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Factors Affecting Adoption of Telemedicine for Virtual Healthcare Services in Indonesia

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Abstract

Background: The utilization of virtual healthcare services, particularly telemedicine, has been accelerated by the COVID-19 pandemic. Although the pandemic is no longer the primary concern, telemedicine still holds potential for long-term adoption. However, implementing telemedicine in Indonesia as an online platform for remote healthcare delivery still faces issues, despite its potential. Further investigation is required to identify the factors that affect its adoption and develop strategies to surmount implementation challenges.
Objective: This study aims to examine and enrich knowledge about the adoption of telemedicine in Indonesia.
Methods: A cross-sectional survey was conducted through an online questionnaire to collect data. Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) was employed by integrating with several factors, such as eHealth Literacy, Privacy Concerns, and Trust. Gender and age were considered as moderating variables. Data samples were analyzed using Partial Least Square – Structural Equation Modeling (PLS–SEM).
Results: The findings suggest that performance expectancy, effort expectancy, social influence, eHealth literacy, and trust have a significant impact on adults' behavioral intention to use telemedicine. However, facilitating condition, price value, and privacy concern do not show any significant effects on adults' Behavioral Intention to Use Telemedicine.
Conclusion: This study highlights the importance of understanding adoption factors to develop effective strategies. Results show performance expectancy, effort expectancy, social influence, eHealth literacy, and trust are significant factors, while facilitating condition, price value, and privacy concern are not. The UTAUT2 model is a good predictive tool for healthcare adoption. To increase usage intention, several aspects must be considered in the implementation of telemedicine.

Keywords: Adoption, Behavioral Intention to Use, Telemedicine, UTAUT2, Virtual Healthcare.

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I. INTRODUCTION

Nowadays, healthcare providers are faced with the challenge of delivering value-based healthcare services while dealing with limited resources, requiring a shift from traditional to technology-based services. This paradigm shift in healthcare requires evidence-based and cost-effective service delivery [1]. As information and communication technology continues to rapidly grow and become an enabler in almost all sectors, digital healthcare has emerged as a solution in the digital transformation era to deliver healthcare services [2], [3].

However, the healthcare sector faces a new challenge in delivering high standards during this digital transformation era. Since the end of 2019, the COVID-19 outbreak caused by SARS-CoV-2 has become a worldwide concern [4], [5]. As of August 25, 2022, more than 596 million confirmed cases have been reported in 230 countries. Elderly people or those with certain health conditions have a higher chance of developing severe symptoms when infected with the virus [6]. Social restrictions have been declared globally since March 2020, especially for activities involving direct human-to-human contact, including healthcare services, which require encounters between health practitioners and patients [7]. During the pandemic, almost all mobility and activities are restricted, including primary healthcare. However, several diseases still require regular consultations with doctors

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[8], and delivering healthcare services without compromising quality during the pandemic has been challenging [5], [9].

Although COVID-19 is not currently a significant concern, the use of technology to assist in various activities persists, including the healthcare sector. Healthcare institutions have started virtualizing healthcare services to minimize direct contact between doctors and patients through the use of a technology called telemedicine [10]–[13]. Telemedicine has gained popularity in recent times, especially due to its impact on addressing COVID-19-related issues such as clinical teleconsultation, articles, medicines, and diseases. The outbreak can be considered a tipping point for the existence of telemedicine and had a significant impact on the penetration of telemedicine, accelerating its adoption and usage across the world due to the need for remote healthcare services to minimize the spread of the virus [14], [15]. Thus, telemedicine has emerged as a practical solution to bridge the gap in healthcare services by providing medical assistance from a remote location. It has the capability to serve as a channel for remote consultation with healthcare professionals, facilitating diagnosis and screening, and providing reliable health information and advice on the initial steps that patients can take. By combining medical expertise, telemedicine enables healthcare providers and patients to reduce the need for unnecessary in-person meetings, regardless of distance or time constraints. Telemedicine is not a new concept in Indonesia, and several telemedicine platforms are available in the country, including Halodoc, Alodokter, KlikDokter, SehatQ, etc. Still, it has gained popularity in recent times, especially due to its impact on addressing COVID-19-related issues such as clinical teleconsultation, health-related articles, medicines, and diseases [16], [17].

