealth using the TAM model and found that perceived usefulness has a significant positive impact on attitudes toward telehealth. In this study, positive attitude includes satisfaction and high favourability. In addition, the significant positive impact of PU on customer satisfaction has been confirmed in cases of m-commerce (Marinkovic & Kalinic, 2017), mobile social applications (Hsiao et al., 2016), mobile services (Lee et al., 2015), m-banking (Susanto et al., 2016), and mobile websites (Zhou, 2011). Based on the description above, the following hypotheses can be proposed:

Hypothesis 1 (H1). Performance expectancy positively influence user satisfaction in Generation Z and Millennials.

Although some research has found that effort expectancy does not significantly affect user satisfaction (Kalinić et al., 2019; Lee et al., 2021), effort expectancy, which is often equated with perceived ease of use (PEU) in the TAM model, has been found to have a significant positive influence on customer satisfaction in telemedicine research (An et al., 2021; Yan et al., 2021). Furthermore, in other studies, it has been found that PEU significantly affects customer satisfaction in mobile application services (Lee et al., 2015) and mobile websites (Zhou, 2011). Based on the descriptions provided, the following hypothesis can be formulated:

Hypothesis 2 (H2). Effort expectancy positively influence user satisfaction Generation Z and Millennials.

Social influence is one of the predictors commonly found in research on technology acceptance and use. Although social influence does not significantly affect user satisfaction in some studies on m-health (Lee et al., 2021) and m-commerce (Kalinić et al., 2019), several previous studies examining the influence of social environment on customer satisfaction have obtained significant results, such as in the use of mobile social apps (Hsiao et al., 2016), online life insurance purchase (Viswanathan et al., 2020), and social commerce websites (Beyari & Abareshi, 2018). Considering that reviews from others can also influence the intention to use an application, the following hypothesis can be formulated:

Hypothesis 3 (H3). Social influence positively influence user satisfaction Generation Z and Millennials.

In this study, considering that the current telemedicine service applications are paid, it can be assumed that the perceived value ratio of the telemedicine service in relation to the monetary cost incurred to use the service affects customer satisfaction. Kalinic et al. (2019) and Lin and Wang (2006) found that perceived value in m-commerce significantly affects customer satisfaction. Additionally, previous research has found that perceived value in the monetary context influences customer satisfaction in the

use of mobile social tourism (Kim et al., 2013) and mobile services (Kuo et al., 2009). Based on the descriptions provided, the following hypothesis can be formulated:

Hypothesis 4 (H4). *Price value positively influence user satisfaction* Generation Z and Millennials.

Customer satisfaction greatly reflects the customer's assessment of a particular service or product (Tandon et al., 2017). Customer satisfaction is usually a key driver in a customer's attitude toward the continued use of a technology or system (Marinkovic & Kalinic, 2017). Lin and Wang (2006) found that customer satisfaction affects customer loyalty in m-commerce usage, while Kalinic et al. (2019) found that customer satisfaction influences commitment to continued use in m-commerce. In the context of medical services and m-Health, Lee et al. (2021) and Barutçu et al. (2018) found that user satisfaction with m-Health has a positive influence on intention to use m-Health services. Based on the descriptions provided, the following hypothesis can be formulated:

Hypothesis 5 (H5). User *satisfactions positively influence* behavioral *intention* Generation Z and.

Figure 1 visualizes the relationship between variables that make up research model. Each hypothesis is assigned to Fig. 1.

Methods

Research design

The research was conducted using a quantitative study method with a cross-sectional approach. The objective of this study is to test and analyze the factors influencing user satisfaction toward behavioral intention of Gen-Z and Millennials on the Alodokter telemedicine application. There are a total of 6 variables involved in this study, with the

