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Exploring user satisfaction in digital healthcare:
The role of doctor-patient communication, service quality, and user experience on Halodoc's online medical platform (a PLS-SEM analysis)

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Abstract

The integration of digital technology into healthcare services, particularly through telemedicine, has greatly improved user convenience and accessibility. This study examines the effect of effective communication and service quality on user satisfaction using the Halodoc application with user experience evaluated as a potential moderating factor. Adopting a quantitative research approach, data were gathered via an online survey of 184 purposively selected respondents and analyzed by means of Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings revealed that effective communication had no direct significant effect on user satisfaction, whereas service quality had a strong and positive one. Moreover, user experience independently enhanced user satisfaction but did not significantly moderate the relationship between effective communication, service quality, and user satisfaction. This study contributes to the academic field of health communication by providing valuable insights into factors shaping user satisfaction within telemedicine platforms. From a managerial perspective, the results underscore the necessity of ongoing innovation in service delivery. Additionally, they emphasize the importance of enhancing the responsiveness and professional competence among healthcare providers through structured training programs to better meet user needs and expectations.
Keywords: Telemedicine; Effective Communication; Service Quality; User Experience; User Satisfaction

1. Introduction

The rapid advancement of digital technology has profoundly reshaped healthcare services, particularly through the emergence of telemedicine, which provides users with unprecedented convenience and accessibility (Herawati, 2011). As a cornerstone of human interaction, communication plays an essential role in healthcare, particularly within the virtual environments facilitated by telemedicine platforms (Alfarizi & Nuryana, 2019).

In this digital age, social media has emerged as a pivotal communication channel, functioning as a primary source of information and solutions across various contexts, including health crises (Zanuddin et al., 2021; Afifi et al., 2024a; Afifi et al., 2024b). Governments worldwide have also harnessed digital media to educate the public and encourage preventive behaviors during health crises such as in the COVID-19 pandemic (Afifi et al., 2023). Social media has also proven to be an effective tool for health communication during emergencies, including pandemics or natural disasters where the face-to-face interactions are found constrained (Nihayah & Afifi, 2023; Ashrianto et al., 2023). As a result, telemedicine has become a critical alternative for delivering healthcare

services, successfully addressing any challenges posed by infectious disease outbreaks (Sari et al., 2021).

In Indonesia, Halodoc is recognized as one of the most widely used telemedicine platforms. Research by Silalahi et al. (2018) identified Halodoc as the preferred platform for online doctor consultations, surpassing its competitors. The application offers a range of healthcare services, including *Chat with a Doctor, Health Store, Offline Appointment Booking, Home Lab Services*, and other specialized health solutions. Of these features, the *Chat with a Doctor* service allows users to consult healthcare professionals via their mobile devices at any time and place. This interaction depends on visual, audio, and data communication to facilitate remote diagnosis, treatment, and patient care.

Effective communication between doctors and patients is critical for gathering accurate information about patient condition, later on enabling proper diagnoses and appropriate care (Prihanti, 2017). Successful communication during virtual consultation significantly impacts patient outcome and satisfaction (Fourianalistyawati, 2012). However, Halodoc consultation is only limited to a 30-minute session, raising concerns about whether this timeframe is sufficient in addressing patient needs and facilitating meaningful communication.

Previous studies have identified gaps between user expectations and the service quality provided by Halodoc.

Febiola and Samanhudi (2022) noted some issues such as slow response times, templated doctor replies, misinterpretation of complaints, and unclear solutions, commonly reflected in user reviews and point to persistent challenges in service quality. Contrastingly, other studies reported the opposing perceptions of Halodoc's service quality. For instance, Chabibah & Kusumayati (2021) found that most users were satisfied with the platform, highlighting positive feedback regarding its services. These conflicting findings reveal inconsistencies in the perception of service quality.

In the broader context of technology adoption, user satisfaction is frequently driven by perceived benefits, resource efficiency, and ease of use. Within online healthcare services, satisfaction relies upon the platform's ability to address user needs effectively and to provide a seamless experience (Zagita et al., 2019). Additionally, user satisfaction is significantly determined by their overall experience with the platform. Positive experiences can amplify the effects of effective communication and high service quality, while negative ones may undermine these benefits (Pramita, 2019).

The role of user experience as a moderating factor is particularly important in understanding its interplay with communication effectiveness and service quality in influencing user satisfaction. For instance, Cabanillas et al. (2015) argued that user satisfaction is shaped by perceived ease of use and trust, rather than being directly moderated by experience. In contrast, Rodget et al. (2005, in Shao et al., 2020) suggested that system and service quality have a more pronounced impact on experienced users compared to novice users.