Telemedicine is expected to continue to grow and become more widely adopted even after the COVID-19 pandemic subsides. It has proven to be a valuable tool for providing remote healthcare services, offering convenience and flexibility for patients who may have difficulty accessing traditional in-person care. The outbreak has accelerated the adoption and usage of telemedicine, and it is likely that this trend will continue as healthcare providers and patients become more comfortable with virtual visits and remote care. Telemedicine has had a significant impact on different aspects of health system performance, including efficiency, cost-effectiveness, quality, regulatory issues, and reimbursement [18], [19].

Despite the increased adoption of telemedicine during the pandemic, several issues remain that need to be addressed. These include privacy concerns when using video conferencing for medical exams, difficulties in providing accurate diagnoses solely through virtual communication, and financial and reimbursement issues [4], [20]. In Indonesia, telemedicine implementation continues to face numerous obstacles and challenges in providing high-quality and affordable consultation, diagnosis, and treatment to the population. These challenges include limited access to communication infrastructure and technology, shortages of human resources, inadequate regulations, concerns about data security, financing for telemedicine providers, and concerns about the quality of remote doctor-patient and healthcare worker relationships [21], [22]. Furthermore, telemedicine is viewed as an option to replace face-to-face appointments when it is not feasible to have such meetings. During the outbreak, telemedicine utilization has been considered only as an alternative to avoid exposure to the virus [15], [18]. Telemedicine definitely cannot totally replace in-person visits and should not be fully considered as a replacement for traditional medical practice due to the lack of private places to attend online consultations or some diseases cannot be diagnosed via remote consultation [23], [24]. Several situations may not be appropriate for telemedicine interventions, such as patients with chronic severe conditions like cardiovascular disease, tuberculosis, cancer, pneumonia, diabetes, hypertension, or emergencies that require immediate medical attention in an emergency room [14]. In such cases, an in-person visit is necessary to assess the patient's condition due to the severity of the symptoms. Providers must consider the patient's condition, mitigating factors, available resources, and their own proficiency and comfort in using telemedicine [25], [26]. Moreover, access to telemedicine for disadvantaged groups, such as the elderly and poorer patients, particularly in rural areas, needs more attention [19], [27]. Most people consider face-to-face consultations to be more reliable than virtual consultation One possible reason for the limited use of telemedicine in developing nations, particularly in rural locations, is the population's inadequate ICT literacy [4], [28], [29]. Consequently, the utilization of telemedicine in developing countries remains low. Despite people's willingness to accept online healthcare delivery, additional initiatives are still necessary to promote awareness and educate the public about the advantages and disadvantages of telemedicine in developing countries [21].

Although telemedicine has increased access to healthcare and enhanced the patient experience, further analysis is required to fully understand its impact on equity and efficiency. Previous studies have examined the adoption of digital health technologies such as telemedicine, telehealth, mobile health or mHealth, electronic health records, etc. These studies have examined the adoption of digital health technologies through various theories, including the Theory of Planned Behavior (TPB) [30], Technology Acceptance Model (TAM) [31]–[33], Unified Theory of Acceptance and Use of Technology (UTAUT) [3], [34]–[40], and extended version of UTAUT (UTAUT2) [6], [38],