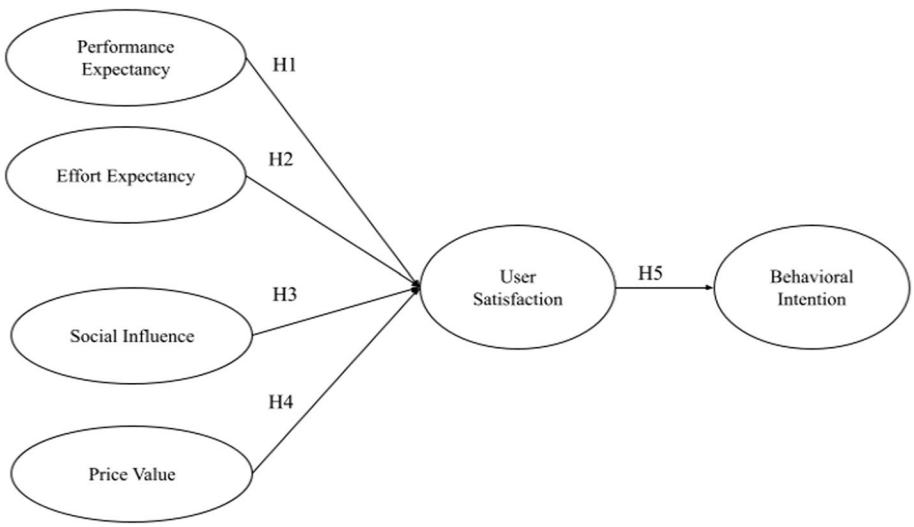

Fig. 1 Research model showing factors influencing behavioral intention mediated by customer satisfaction. *H1* Hypothesis 1, *H2* Hypothesis 2, *H3* Hypothesis 3, *H4* Hypothesis 4

independent variables being performance expectancy, effort expectancy, social influence, and price value. The dependent variable in this study is behavioral intention with user satisfaction as the mediating variable.

Sampling and data collection

While probability sampling is considered ideal in research, many studies in social science research actually rely on non-probability sampling (Rowley, 2014). Non-probability sampling involves purposive selection, chance, or expert judgment, where individuals' chances of being selected are unknown (Burns et al., 2008). Non-probability sampling is more common and appropriate in field research, especially studies involving human subjects (Bryman & Bell, 2015). Carefully controlled non-probability sampling can produce valid and meaningful results (Schindler, 2011). The choice between probability and non-probability sampling does not determine the quality of the research (Memon et al., 2017). Probability sampling is ideal for generalizability sampling, but if the goal is rigorous theory testing, non-probability sampling is more appropriate (Calder et al., 1981; Hulland et al., 2018). In social science studies, it is extension of knowledge and generalization of theory that is important, not generalization of sampling (Memon et al., 2017). Probability sampling techniques require a sampling frame, which is a complete list of all subjects in the target population. However, obtaining a sampling frame and achieving a 100% response rate can be challenging, especially in studies involving diverse and dispersed populations such as in Indonesia (It is easy to compromise the underlying assumptions of probability sampling by giving each subject an equal chance in a large geographic area with uneven Internet penetration.). Non-probability sampling is appropriate when the choice of sampling strategy is consistent with the research objectives, the goal is to generalize theory, and a complete sampling frame is not available (Hulland et al., 2018; Memon et al., 2017; Rowley, 2014). As this study is concerned with testing the theoretical framework from a predictive perspective and aims to extend existing theories or models, a purposive sampling method was selected.

In this study, Millennial and Gen-Z consumers who have used telemedicine applications in Indonesia within the past year were selected as the population. Sampling was done purposively during November 2022. Respondents remained anonymous and voluntary, with their data confidentiality assured through consent. The researcher has conducted peer reviews by experts and obtained approval from the Marketing Division, Department of Management, Universitas Pelita Harapan.

An online questionnaire was used to collect quantitative data, which aimed to measure the constructs in the previously outlined model. The questionnaire was developed based on indicators obtained from relevant journals, books, and other information. It was translated into Bahasa Indonesia and reviewed by experts in the field of health marketing to ensure accuracy and comprehensibility. A total of 30 questions were obtained from various literature and rephrased. Each indicator was assessed using a 5-point Likert scale to indicate agreement, ranging from 1 (strongly disagree) to 5 (strongly agree).

Prior to the main study, the questionnaire underwent a pilot test among the public with feedback to improve question items and the overall questionnaire. The pretest sample was excluded from the main study. The questionnaire was adapted from previous literature and studies (Byun & Park, 2021; Kalinić et al., 2019; Lee et al., 2021; Venkatesh et al., 2003, 2012) and modified for the purpose of novelty and understanding concepts.