Although numerous studies have examined the relationships between communication, service quality, and user satisfaction in telemedicine, most focus on these variables individually. For example, Saputra and Dewi (2022) analyzed the connection between service quality and user satisfaction, while Biglu et al. (2017) explored the influence of communication skills on patient satisfaction. However, limited research has comprehensively examined effective communication, service quality, user experience, and user satisfaction within a single integrative framework.

This study aims to address this research gap by investigating these four interrelated variables within the context of Halodoc's telemedicine services. By incorporating user experience as a moderating factor, this research provides a novel perspective to understand how user experience influences the dynamics between communication effectiveness, service quality, and user satisfaction. The findings of this study are expected to provide valuable insights for the improvement of telemedicine services, contributing to both academic discourse and practical strategies in healthcare management.

2. Literature Review and Conceptual Model

2.1. Social cognitive theory

Social Cognitive Theory serves as a fundamental framework for analyzing user satisfaction with e-health services, offering critical insights into the cognitive and behavioral mechanisms that drive user behavior. Developed by Albert Bandura, this theory builds upon the foundations of Social Learning Theory but places a sharper emphasis on the mental processes governing human behavior (Littlejohn & Foss, 2009). At its core, the theory theorizes that human actions are shaped by the dynamic interplay of environmental factors, personal attributes, and behavioral determinants (Wu et al., 2021).

Over the years, Social Cognitive Theory has been widely applied to explain individual behavior, including the adoption of telehealth systems (Zhou & Fan, 2019). It has particularly been proven useful in understanding and predicting health-related behaviors and user acceptance of medical information systems (Wu et al., 2021). In the context of telemedicine, this theory helps to elucidate how environmental factors—such as service quality, trust in technology, and doctor-patient interactions—intersect with personal factors, including knowledge, attitudes, and perceptions of telemedicine, and behavioral factors, such as the intention to use telemedicine platforms and the level of user satisfaction.

By adopting Social Cognitive Theory, this study aims to gain a comprehensive understanding of the variables influencing user satisfaction in telemedicine services. The framework offers a structured approach to examine the interconnections among these factors and their collective impact on telemedicine adoption and user satisfaction.

2.2. Effective communication

Communication plays a central role in shaping the doctor-patient relationship, serving as the primary conduit through which patients articulate concerns, seek clarification, and express emotions (Febriantoro, 2020). Effective communication ensures that messages delivered by healthcare providers are not only transmitted but also understood, internalized, and acted upon appropriately by patients (Prihanti, 2017). The ultimate goal of effective communication is to foster a mutual understanding and enable meaningful feedback, ensuring that both parties can achieve clarity and alignment in their interactions.

Effective communication is broadly based on five fundamental principles: respect, empathy, audibility, clarity, and humility (Prihanti, 2017). These principles form a basis for effective doctor-patient interactions, emphasizing the significance of fostering emotional connections and promoting a transparent and meaningful dialogue.

Several previous studies (as cited in Atinga et al., 2019) emphasized a significant relationship between effective communication and patient satisfaction. Patient satisfaction tends to improve when healthcare providers offer clear and comprehensible explanations and allocate sufficient time for consultations. Conversely, satisfaction is highly contingent upon the quality of communication during medical interactions. Additionally, inadequate consultation duration, ambiguous explanation, and limited opportunities for patients to ask questions have been identified as primary contributors to dissatisfaction.

Building on this theoretical foundation, the first hypothesis of this study is proposed:

H1: Effective communication between doctors and patients has a significant influence on user satisfaction with the Halodoc application.

2.3. Service quality

Service quality is widely acknowledged as a critical determinant of customer satisfaction, particularly in the healthcare sector (Astuti & Sintesa, 2020). It refers to the degree to which a service meets or exceeds user expectations, encompassing both functional and relational aspects of service delivery (Boadi et al., 2019).

Service quality can be analyzed through five core dimensions: reliability, responsiveness, assurance, empathy, and tangibility (Tjiptono & Chandra, 2016; Wu et al., 2021). However, in the context of virtual healthcare services, additional dimensions become particularly significant including ease of use, website design, personalization, and responsiveness, which collectively address the unique requirements and expectations of online healthcare platforms (Ribbink et al., 2004; Chabibah & Kusumayati, 2021).