[41]–[50]. However, several of these previous studies have shown contradictory results regarding the factors influencing adoption. The contradictory results may be due to the varied target populations, which have different characteristics such as culture, level of economic and social development, age, gender, etc. For instance, Baudier et al. [50] conducted a study on the adoption of telemedicine for teleconsultation services with participants from Europe and Asia randomly. The analysis showed that effort expectancy and social influence were not significant factors for someone to use the technology. This is consistent with other research by Schmitz et al. [46], which conducted cross-countries study in U.S – Germany and Serrano et al. [40] who conducted a study in Brazil, and concluded that both factors are not considered to affect the adoption of telemedicine. In contrast, a study by Yamin and Alyoubi [39] in Saudi Arabia found contradictory results to the previously mentioned research, as they discovered that both effort expectancy and social influence significantly affect the adoption of telemedicine. However, research by Rahi et al. [35] and Martin et al. [42] showed different outcomes, where social influence had effect on adoption, but effort expectancy did not. These contradictory results may be due to differences in respondent characteristics.

In the same context, a study conducted in Indonesia by Napitupulu et al. [51] found that the perceived level of effort required to use online healthcare services has an impact on their adoption, while social influence does not. On the other hand, Islami et al [52] found that social influence does have an impact on the adoption of telemedicine platforms. In the context of mHealth services, Octavius and Antonio [41] discovered that ease of use was not a factor affecting the adoption of the platform among Indonesians, but social influence was. However, Nawarini et al. [53] found that both ease of use and social influence did not impact the adoption of telemedicine in Indonesia, which is consistent with findings by Melinda et al. [54]. These studies demonstrate that even studies targeting the population in the same country can have varying results, which may be due to factors such as diversity, digital literacy, geographic and environmental factors, and others. Despite this, telemedicine and related applications have great potential to improve healthcare access and coverage, particularly in rural Indonesia, where healthcare services are still expensive and difficult to access [27], [55].

However, research on the adoption factors of digital health platforms such as telemedicine, telehealth, mHealth, and their kind remains limited in Indonesia. Therefore, this study aims to examine and enrich knowledge about the adoption of telemedicine in Indonesia. This study employed UTAUT2 to build a conceptual model to assess and understand the effect of several variables on consumers' adoption. Apart from variables from UTAUT2, other variables such as eHealth literacy, privacy concern, and trust were also examined. The research contains an introduction, literature review, methodology, results, discussion, and conclusion.

II. Literature Review

A. Telemedicine

The term "Telemedicine" is frequently used interchangeably with other similar terms such as "Telehealth", "eHealth", and "digital health", which all refer to virtual or remote healthcare [56]. However, these terms are not precisely defined. Healthcare itself covers a broad range of health-related topics, which may include diagnoses and treatments of patients, health-administrative activities, health education for staff or patients, etc. [56]. The term "telemedicine" was introduced by World Health Organization in the 1970s as a technology-driven healthcare service to support conventional healthcare delivery by employing information technology and enabling distance communication between patients and health practitioners. The term telemedicine is frequently interchanged with various other terms of other terms, like Telehealth and mHealth. Telemedicine, Telehealth, and mHealth are subsets of eHealth. Telemedicine specifically refers to healthcare service which allows healthcare professionals to diagnose, decide treatments, evaluate, and prevent diseases or injuries and enables distance communication between patients and healthcare practitioners using technology [57], [58]. Telehealth is a broader term that encompasses a wide range of healthcare services and information delivered through telecommunication technologies, including clinical and non-clinical services such as health education, public health campaigns, and administrative meetings between healthcare providers [50]. Meanwhile, mHealth or mobile health refers to the concept of medical and public health practices supported by mobile devices, including mobile phones, which allow patient monitoring devices, personal digital assistants, and other health-related wireless devices. [57], [59]. The services included consultations, diagnoses, treatments, medical data exchange, evaluations, and prevention of disease and injuries [16], [57], [58], [60], [61]. Basically, telemedicine is a technology-based service that utilizes the advancement of information technology and communication, such as video conferencing, smartphones, and other communication technology tools, such as multimedia and computer network technology, to deliver and support medical applications and services [58], [62]. In a nutshell, telemedicine can be briefly defined as digitalized and distance healthcare service. Telemedicine falls into two categories: store and forward telemedicine and real-time telemedicine. Store and