Table 1 Demographic characteristics

No	Demographic characteristics	Sample (*n*)	Percentage (%)
1	Gender		
	Male	84	52.5
	Female	76	47.5
2	Age		
	17–25 years (Gen Z)	40	25
	26–41 years (Millennials)	120	75
3	Current Residence		
	DKI Jakarta	83	51.9
	Java Island other than DKI Jakarta	48	30
	Other areas	25	18.1
4	Income		
	< Rp. 4.500.000	45	28.1
	Rp. 4.500.000–Rp. 10.000.000	75	46.9
	> Rp. 10.000.000	40	25
5	Education		
	High School (SMP/SMA)	46	28.8
	Diploma (D3)	5	3.1
	Bachelor's degree (S1)	91	56,9
	Post-graduate (S2)	18	11.2
6	Occupation		
	Private sector employee	89	55.6
	Student	19	11.9
	Civil servant	26	16.2
	Self-employed	17	10.6
	Labor	4	2.5
	Others	5	3.2

An online questionnaire was created using Google Forms. It was then distributed through the most widely used social media platforms in Indonesia such as WhatsApp, Line, Facebook, and Instagram. Either groups or individuals belonging to the Gen-Z and Millennial age categories were used to distribute the questionnaire. Some of the eligibility criteria for filler participants were: (1) aged over 17, (2) having used the Alodokter telehealth application, (3) being Indonesian citizens. The exclusion criteria were those who did not fill out the questionnaire in its entirety.

A total of 317 individuals participated in this study. From these data, 160 respondents will be analyzed as they are the ones who have used the Alodokter telemedicine application within the past year. This sample size meets the minimum criteria for analysis using Partial Least Square-Structural Equation Modelling (PLS–SEM) (Hair et al., 2012; Memon et al., 2020). Table 1 shows demographic characteristics of the respondents.

Operational definition of variables

In this study, performance expectancy, effort expectancy, social influence, and price value have been chosen as the main indicators influencing behavioral intention in the use of Alodokter telemedicine, with user satisfaction as a mediating variable. Table 2 presents operational definitions of these variables are presented.

Table 2 Operational definitions of construct variables

Variable	Operational definitions	References
Performance expectancy	The level of perceived influence of using Alodokter telemedicine services in achieving the expected goals	(Byun & Park, 2021; Kalinić et al., 2019; Lee et al., 2021; Venkatesh et al., 2003, 2012)
Effort expectancy	The level of perceived ease of use of Alodokter telemedicine services	(Byun & Park, 2021; Kalinić et al., 2019; Lee et al., 2021; Venkatesh et al., 2003, 2012)
Social influence	The level of perception of how much an individual feels that others, whom they consider important, believe they should use Alodokter telemedicine services	(Byun & Park, 2021; Kalinić et al., 2019; Lee et al., 2021; Venkatesh et al., 2012)
Price value	The level of satisfaction in using Alodokter telemedicine services compared to the price to be paid	(Byun & Park, 2021; Kalinić et al., 2019; Venkatesh et al., 2012)
User satisfaction	Feelings of pleasure or disappointment regarding the comparison between expectations and performance outcomes of Alodokter telemedicine services	(Kalinić et al., 2019; Lee et al., 2021)
Behavioral intention	Intention or plan to use Alodokter telemedicine services currently or in the future	(Byun & Park, 2021; Lee et al., 2021; Venkatesh et al., 2003, 2012)

Data analysis

The analysis in this study uses PLS–SEM as it is suitable for explanatory research (Hair et al., 2019). In addition to examining the behavioral intention of Gen-Z and Millennials toward telemedicine service, this study explores theoretical or knowledge extensions of existing established theories that are preferable for PLS–SEM analysis (Hair et al., 2019; Memon et al., 2017). Because PLS–SEM shows the direct and indirect effects of independent variables, it is considered superior to regression analysis, and it also provides less contradictory results in the detection of mediation effect (Ramli et al., 2018). PLS–SEM facilitates both modes (regression and correlation weights) in the measurement model more efficiently (Hair et al., 2019). PLS–SEM is able to deal with complex structural cause and effect models with a large number of constructs and indicators (Richter et al., 2016; Rigdon, 2012). PLS–SEM eliminates some of the assumptions of ordinary least squares regression, like the data must have a normal multivariate distribution and the absence of multicollinearity problem between exogenous variables (Ramayah et al., 2017). Data characteristics, such as small sample size and non-normal data, are another reason for choosing PLS–SEM analysis in this study (Hair et al., 2019).