Research consistently demonstrates a strong relationship between service quality and user satisfaction. High-quality healthcare services, characterized by reliability, empathy, and responsiveness, are more likely to generate positive user experiences and foster long-term trust (Fransiska & Bernarto, 2021; Kassim & Abdullah, 2010).

Drawing from these theoretical insights, the second hypothesis of this study is formulated as follows:

H2: Service quality has a significant influence on user satisfaction with the Halodoc application.

2.4. User experience

User experience encompasses an individual's perceptions, emotions, and cognitive responses resulting from their interaction with product, system, or service. In the context of telemedicine, it refers to how users perceive and respond to their interactions with virtual healthcare platforms, including usability, functionality, and emotional satisfaction (Zagita et al., 2019).

When users have a positive experience and perceive the benefits of a service, their satisfaction tends to have a favorable impact, potentially influencing the long-term sustainability of their interest in utilizing telemedicine services (Imlach, 2021, as cited in Sari et al., 2021). Additionally, Hassenzahl and Tractinsky (2006) emphasized that user experience is shaped by a combination of internal user factors such as expectations, motivations, and emotional states and external system attributes, including design complexity, usability, and purpose.

Empirical studies consistently demonstrate a significant relationship between user experience and satisfaction. Positive user experiences are shown to directly enhance satisfaction levels, whereas negative ones often result in frustration and disengagement (Pramita, 2019; Hwang & Seo, 2016, as cited in Dewi et al., 2022).

Based on these insights, the third hypothesis is proposed:

H3: User experience has a significant influence on user satisfaction with the Halodoc application.

2.5. User satisfaction

User satisfaction reflects the extent to which healthcare services align with or surpass user expectations. It encompasses both cognitive and emotional evaluations, integrating perceptions of service quality, communication effectiveness, and user experience (Tjiptono & Chandra, 2016). Satisfaction, in this context, refers to the sense of contentment or dissatisfaction users feel when comparing a service's actual performance against their anticipated expectations (Kotler & Caslione, 2009, as cited in Boadi et al., 2019).

In the healthcare sector, user satisfaction is shaped by various factors, including effective communication, superior service quality, and favorable user experiences (Asnawi et al., 2019). Customer satisfaction can be assessed through four primary dimensions: overall service satisfaction, decision-making regarding service providers, comfort experienced during service, and enjoyment derived from using the service (Ribbink et al., 2004, as cited in Chabibah & Kusumayati, 2021).

Good communication skills, reliable service quality, and engaging user experiences collectively contribute to increasing satisfaction levels. Conversely, poor communication, low service quality, and negative user experiences can significantly undermine satisfaction and erode trust in healthcare providers (Lang, 2012; Riskiyah et al., 2017).

Additionally, user experience may moderate the relationship between communication, service quality, and satisfaction (Cabanillas et al., 2015; Shao et al., 2020). Experienced users often exhibit higher satisfaction levels, as they are more adept at navigating the system and understanding its functionalities.

Building upon this theoretical foundation, the fourth and fifth hypotheses are formulated as follows:

H4: User experience significantly strengthens the relationship between effective communication and user satisfaction with the Halodoc application.

H5: User experience significantly strengthens the relationship between service quality and user satisfaction with the Halodoc application.

This theoretical framework offers a comprehensive foundation for exploring the intricate relationships among communication, service quality, user experience, and user satisfaction within the context of telemedicine platforms such as Halodoc. The conceptual model underpinning this research is illustrated as shown in Fig. 1.
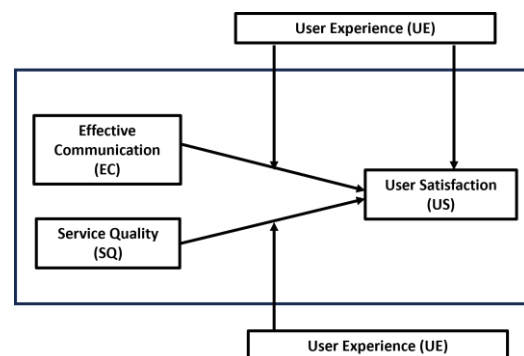

Fig. 1. Conceptual Model

3. Methodology

This study employed a quantitative approach using a survey method. The approach was chosen to systematically examine theoretical relationships by observing the connections among variables (Creswell, 2017). A quantitative research paradigm follows a positivist perspective, which asserts that phenomena can be measured and quantified (Mulyadi, 2011).