forward is better known as asynchronous telemedicine. Meanwhile, real-time telemedicine is better known as synchronous telemedicine [58]. Telemedicine has been playing an essential role in healthcare and emerged as a response to solve contact restrictions issues related to providing and delivering adequate healthcare services both in developing and developed countries [8], [55], [63]–[66]. Despite its potential to utilize technology or mobile-based service to deliver healthcare (e.g., telemedicine), providing adequate healthcare in low-resource settings, including low-income countries, is challenging. It is crucial to evaluate the feasibility and the quality of the service [56].

B. The Unified Theory of Use and Acceptance of Technology 2 (UTAUT2)

The Unified Theory of Acceptance and Use of Technology (UTAUT2) was introduced as an extended version of UTAUT which was introduced by Venkatesh et al. [67], [68]. This model was originally developed with four core independent variables: performance expectancy, effort expectancy, social influence, facilitating conditions and two dependent variables, namely behavioral intention to use and usage behavior and four moderating variables (age, experience, gender, and voluntariness of use). UTAUT was originally designed to examine and assess technology acceptance and adoption behaviors in organizational settings context and has been widely used in various studies in the Information Systems field to evaluate and forecast various adoption-related concerns. For instance eLearning [69], [70], eGovernment [71]–[73], Location-Based Service (LBS) [74], mobile banking [75], eCommerce [76]–[78], eHealth [36]–[38], etc.

However, the UTAUT model is primarily designed to analyze technology adoption among employees in organizational settings, while telemedicine is more likely to be adopted at the individual level. To address this issue, Venkatesh et al. [68] introduced the extended version with three additional independent variables, namely habit, hedonic motivation, and price value, to better suit the needs of customers. This extended version also includes several moderating variables such as age, gender, and experience to adjust to the customers and their necessaries. The ability to learn and effectively use new technologies is connected to age because of the physical, cognitive, and sensory changes that come with aging. Elderly individuals may experience limitations in their technological proficiency, which can hinder their ability to adopt new technologies. In contrast, younger generations are exposed to technology from an early age, shaping their attitudes and beliefs toward technology and increasing their propensity to explore and use new technologies. This exposure to technology from an early age can lead to a more significant comfort level with technology among younger generations and make it easier for them to adapt to new technological innovations. Also, technology usage attitude and preference are associated with gender. Generally, men and women exhibit diverse attitudes, preferences, and technological experiences that can influence their adoption of technology and the advantages they derive from it. These gender differences can lead to differing levels of comfort, ease, and proficiency with technology. Meanwhile, experience refers to individuals' previous interaction with technologies or related systems. Individuals who have greater experience are more likely to develop a positive attitude and gain the necessary skills and knowledge to use technology effectively. On the other hand, those with less experience may require more support to become proficient and may have a lower inclination to use the technology in the future [67], [68].

Both UTAUT and the extended version (UTAUT2) have been employed in many types of research in the Information Systems field to assess and predict various adoption-related issues. Application of the theory has been combined with other theories or any external variables additions and limited to not only one type of consumer but also any consumer [79]. Compared to UTAUT, the extended version (UTAUT2) explains variances of both behavioral intention and technology use better than the predecessor [46], [68]. Moreover, UTAUT2 offers a more holistic and integrative focus on consumers' settings. In the extended version, voluntariness is no longer considered as moderating variable since consumers' decision to use or adopt technology is voluntary [68]. UTAUT2 theory also has been widely used to examine the understanding of technology adoption in many contexts, namely eCommerce [80]–[82], online banking [49], [83], eLearning [84], and eHealth [6], [38], [44]–[50].