PLS–SEM analysis is conducted using SmartPLS software version 3.2.9 on MacOS (Ringle et al., 2015). From the results of the PLS–SEM testing, two models are obtained, namely, the outer model and the inner model. The outer model, or measurement model, tests the reliability and validity of the indicators of the variable constructs. Reliability testing is done through indicator assessment (outer loading), and construct reliability is assessed using Cronbach's alpha and composite reliability. Validity testing is done through construct validity (average variance extracted) and discriminant validity through heterotrait/monotrait ratio. After fulfilling the reliability and validity tests, the next step is to conduct the structural analysis or inner model analysis.

The inner model is the structural model that displays the relationships between the constructs and their influences on each other, in this case, testing the hypotheses of each relationship. Testing is done using the parameter value of $p < 0.05$ with a t-statistic value > 1.645.

Results

The first result of data processing using SmartPLS software version 3.2.9 on MacOS is the outer model measurement result. Here, validity and reliability testing will be conducted. In assessing convergent validity, besides looking at the average variance extracted (AVE) value ≥ 0.50, the outer loadings should also be considered, which should be ≥ 0.708 (Hair et al., 2019) If there are indicators with outer loadings below this threshold, it can be considered whether removing those indicators can improve the reliability and validity values (both convergent and discriminant).

Next, reliability testing is conducted through Cronbach's Alpha and composite reliability values. These values need to be evaluated if they are above 0.70 or not. The upper limit commonly used as a criterion is composite reliability, while the lower limit is Cronbach's Alpha. If both have values > 0.70, it can be said that the variables in this study are reliable with the assumption that the model is correct (Hair et al., 2019). However, it should be noted that the values should not exceed 0.95 as it may cause redundancy. Table 3 enlists reliability and convergent validity analysis are presented.

All constructs in the study have AVE values above 0.5, indicating that each construct can explain at least 50% of the variance of each item in the model. In addition, all indicators also have reliability values above 0.7 and do not exceed the upper limit of 0.95, indicating that the reliability of the constructs is acceptable (see Table 3).

Another step is to measure discriminant validity. Discriminant validity can be tested using the Fornell–Larcker criterion, but Henseler et al. (2015) showed that the Fornell–Larcker criterion performs poorly, especially when the indicator loadings on a construct are only slightly different. Instead, Henseler proposed the heterotrait–monotrait (HTMT) correlation ratio (Hair et al., 2019). Accepted HTMT values are below 0.90, indicating that a construct has specific discriminated indicators (Hair et al., 2019; Henseler et al., 2015).

Table 4 shows how the model meets the criteria for discriminant validity testing. In this study, all values below 0.9 indicate that the model discriminates well in assessing each construct.The evaluation of the structural model is done by checking for multicollinearity to determine the possibility of relationships between the independent variables within a model. This can be seen through the analysis of Variance Inflation Factor (VIF) values. The criteria for VIF values are below 5.0, but it is recommended to be below 3.0 to ensure there are no issues with multicollinearity (Hair et al., 2019). In this model, all VIF values are below 3.0.

The R-Square values for BI and SAT are 0.554 and 0.678, respectively, indicating that 55.4% of the variance in behavioral intention can be explained by user satisfaction, while 67.8% of the variance in user satisfaction can be explained by performance expectancy, effort expectancy, social influence, and price value. This indicates that both models have

Table 3 Evaluation of measurement model test results

Variables	Items	Outer Loadings	Cronbach's α	Composite Reliability	Average Variance Extracted (AVE)
Performance expectancy	PE1	0.778	0.834	0.883	0.603
	PE2	0.701			
	PE3	0.808			
	PE4	0.788			
	PE5	0.802			
Effort expectancy	EE1	0.847	0.831	0.881	0.599
	EE2	0.711			
	EE3	0.759			
	EE4	0.811			
	EE5	0.733			
Social influence	SI1	0.828	0.892	0.920	0.698
	SI2	0.865			
	SI3	0.792			
	SI4	0.886			
	SI5	0.802			
Price value	PV1	0.728	0.814	0.869	0.571
	PV2	0.782			
	PV3	0.792			
	PV4	0.718			
	PV5	0.754			
User satisfaction	SAT1	0.751	0.850	0.893	0.626
	SAT2	0.816			
	SAT3	0.730			
	SAT4	0.797			
	SAT5	0.857			
Behavioral intention	BI1	0.715	0.827	0.878	0.590
	BI2	0.745			
	BI3	0.848			
	BI4	0.808			
	BI5	0.715			