Table 1. Variables and Indicators

Variable	Dimension	Indicator
Effective Communication (X1)	Respect	EC1. Respectful Attitude
	Empathy	EC2. Listening
		EC3. Understanding
	Audibility	EC4. The Message Can Be Received
	Clarity	EC5. Clarity of The Message
Prijosaksoni et al. (2002, as cited in Prihanti, 2017)		EC6. Transparency/Open-Mindedness
	Humility	EC7. Humility
Service Quality (X2)	Reliability	SQ1. Punctuality
		SQ2. Reliability
	Responsiveness	SQ3. Quick Response
		SQ4. Effective Response
	Assurance	SQ5. Feeling of Safety
Tjiptono & Chandra (2016)		SQ6. Feeling of Comfort
	Empathy	SQ7. Understanding the User
	Tangibility	SQ8. Physical Evidence
User Experience (Z)		UE1. A Good Impression
		UE2. A Pleasant Experience
Sahin et al. (2011) and Brakus et al. (2009, as cited in Pramita, 2019).		UE3. Helping Problem Resolution
		UE4. Appropriate Action
		UE5. Enhancing Feelings of Happiness
User Satisfaction (Y)		US1. Overall Satisfaction
		US2. Service Provider's Decision
Ribink et al. (2004, as cited in Chabibah & Kusumayati, 2021).		US3. Comfort while Using the Service
		US4. Pleasure while Using the Service

The research was conducted from August 2023 to November 2023 in Yogyakarta and Magelang. These locations were specifically selected in view of the significant number of Halodoc application users identified in these regions. According to Google Trends (December 2023), Yogyakarta ranked second nationwide in search queries for Halodoc, trailing only behind Jakarta, while Central Java ranked 15th, with Mertoyudan, Magelang recording the highest search proportion in the region. These findings indicate a substantial level of engagement with Halodoc

health consultation services in both Yogyakarta and Magelang.

Data collection was conducted online by distributing questionnaires via the researchers' social media platforms. Respondents here were asked to complete the survey using a five-point Likert scale with the following response options: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree.

The study employed a purposive sampling method, a non-probability sampling technique where participants are deliberately selected based on specific criteria rather than random sampling (Riyani, 2021). The inclusion criteria for respondents included (1) Users of the Halodoc application in Yogyakarta and Magelang aged 17 years or above, and (2) Users who have previously utilized Halodoc's online consultation services.

To determine the sample size, the Hair formula was applied due to the unknown population size. According to Hair et al. (1998), the sample size can be calculated based on the number of indicators, multiplied by a range of 5 to 10 respondents per indicator. With 24 indicators in this study, the required sample size was estimated to be between 120 and 240 Halodoc users.

This study involved the following variables:
1) Exogenous Variables (X): Effective Communication (EC) and Service Quality (SQ)
2) Endogenous Variable (Y): User Satisfaction (US)
3) Moderating Variable (Z): User Experience (UE)

Table 1 presents a detailed research matrix outlining the operational framework of this study.

Table 2. Respondent Characteristics

Category	Criteria	%
Gender	Male	59
	Female	41
Age	17-21 Years Old	55
	22-26 Years Old	27
	27-31 Years Old	8
	32-36 Years Old	4
	> 36 Years Old	6
Occupation	Student	60
	Private Employee	9
	Government Employee	8
	Entrepreneur	10
	Others	4
Residence	Magelang	40
	Yogyakarta	60
Frequency of Use	1 Time	36
	2-3 Times	46
	> 3 Times	18

4. Result and Discussion

The research findings from 184 Halodoc users who have

previously utilized the doctor chat service in Yogyakarta and Magelang are summarized in Table 2, which presents their demographic and usage profiles.

Table 2 highlights essential demographic, geographic, and behavioral insights into Halodoc users, revealing that the platform predominantly catered to young adult students from Yogyakarta and Magelang with moderate engagement levels. This user profile offered a solid basis in analyzing satisfaction, behavioral patterns, and potential avenues for enhancing telemedicine services.