The reason for selecting UTAUT2 as the theoretical foundation for this study is primarily due to its appropriateness as a framework. Furthermore, UTAUT2 offers a comprehensive and integrated outlook on consumer environments, which is deemed fitting for the context of this study, as the adoption of telemedicine is likely to occur at an individual level. Moreover, UTAUT2 has not been extensively used to investigate the acceptance or adoption of telemedicine for virtual healthcare services in Indonesia.

C. Hypotheses Development and the Proposed Conceptual Model

UTAUT2 was employed in considering the different characteristics of the countries, this study aims to examine and enrich knowledge about the adoption of telemedicine in Indonesia. UTAUT2 was considered as a flexible and adaptable model, and researchers can modify the model to fit their specific research context and objectives. This theory was developed based on a wide range of technology contexts [67], [68], [85]. In this study, five out of seven

variables of the original model were included, such as performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC), social influence (SI), price value (PV).

Even though the model initially included habit and hedonic motivation, these constructs were removed from this study because they did not apply to the context. Habit refers to how automatic using telemedicine is due to previous usage, and people who have a strong habit of using technology tend to keep using it despite any difficulties or lower perceived usefulness [68]. This construct is connected to several indicators, such as behavioral frequency, which is the extent to which the behavior is done regularly and frequently. Generally, people use technology often and regularly when it meets their normal needs. However, telemedicine is not regularly needed for healthcare services unless it is for other eHealth objectives such as regular monitoring. Emotional attachment, which refers to the personal connection a person has with the behavior and the feeling of satisfaction or accomplishment from using it, is also included in this construct. Several indicators of habit from Venkatesh et al. [68], show that habit is related to prior experiences and even addiction to using technology, implying that individuals may form a habitual inclination toward using healthcare platforms, but it takes time to develop this habit. If people only use telemedicine for infrequent consultations, it may not become a consistent aspect of their digital healthcare behavior [3]. Additionally, despite the significant potential, there is no substantial evidence that all Indonesians have ever used the platform, particularly those in rural areas with limited access to healthcare services. Thus, including the habit construct may not be relevant for people who have never used telemedicine, particularly those in rural areas. This construct may be more relevant for certain types of healthcare services that require regular patient engagement with the technology, such as remote consultations or monitoring.

In the context of telemedicine, the use of the platform is primarily driven by the need to access healthcare services remotely and is focused on the usefulness and functionality of healthcare service rather than for pleasure or enjoyment. Telemedicine is intended to provide a practical solution to healthcare access and is typically used when an individual cannot or prefers not to visit a doctor in person [6]. Meanwhile, hedonic motivation refers to the pleasure or enjoyment that individuals derive from using technology [68]. Telemedicine platforms are primarily intended to provide healthcare services and support. The overall goal is to improve the patient's health outcomes and provide medical assistance, rather than to provide a source of pleasure or enjoyment [6], [38]. Therefore, the construct of hedonic motivation is not relevant to telemedicine as it does not align with the primary motivations for using the platform. Thus, this construct was excluded from this study. As a result, we only included the five relevant variables and developed a model that is suitable for the study. We also integrated the model with several factors, which will be explained. The visual representation of the proposed conceptual model is presented in Fig. 1. The hypotheses can give predictions of consumers' behavioral intention to adopt telemedicine platforms. Table 1 shows the hypotheses tested in this study.

1) Performance Expectancy

Performance expectancy (PE) measures the extent to which an individual believes that using a technology can assist them in achieving their desired goals. It reflects the perceived usefulness of a system and is a crucial factor that affects an individual's intention to use a technology. This means that if individuals believe that using a technology can be beneficial and help them reach their desired outcomes, they are more inclined to intend to use it [67], [68], [86]. In the case of telemedicine, PE was discovered to be a significant predictor of the acceptance [46]. This implies that the more individuals perceive that telemedicine is advantageous and can assist them in achieving their health objectives and enhancing their health outcomes, the more likely they are to adopt it. Conversely, if patients do not see any benefit or usefulness in using telemedicine, they are less likely to intend to use it. Therefore, the hypothesis of this study was formulated as follows.