PE Performance expectancy, *EE* Effort expectancy, *SI* Social influence, *PV* Price value, *SAT* User satisfaction, *BI* Behavioral intention

Table 4 Discriminant validity

	BI	EE	PE	PV	SAT	SI
BI						
EE	0.649					
PE	0.627	0.799				
PV	0.696	0.555	0.553			
SAT	0.870	0.819	0.803	0.781		
SI	0.709	0.368	0.468	0,0.454	0.537	

BI Behavioral intention, *EE* Effort expectancy, *PE* Performance expectancy, *PV* Price value, *SAT* User satisfaction, *SI* Social influence

Table 5 Hypothesis test result

Hypothesis	Path	Standardized path coefficient	*p*-Values*	*t*-Statistics	Results
H1	Performance Expectancy → User Satisfaction	0.250	0.000	3.629	Supported
H2	Effort Expectancy → User Satisfaction	0.320	0.000	4.915	Supported
H3	Social Influence → User Satisfaction	0.123	0.009	2.385	Supported
H4	Price Value → User Satisfaction	0.346	0.000	4.611	Supported
H5	User Satisfaction → Behavioral Intention	0.744	0.000	17.430	Supported

*Sig. at $p \leq 0.05$. *H1* Hypothesis 1, *H2* Hypothesis 2, *H3* Hypothesis 3, *H4* Hypothesis 4

Table 6 Specific indirect effect

Path	Standardized path Coefficient	*p*-values*
Performance Expectancy → User Satisfaction → Behavioral Intention	0.238	0.000
Effort Expectancy → User Satisfaction → Behavioral Intention	0.186	0.000
Price Value → User Satisfaction → Behavioral Intention	0.258	0.000
Social Influence → User Satisfaction → Behavioral Intention	0.093	0.009

*Sig. at $p \leq 0.05$

moderate strength of predictive accuracy. Another test, Q^2_Predict was also measured to know the predictive relevance on the variable. The Q^2_Predict value on user satisfaction (0.647) shows large predictive relevance, while on behavioral intention (0.469) shows medium predictive relevance.

Table 5 compiles the results of hypothesis testing using bootstrapping feature in SmartPLS, it informs that all hypotheses are supported, indicating a significant positive influence between the variables being tested. This can be seen from all the positive path coefficient values, p value < 0.05, and t-statistic values above 1.645.

We can observe in Table 6 that the independent variables are mediated by the customer satisfaction variable toward the dependent variable. Table 6 reflects that the four independent variables, namely, performance expectancy, effort expectancy, social influence, and price value, are mediated by the customer satisfaction variable in influencing the independent variable of behavioral intention, as they meet the significance criteria with a p value < 0.05 and t-statistic value < 1.645.

From the hypothesis testing, it can be found that social influence has the smallest path coefficient (0.123), therefore SI has small effect on satisfaction compared to price value (0.346) which affect the most. Figure 2 displays the results of the PLS–SEM analysis with standardized path coefficients. From these results, it can be stated that the proposed model has the capability to depict the factors that influence telemedicine behavioral intention.