4.1. Measurement Model (Outer Model)

1)   Convergent Validity

Table 3. Outer loadings results

Indicator	Outer Loadings	Description
EC1	0,780	Valid
EC2	0,827	Valid
EC3	0,831	Valid
EC4	0,845	Valid
EC5	0,829	Valid
EC6	0,829	Valid
EC7	0,830	Valid
EC8	0,770	Valid
EC9	0,872	Valid
EC10	0,828	Valid
EC11	0,848	Valid
EC12	0,821	Valid
EC13	0,769	Valid
EC14	0,847	Valid
EC15	0,863	Valid
SQ1	0,825	Valid
SQ2	0,825	Valid
SQ3	0,837	Valid
SQ4	0,852	Valid
SQ5	0,848	Valid
SQ6	0,838	Valid
SQ7	0,809	Valid
SQ8	0,803	Valid
SQ9	0,837	Valid
SQ10	0,846	Valid
SQ11	0,841	Valid
SQ12	0,858	Valid
SQ13	0,851	Valid
SQ14	0,836	Valid
SQ15	0,785	Valid
SQ16	0,836	Valid
UE1	0,872	Valid
UE2	0,836	Valid
UE3	0,872	Valid
UE4	0,823	Valid
UE5	0,846	Valid
UE6	0,870	Valid
UE7	0,873	Valid
UE8	0,895	Valid
UE9	0,860	Valid
UE10	0,881	Valid
UE11	0,825	Valid

Table 3 continued. Outer loadings results

Indicator	Outer Loadings	Description
US1	0,846	Valid
US2	0,887	Valid
US3	0,887	Valid
US4	0,881	Valid
US5	0,873	Valid
US6	0,874	Valid
US7	0,861	Valid
US8	0,868	Valid
US9	0,872	Valid

According to the Rule of Thumb, a factor loading value exceeding 0.7 and an Average Variance Extracted (AVE) greater than 0.5 are required to establish convergent validity (Ghozali & Latan, 2015). Referring to Table 3, all constructs had the outer loading values above 0.7, confirming the validity of all indicator variables. With these criteria for convergent validity satisfied, the analysis proceeded to evaluate the Average Variance Extracted (AVE) values.

Table 4. Construct Value of Average Variance Extracted (AVE)

Variable	Average Variance Extracted (AVE)
Effective Communication (EC)	0.683
Service Quality (SQ)	0.694
User Experience (UE)	0.739
User Satisfaction (US)	0.761

Table 4 depicts that the variables of Effective Communication, Service Quality, User Experience, and User Satisfaction all exhibited Average Variance Extracted (AVE) values exceeding 0.5. This confirmed that all constructs have met the required reliability standards. With these criteria satisfied, the assessment of convergent validity was deemed complete.

2)   Discriminant validity

a)   Cross Loading

The evaluation of discriminant validity involves analysing the cross-loading values. Discriminant validity is determined by comparing the square root of the Average Variance Extracted (AVE) for each construct with the correlation coefficients between constructs in the model. According to Fornell and Larcker (1981), discriminant validity is established when the square root of the AVE for each construct is greater than the correlation values between latent constructs (Ghozali & Latan, 2015).

Table 5 indicates that the outer loading values of the indicators for their respective constructs were consistently higher than their correlations with other constructs. This finding reflected strong internal correlations among the

indicators, thereby meeting the required criteria. Consequently, it can be concluded that all constructs demonstrated robust discriminant validity. Table 6 presents the detail of the Fornell-Larcker analysis.

Table 5. Analysis of Indicator Cross-Loading Values

Indicator	EC	SQ	UE	US
EC1	**0,780**	0,726	0,721	0,699
EC2	**0,827**	0,785	0,744	0,730
EC3	**0,831**	0,785	0,751	0,756
EC4	**0,845**	0,813	0,819	0,782
EC5	**0,829**	0,784	0,747	0,778
EC6	**0,829**	0,781	0,767	0,794
EC7	**0,830**	0,782	0,698	0,725
EC8	**0,770**	0,694	0,667	0,687
EC9	**0,872**	0,814	0,790	0,807
EC10	**0,828**	0,748	0,731	0,729
EC11	**0,848**	0,816	0,772	0,789
EC12	**0,821**	0,790	0,791	0,782
EC13	**0,769**	0,719	0,709	0,694
EC14	**0,847**	0,779	0,784	0,781
EC15	**0,863**	0,835	0,815	0,810
SQ1	0,818	**0,825**	0,766	0,759
SQ2	0,754	**0,825**	0,775	0,753
SQ3	0,759	**0,837**	0,815	0,788
SQ4	0,840	**0,852**	0,808	0,820
SQ5	0,828	**0,848**	0,791	0,797
SQ6	0,789	**0,838**	0,818	0,795
SQ7	0,750	**0,809**	0,717	0,772
SQ8	0,739	**0,803**	0,730	0,739
SQ9	0,733	**0,837**	0,783	0,777
SQ10	0,819	**0,846**	0,813	0,820
SQ11	0,745	**0,841**	0,825	0,796
SQ12	0,813	**0,858**	0,840	0,834
SQ13	0,834	**0,851**	0,788	0,813
SQ14	0,799	**0,836**	0,786	0,797
SQ15	0,715	**0,785**	0,744	0,748
SQ16	0,797	**0,836**	0,820	0,794
UE1	0,832	0,852	**0,872**	0,817
UE2	0,838	0,834	**0,836**	0,820
UE3	0,830	0,852	**0,872**	0,834
UE4	0,731	0,787	**0,823**	0,791
UE5	0,775	0,776	**0,846**	0,783
UE6	0,772	0,818	**0,870**	0,801
UE7	0,800	0,808	**0,873**	0,835
UE8	0,780	0,818	**0,895**	0,846
UE9	0,762	0,806	**0,860**	0,791
UE10	0,756	0,807	**0,881**	0,811
UE11	0,758	0,799	**0,825**	0,827
US1	0,730	0,776	0,797	**0,846**
US2	0,818	0,841	0,869	**0,887**