H1: Performance expectancy significantly affects the behavioral intention to use telemedicine.

2) Effort Expectancy

Effort expectancy (EE) is a measure of how easy it is to use a technology or system. This means that when people perceive a technology as easy to use and requiring little effort, they are more likely to have the intention to use it [3], [67], [68], [86]. In the case of telemedicine, EE was found to be a significant factor in its acceptance [36]. In other words, the easier people perceive it to be to use telemedicine, the more likely they are to adopt it. People are more likely to use telemedicine if they perceive it as requiring minimal effort and being easy to use. Conversely, if telemedicine is perceived as difficult to use and requiring a lot of effort, patients are less likely to use it. This construct is relevant to the study because customers prefer easy-to-use technology. [61]. However, it was found to be not significant in developed countries [50]. Although this may vary in different populations, especially in a developing country. Therefore, the study's hypothesis was formulated to address this issue.

H2: Effort expectancy significantly affects the behavioral intention to use telemedicine.

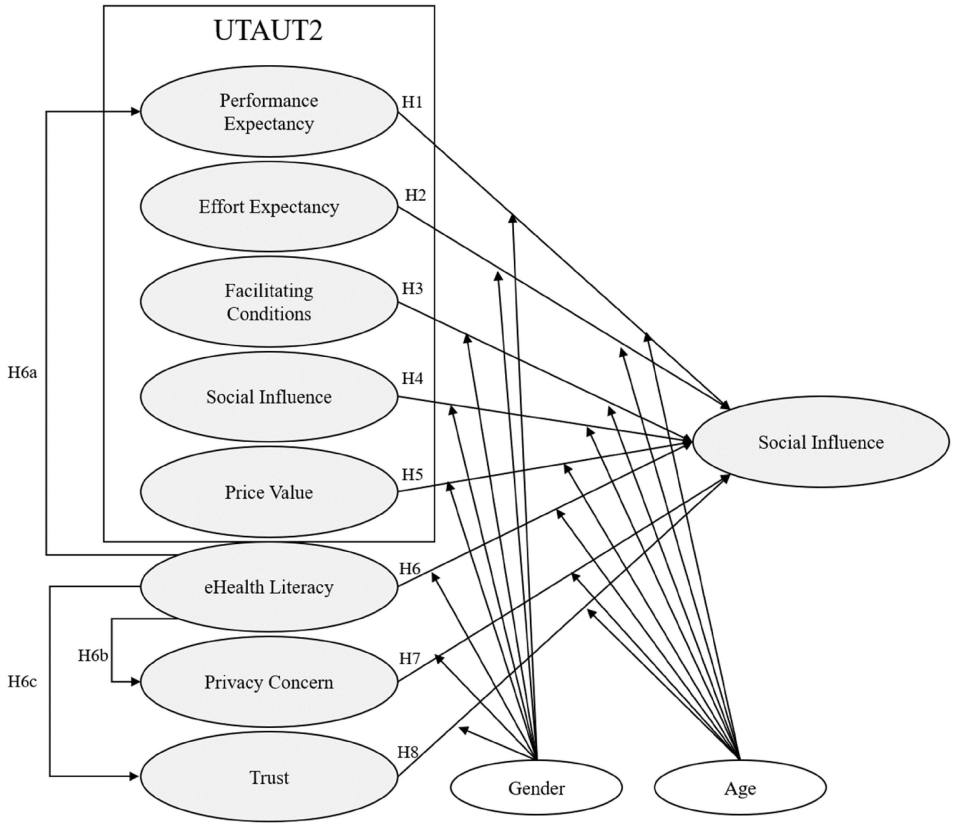

Fig. 1 Proposed Conceptual Model

3) Facilitating Condition

Facilitating conditions (FC) refers to the level of a consumer's belief in the necessary of adequate technical infrastructure, technological skills to complete a task on their own, or if they require assistance from others will support them to use or adopt a technology. This construct represents that users tend to have greater motivation to adopt new technologies if they perceive availability of resources, such as hardware, software, technical support, and training or assistance, that can facilitate technology adoption and use [6]. According to Alawan et al. [49], individuals tend to be interested in the availability of resources, facilities, and skills needed to use a technology effectively. In fact, the type of facilities required, such as gadgets, internet access, and secure applications, are critical factors that enable easy and fast access to any online services. Facilitating conditions is relevant for present study as consumers in Indonesia tend to use technology if they have adequate infrastructures, such as gadgets or internet access, and technical skill [52]. Moreover, most studies mention that the successful adoption of telemedicine services definitely depends on the presence of adequate technological infrastructure and technological skill [3], [67], [68], [86]. On the other hand, FC did not have a significant impact on the intention to use telemedicine in developed countries. This could be because having a virtual appointment with a doctor may not be seen as a daunting or complex undertaking, as it is viewed as an continuation of the routine activities that people already engage in their everyday lives, such as using video conferencing technology to communicate with their relatives [46]. Also, according to Kamal et al. [31], this construct was found to be driver that affecting usage intention of telemedicine service. Therefore, the hypothesis of this study was formulated as follows.