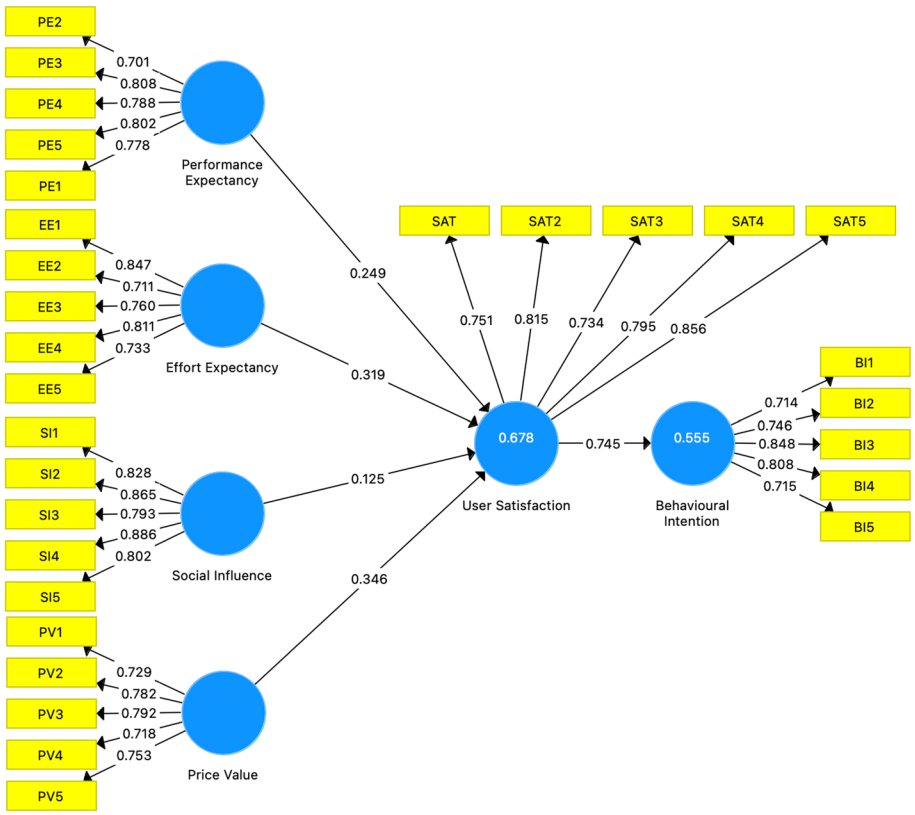

Fig. 2 Result model. Arrows toward the yellow box indicates outer loadings, while arrows pointing on the blue circle represent standardize coefficient effect. R^2 was shown inside the blue circle

Discussion

This study discusses the factors that influence customer satisfaction as a mediating variable for the intention to use the Alodokter telemedicine service application. Based on the demographic data presented in the results section, although the number of male Alodokter users is higher than female users, when it comes to telemedicine usage, females outnumber males. This is consistent with the findings of Darrat et al. (2021), which showed that females prefer virtual visits compared to males. Additionally, they found that older patients, patients with low income, and patients with low education are less likely to engage in virtual visits, including telehealth or telemedicine that utilizes remote communication instead of face-to-face consultations. This is in line with the demographic data in this study, where the majority of telemedicine users have at least a bachelor's degree and a middle to high income.

The results of the above analysis have successfully demonstrated that performance expectancy has a positive influence on customer satisfaction with the Alodokter telemedicine service application. This is in line with previous studies (Hsiao et al., 2016; Kalinić et al., 2019; Lee et al., 2021; Marinkovic & Kalinic, 2017) that found performance expectations to be positively correlated with customer satisfaction. This indicates that users have high expectations or expectations of Alodokter in providing existing services, and users are satisfied with it. This may be due to users who need medical treatment when they are unable to visit health facilities and are able to receive optimal treatment from Alodokter.

Furthermore, a positive relationship was found between effort expectancy and the intention to use the telemedicine service application. This is consistent with several previous studies (An et al., 2021; Lee et al., 2015; Yan et al., 2021; Zhou, 2011). Although there are studies that found no positive effect of effort expectancy on behavioral intention (Kalinić et al., 2019; Lee et al., 2021), this may be due to the fact that the studies were conducted in developed countries where mobile applications are no longer seen as innovative services but rather a part of daily life, where business and payments are all done using mobile applications, not just for entertainment purposes. However, the current study was conducted in a developing country, Indonesia.

The results of the analysis above have successfully proven that performance expectancy has a positive influence on user satisfaction with the Alodokter telemedicine service application. This is consistent with previous studies (Hsiao et al., 2016; Kalinić et al., 2019; Lee et al., 2021; Marinkovic & Kalinic, 2017) that found performance expectancy to have an impact on customer satisfaction. This indicates that users have high expectations of Alodokter telemedicine in providing the existing services and users are satisfied with it. This may be due to users who need medical treatment when they cannot visit health facilities and receive optimal treatment from Alodokter.