Table 5 continued. Analysis of indicator cross-loading values

Indicator	EC	SQ	UE	US
US3	0,832	0,846	0,853	**0,887**
US4	0,848	0,867	0,855	**0,881**
US5	0,830	0,852	0,821	**0,873**
US6	0,788	0,826	0,813	**0,874**
US7	0,760	0,768	0,789	**0,861**
US8	0,799	0,820	0,815	**0,868**
US9	0,782	0,825	0,822	**0,872**

Table 6. Fornell-Larcker Criterion Value

Variable	US	EC	SQ	UE
User Satisfaction (US)	0,872			
Effective Communication (EC)	0,917	0,827		
Service Quality (SQ)	0,946	0,941	0,833	
User Experience (UE)	0,948	0,913	0,947	0,860

As shown in Table 6, the AVE criterion has not been met. This inconsistency may stem from redundant statements within the measurement items, where some indicators across different constructs exhibited similar or repetitive phrasing. Such redundancy can undermine the discriminant validity of the constructs, compromising their uniqueness and distinctiveness.

Table 7. Analysis of the Heterotrait-Monotrait Ratio (HTMT)

Variable	US	EC	US	UE
User Satisfaction (US)				
Effective Communication (EC)	**0,949**			
Service Quality (SQ)	**0,979**	**0,970**		
User Experience (UE)	**0,984**	**0,945**	**0,979**	

Discriminant validity can be assessed using the Heterotrait-Monotrait Ratio (HTMT). A model is considered to exhibit adequate discriminant validity when the HTMT value is below 1.0 with an optimal threshold recommended at HTMT < 0.90 (Garson, 2016). As presented in Table 7, several HTMT values exceeded the 0.90 threshold, suggesting potential redundancy in the measurement items. This redundancy occurred when indicators across different constructs used similar or repetitive wording, thus compromising the distinctiveness of the constructs. These results are consistent with the findings from the Fornell-Larcker criterion, further supporting the indication of inadequate discriminant validity.

3) Reliability test

Reliability testing plays a fundamental role in evaluating the accuracy, consistency, and precision of research instruments. According to Ghozali and Latan (2015), reliability assessment using reflective indicators in SEM-PLS can be conducted through Composite Reliability where a value exceeding 0.7 indicates acceptable reliability.

As presented in Table 8, both Cronbach's Alpha and Composite Reliability values for all constructs surpassed the 0.7 threshold, signifying that the constructs demonstrated strong internal consistency and reliability. Consequently, it can be inferred that the measurement model was reliable. The study can therefore advance to the inner model evaluation phase with a focus on analyzing the relationships and effects between constructs within the structural model.

Table 8. Reliability test analysis

Variable	Cronbach's Alpha	Composite Reliability
Effective Communication (EC)	0.967	0.970
Service Quality (SQ)	0.971	0.973
User Experience (UE)	0.965	0.969
User Satisfaction (US)	0.961	0.966

4.2. Structural model (inner model)

1) R-Square

Table 9. R-Square analysis

Dependent Variable	R Square	R Square Adjusted
User Satisfaction (US)	0.927	0.925

The evaluation of R-Square (R^2) serves to determine the predictive power of a model by analyzing the variance explained by each endogenous variable. R-Square values of 0.75, 0.50, and 0.25 indicate a model with strong, moderate, and weak predictive power, respectively (Ghozali and Latan, 2015),

As presented in Table 9, the R-Square value for the User Satisfaction (US) variable was 0.927, equivalent to 92.7%. This suggested that effective communication, service quality, and user experience collectively explained 92.7% of the variance in user satisfaction, while the remaining 7.3% was determined by factors outside the scope of this study. Therefore, it can be concluded that the impact of effective communication, service quality, and user experience on user satisfaction was substantial, reflecting a strong predictive model.