H3: Facilitating conditions significantly affects the behavioral intention to use telemedicine.

4) Social Influence

Social influence (SI) measures the extent to which social factors influence an individual's intention to use a technology. This means that individuals tend to consider the opinions and influence of others when deciding whether or not to use a technology or system [3], [67], [68], [86]. Social influence was discovered to be a crucial factor in

determining its acceptance of a technology as it may impact telemedicine adoption because individuals tend to seek validation and approval from others, especially from those who are important to them, such as family members and friends. If someone perceives that their social circle has positive attitudes toward telemedicine, they are more likely to adopt it themselves. On the other hand, if someone perceives that their social circle has negative attitudes toward telemedicine, they may be less likely to adopt it. Additionally, healthcare providers and professionals also play an important role in shaping patients' attitudes toward telemedicine, as they are trusted sources of information and guidance. Therefore, positive attitudes toward telemedicine from healthcare providers can also influence patients' intentions to use it. Kamal et al. [31] found that SI is a factor that influences the adoption of telemedicine based on their previous study. However, Baudier et al. [50] did not find any significant impact of this construct on the adoption of telemedicine in developed countries. However, the results may vary in different population. Therefore, the hypothesis of this study was formulated as follows.

H4: Social influence significantly affects the behavioral intention to use telemedicine.

5) Price Value

Price value (PV) measures the value that a technology offers in relation to its cost, is strongly correlated with the intention to use telemedicine. This construct is addressed to the cost issue of technology use. If patients perceive the cost of using telemedicine as reasonable and providing good value for their money, they are more likely to have the intention to use it. Conversely, if patients perceive the cost of using telemedicine as high and not worth the value, they are less likely to have the intention to use it. [3], [67], [68], [86]. In developing countries, the cost factor may play an important role in the decision to use technology. In the case of eHealth, people may perceive technology as a cost-effective alternative to visiting a hospital, particularly in rural areas where travel costs can add up [87]. Previously, Baudier et al. [6] conducted a study in developed countries and revealed that PV was one factor that affects the acceptance of telemedicine. This study aims to find out if this construct also affects behavioral intention to use telemedicine services among Indonesians. Therefore, the hypothesis of this study was formulated as follows.

H5: Price value significantly affects behavioral intention to use telemedicine.