Positive influence was also found in the relationship between social influence and user satisfaction. This is consistent with previous research (Beyari & Abareshi, 2018; Hsiao et al., 2016; Viswanathan et al., 2020). Although there are studies that found no positive relationship between the two (Kalinić et al., 2019; Lee et al., 2021), this may be due to, as explained earlier, users' habits toward mobile services that allow individuals to determine the benefits and uses regardless of their environment. However, in this study the social influence variable has the smallest effect on satisfaction compared to other variables.

Price value was found to have the greatest positive influence on behavioral intention to use the telemedicine application. This finding is consistent with previous research (Kalinić et al., 2019; Kim et al., 2013; Kuo et al., 2009; Lin & Wang, 2006). This implies that the monetary value or price offered by the Alodokter telemedicine service has an impact on customer satisfaction. Although the average income is middle to high, this may be due to concerns about the financial ability or issues of the young adult population, especially Gen-Z that usually feel anxious about their financial (Ozkan & Solmaz, 2015). A study conducted among the Gen Z population found that financial attitude has a significant impact on financial happiness, indicating that they need to have a positive financial attitude in order to effectively address financial difficulties. This speaks to how they manage their finances, including healthcare spending nabila (Nabila et al., 2023).

Lastly, it was found that customer satisfaction has a positive influence on behavioral intention to use. This is in line with previous research (Barutçu et al., 2018; Kalinić et al., 2019; Lee et al., 2021). Moreover, customer satisfaction has a potential effect on usage behavioral intention with a path coefficient of 0.745. Therefore, it is crucial to improve customer satisfaction among the young adult population to enhance the intention to use the Alodokter telemedicine application.

The model used in this research has shown good predictive accuracy and predictive relevance, allowing for accurate prediction of customer satisfaction and behavioral

intention to use telemedicine applications. The study also found that price value has the greatest influence on young adult users, who may still experience financial instability. This may explain why Gen-X users are more satisfied with using telemedicine services.

Theoretical implications

The theoretical implications of this study lie in the confirmation and extension of the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model. By examining the factors that influence young adults' behavioral intention to use the Alodokter telemedicine service, this study validates the positive effects of performance expectancy, effort expectancy, social influence, and price value on behavioral intention, with user satisfaction serving as the mediating variable. These findings contribute to the existing literature by providing empirical evidence in the context of telemedicine applications.

Managerial implications

Managerial implications of this study highlight the importance of understanding and addressing the factors that influence customer satisfaction and behavioral intention in the telemedicine industry, particularly among young adults. First, service providers should focus on increasing performance expectancy by meeting users' high expectations and providing optimal telemedicine services. Effort expectancy should also be emphasized by ensuring that the application is user-friendly, intuitive, and easily accessible. Social influence, while having a smaller impact on satisfaction, can still be leveraged by encouraging positive word-of-mouth and testimonials from satisfied users. The most important managerial implication, however, is to recognize the influence of price value on behavioral intention. Providers should consider implementing pricing strategies that align with the financial concerns and expectations of the target demographic, particularly Gen-Z and Millennials. By addressing these theoretical and managerial implications, telehealth service providers can improve customer satisfaction, enhance the user experience, and increase usage and adoption among young adults.

Limitations, recommendations, and future research

This study was conducted at a single point in time, while users' perceptions of using telemedicine service may change over time as new experiences are gained and the pandemic situation changes. Future studies could use a longitudinal design to obtain more accurate results from a specific group. In addition, this study only collected data in one country. Cross-cultural research would allow attitudes from different nations to be compared. Further research with a larger sample size is recommended to be conduct considering the limitations of the number respondents obtained. Since this study mainly focused on variables in the UTAUT2 model, we suggest that future research could explore other variables and the use of other models to provide additional perspectives on user satisfaction in the context of telehealth applications, such as TAM and CSI that encompasses multiple dimensions and factors beyond the scope of UTAUT2. By applying these alternative frameworks, researchers can further the understanding of telemedicine service's user satisfaction and identify unique predictors and determinants, ultimately improving overall user experience and engagement. Given that price value has the most significant impact on behavioral intention, future studies exploring influence of financial attitude in

telemedicine usage behavior among Millennials and Gen Z may be conducted. The findings on this research can also be applied to the telemedicine in general.