2) Hypothesis Testing

Table 10. Path coefficients analysis

Predictors	User Satisfaction (US)
Effective Communication (EC)	0.000
Service Quality (SQ)	0.485
Moderating Effect 1	-0.199
Moderating Effect 2	0.225
User Experience (PP)	0.515

The analysis of path coefficients evaluates the strength and significance of relationships within the structural model. Path coefficients are the standardized values ranging from -1 to +1.

A strong positive relationship is indicated by path coefficients approaching +1, whereas a strong negative relationship is signified by values approaching -1. Conversely, weaker relationships are represented by coefficients closer to 0 (Marliana, 2020).

As shown in Table 10, the relationships between Effective Communication and User Satisfaction (EC → US), Service Quality and User Satisfaction (SQ → US), User Experience and User Satisfaction (UE → US), and the Moderating Effect 2 on User Satisfaction (SQ & UE → US) all demonstrated a positive direction of influence. In contrast, the Moderating Effect 1 on User Satisfaction (EC & UE → US) exhibited a negative relationship.

Table 11. T-Statistics value

Path/Hypothesis	T-Statistics	P Value	Description
EC –> US	0.003	0.499	Insignificant
SQ –> US	3.476	0.000	Significant
Moderating Effect 1 –> US	1.244	0.107	Insignificant
Moderating Effect 2 –> US	1.364	0.086	Insignificant
UE –> US	4.376	0.000	Significant

The next phase involved the analysis of the T-statistic values to determine the statistical significance of the relationships between constructs. Bootstrapping was employed to evaluate these significance values with a 5% significance level determined by a T-statistic threshold of >1.96 (Ghozali & Latan, 2015). As shown in Table 11, the relationships that demonstrated statistical significance included: Service Quality → User Satisfaction (SQ → US) with a T-statistic of 3.476 > 1.96. and User Experience → User Satisfaction (UE → US) with a T-statistic of 4.376 > 1.96

Conversely, the following relationships were statistically insignificant, as their T-statistic values fell below the threshold: Effective Communication → User Satisfaction (EC → US) with a T-statistic of 0.003 < 1.96, Moderating Effect 1 (EC & UE → US) with a T-statistic of 1.244 < 1.96 and Moderating Effect 2 (SQ & UE → US) with a T-statistic of 1.364 < 1.96

These results suggested that, while Service Quality and User Experience significantly influence User Satisfaction, Effective Communication and the moderating effects do not exhibit statistically significant impacts.

Table 12. Analysis of Predictive Relevance Value

Parameters	*SSO*	*SSE*	$Q2_{(=1-SSE/SSO)}$
User Satisfaction (US)	1656.000	509.607	**0.692**
Effective Communication (EC)	2760.000	2760.000	
Service Quality (SQ)	2944.000	2944.000	
Moderating Effect 1	184.000	184.000	
Moderating Effect 2	184.000	184.000	
User Experience (UE)	2024.000	2024.000	

A Q^2 value serves as a key indicator for evaluating the predictive relevance of a structural model, particularly in its

capacity to explain the variance in endogenous latent variables. A positive Q² value signifies that the model possesses meaningful predictive relevance, whereas a negative one suggests poor predictive capability. This metric assesses the relative impact of the structural model on observed measurements, offering insights into its accuracy and reliability in forecasting outcomes.

Q² values can be interpreted based on predefined thresholds: a value of 0.02 indicates weak predictive relevance, 0.15 reflects moderate predictive relevance, and 0.35 signifies strong predictive relevance (Ghozali and Latan, 2015)

The analysis as presented in Table 12 revealed a Q² value of 0.692, which significantly surpassed the threshold for strong predictive relevance. This result demonstrated the model's robust predictive capability, indicating that it effectively captured and explained the variance observed in the endogenous variables. Such a high Q² value underscores the model's reliability and its strong capacity to produce meaningful and accurate predictions, enhancing confidence in the validity of the research findings.

Table 13. Analysis of model fit values

Criteria	Saturated Model	Estimated Model
SRMR	0.046	0,047
d_ULS	2,832	2,868
d_G	6,292	6,266
Chi-Square	4484,325	4491,205
NFI	0,684	0,684

The Standardized Root Mean Square Residual (SRMR) is a critical measure for assessing the degree of fit between the proposed model and the observed data. A lower SRMR value indicates a better alignment of the model with the data, suggesting a good model fit. Typically, an SRMR value below 0.10 is regarded as acceptable, while a value below 0.08 is considered indicative of an excellent model fit (Garson, 2016).