Conclusions

This study investigates factors influencing behaviotal intention with user satisfaction as mediating factor. The model focuses on factors in UTAUT2 model that exceptionally influence the variables. We conclude that:

- The positive influence of performance expectancy, effort expectancy, social influence, and price value on Gen-Z and Millennials' behavioral intention in using Alodokter Telemedicine was found to be mediated by user satisfaction in this study.
- The enhancement of customer satisfaction through performance expectancy, effort expectancy, social influence, and price value is crucial in young adults' behavior of using Alodokter telemedicine, considering the increase demand of telemedicine usage since the COVID-19 pandemic.
- The results indicate that most respondents are satisfied with the Alodokter telemedicine service.
- Price value shows to have the most positive influence on Gen-Z and Millennials user satisfaction. This may be explored in further research since the commercialization of telemedicine usage is rising.

We foresee those suggested findings from this study might aid the improvement of commercialization telemedicine usage among younger adults.

Appendix 1. Variables and measurements

	Performance expectancy	**Response options**				
		1	**2**	**3**	**4**	**5**
1	Using Alodokter telemedicine service application is useful in my daily life					
2	Using Alodokter telemedicine service application makes me get health services faster					
3	Using Alodokter telemedicine service application increases the opportunity to achieve things that are very important to me					
4	Using Alodokter telemedicine service application improves my ability to manage my daily health					
5	Using Alodokter telemedicine service application improves my health					
	Effort expectancy					
1	Easy for me to operate the Alodokter telemedicine service application					
2	Learning how to use the Alodokter telemedicine service application is easy for me					
3	My interaction of using the Alodokter telemedicine service application is clear					
4	My interaction of using the Alodokter telemedicine service application is easy to understand					
5	It is easy for me to get the skill to use the Alodokter telemedicine service application					

	Performance expectancy	Response options				
		1	2	3	4	5
	Social influence					
1	People who are important to me think that I should use the Alodokter telemedicine service application					
2	People around me who use the Alodokter telemedicine service application look more prestigious than those who do not					
3	According to my colleagues, I must use the Alodokter telemedicine service application					
4	People whose opinions that I value prefer that I use the Alodokter telemedicine service application					
5	Most people around me use Alodokter telemedicine service application					
	Price value					
1	The Alodokter's telemedicine service has a reasonable price					
2	The Alodokter's telemedicine services is a good value for money					
3	At the current price, Alodokter's telemedicine services provides a good value for money					
4	The price of Alodokter's telemedicine service suits me					
5	Regardless of the price offered, Alodokter's telemedicine services is always good					
	User satisfaction					
1	The Alodokter telemedicine service application fulfills my expectations					
2	I am satisfied with the Alodokter telemedicine service application's user interface					
3	I am satisfied with the Alodokter telemedicine service application's service quality					
4	I am satisfied with the Alodokter telemedicine service application's efficiency					
5	Overall, I am satisfied with the services provided by Alodokter Telemedicine Service Application					
	Behavioral intention					
1	I intend to use Alodokter Telemedicine Service Application in the future					
2	I will always try to use Alodokter Telemedicine Service Application when I need health services in my daily life					
3	I plan to continue using Alodokter Telemedicine Service application frequently					
4	I prefer to use Alodokter Telemedicine Service application when I need health services in the future					
5	Alodokter Telemedicine Service Application is my first choice when I need health services in the future					

Abbreviations

UTAUT	Unified Theory of Acceptance and Use of Technology
TPB	Theory of planned behavior
TAM	Technology acceptance model
DOI	Diffusion of innovation
CSI	Customer satisfaction index
PE	Performance expectancy
EE	Effort expectancy
SI	Social influence
PV	Price value
BI	Behavioral intention
SAT	User satisfaction
PU	Perceived usefulness
PEU	Perceived ease of use
PLS–SEM	Partial Least Square–Structural Equation Modelling
AVE	Average variance extracted
VIF	Variance Inflation Factor

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Author contributions
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Declarations

Competing interests
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