In this study, as presented in Table 13, the SRMR value was 0.047, well below the threshold of 0.10. This result indicated that the model demonstrated a strong fit with the data, further supporting the robustness of the model and its appropriateness for the analysis conducted. The SRMR value of 0.047 not only met but exceeded the standard for an acceptable fit, reinforcing the validity and reliability of the model used in this research.

Based on the research findings and statistical analysis, this study addressed key research questions regarding the role of doctor-patient communication, service quality, and user experience on the Halodoc online medical platform. The results revealed that effective communication between doctors and patients within the Halodoc application did not significantly influence user satisfaction. Verbal interactions alone are inadequate, likely due to the absence of non-verbal communication cues and the inability to perform physical examinations, both of which are critical for achieving accurate diagnoses and delivering personalized care (Atinga et.al., 2019, Jannah et al., 2017). Furthermore, brief consultation durations and connectivity issues exacerbated these challenges, reducing the overall effectiveness of communication. The reliance on templated responses and limited demonstrations of empathy further contributes to perceptions of impersonal interactions, ultimately diminishing user satisfaction (Wu et al., 2021).

In contrast, service quality emerged as a significant determinant of satisfaction with factors such as reliability, responsiveness, assurance, and privacy protection being highly valued by users. These findings align with previous research (Lokantari & Kristaung, 2022; Lu et al., 2021), emphasizing the critical role of service quality in shaping user satisfaction within telemedicine platforms. Notably, assurance was identified as the most influential factor, with users placing high importance on secure and confidential consultations.

User experience also played a significant role in enhancing satisfaction, with personalized interactions and thoughtful communication contributing to positive outcomes, as noted by Sari et al., (2021). However, user experience did not moderate the relationship between effective communication and satisfaction, suggesting that satisfaction is primarily influenced by the accuracy of solutions and the inherent quality of services, rather than by experiential factors (Riskiyah et al., 2017; Cabanillas et al., 2015).

5. Conclusion

This study concludes that user satisfaction with the Halodoc application is primarily driven by service quality and user experience, both of which demonstrated significant positive impacts. In other words, higher service quality and more favourable user experiences are strongly associated with increased satisfaction. Conversely, effective communication did not appear to significantly influence user satisfaction. This finding likely stemmed from the inherent limitations of telemedicine, particularly the absence of non-verbal communication cues such as facial expressions and body language, which are essential for understanding patients' emotional and physical conditions. Furthermore, user experience did not moderate the relationship between effective communication, service quality, and satisfaction, aligning with previous research suggesting that user experience primarily affects satisfaction through perceived usability and trust.

These findings emphasize the pivotal roles of service quality and user experience in shaping user satisfaction while underscoring the challenges posed by communication within telemedicine platforms. Therefore, enhancing non-verbal communication mechanisms, improving diagnostic accuracy, and elevating overall service quality are essential strategies to optimize user satisfaction in telemedicine.

Academically, this research contributes to the field of digital health communication by offering valuable insights into doctor-patient interaction within telemedicine contexts. It broadens the existing body of knowledge on effective communication in digital healthcare while addressing challenges unique to telemedicine. However, the study has certain limitations, including its reliance on prior research with limited comparability, a relatively small sample size due to resource and time constraints, and an exclusive focus on Halodoc, which limits the generalizability of the findings to other telemedicine platforms. Future research should then address these limitations by exploring additional variables, expanding sample sizes for broader applicability, and employing advanced methodologies to examine the intricate interrelationship among communication, service quality, and user satisfaction.

From a practical and managerial perspective, the study

offers several actionable recommendations for improving telemedicine platforms. First, healthcare providers should undergo a targeted training to strengthen their communication skills. Second, telemedicine platforms should be optimized to ensure faster response times, thereby enhancing operational efficiency. Third, user education on effective online consultation practices should be prioritized. Furthermore, integrating personalized features, such as health history-based recommendations, could enhance the relevance and attentiveness of interactions. Additionally, incorporating artificial intelligence (AI) to analyse real-time data and recommend suitable services or providers is strongly advised to enhance the user experience.

Finally, to further improve user satisfaction, telemedicine platforms should consider implementing video consultation features. This capability would enable more comprehensive patient assessments and foster greater trust and confidence in the services provided. By adopting these strategies, telemedicine platforms will be capable of strengthening their competitive positioning and better adapting to the evolving needs of their users.

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