6) eHealth Literacy

The term eHealth literacy (EHL) actually has a close meaning with digital literacy but is limited in digital health scope [88]. Having digital literacy means to possess both internet knowledge and internet skills. These terms are similar but slightly different. Internet knowledge involves understanding the unique language and terminology used on the internet, and being able to communicate this information effectively. Meanwhile, internet skills encompass the ability to use the internet proficiently, including operational and formal skills related to technical aspects, information skills involving searching, evaluating, and selecting information, and strategic skills that involve using information gathered from the internet to achieve personal and professional goals [89]. Nowadays, digital literacy is essential for people to function effectively. To communicate, learn, work, and carry out daily activities, it is critical to be proficient in the use of technology and the internet. Technological literacy enables individuals to make informed decisions about which technology to use and how to use it to improve their lives and the environment. Internet literacy is essential for accessing and evaluating information, communicating with others, and participating in online communities [90].

The initial notion of EHL was introduced by Norman and Skinner [91] when they coined the term eHEALS, which encompasses six primary competencies: traditional literacy, health literacy, scientific literacy, information literacy, media literacy, and computer literacy. eHealth literacy evaluates and measures consumers' abilities to use information systems related to health or health interventions, such as eHealth applications and electronic health records. Like any other technology, individuals must possess the skills to effectively locate, assess, and evaluate information obtained from sources. It is crucial to do the same with health-related information from the internet and apply the knowledge gained to solve health-related problems. Individuals who have sufficient technological literacy are more capable of evaluating whether to trust a technology, as they have proficiency to utilize, adjust, innovate, and appraise technology in a manner that benefits one's personal life, community, and surroundings. A previous study by Alsahafi et al. [92] used eHealth literacy, which was found to impact the behavioral intention to use electronic personal health records (ePHR) in Saudi Arabia. Additionally, ePHR is a tool that offers information about individual health data that is integrated into an electronic health record (EHR), categorizing ePHR as eHealth. Consequently, this study adopts one hypothesis previously proposed by Alsahafi et al. [92] to evaluate and determine the relationship between eHealth literacy performance expectancy and behavioral intention to use telemedicine. Therefore, the hypotheses are formulated as follows.

H6a: eHealth literacy significantly affects the behavioral intention to use telemedicine.

H6b: eHealth literacy significantly affects the performance expectancy to use telemedicine.

Additionally, digital literacy is crucial in using technology and is related to security aspects. A prior study by Ghaiumy Anaraky and Knijnenburg [93] suggests that digital literacy is one factor related to privacy decision-making. Consumers tend to seek information from sources they trust, including online health information sources. Thus, this study aims to assess the relationship between digital literacy in the eHealth context and consumers' privacy concern and trust.

H6c: eHealth literacy significantly affects the privacy concern to use telemedicine.

H6d: eHealth literacy significantly affects trust to use telemedicine.

7) Privacy Concern

Privacy concern (PC) refers to the apprehension that consumers feel regarding the disclosure of their personal information [94]. In today's world, smartphones offer not just traditional phone and messaging services but also internet-based services, allowing users to access various websites and online services. This trend is reflected in the growing number of people using devices in Indonesia. However, despite this increase, many smartphone users in Indonesia still lack awareness of their privacy and personal information [95]. In the area of health-related information, Angst and Agarwal [96] emphasized that privacy is a significant concern in the electronic health field due to the confidential nature of health data. Aydin and Kumru [97] also have stated that PC has emerged as a critical factor affecting the adoption of health systems. In other words, consumers' concerns about their personal information being disclosed can influence their willingness to use health-related systems. The unauthorized use of personal information in electronic services can lead users to lose confidence and perceive potential harm from others accessing their information without authorization Van Dyke et al. [98]. In the context of eHealth, Dhagarra et al, [99] mentioned that individuals perceive awareness about their data that can be exploited without their knowledge, and therefore, concerns about privacy are likely to affect their willingness to accept or adopt certain technologies. According to Wiweko et al. [27], privacy concerns continue to be an issue in Indonesia with regards to telemedicine. Baudier et al. [6] examined the impact of privacy concern on the behavioral intention to use telemedicine cabin. Telemedicine cabin is a novel technology that allows patients to perform independent health assessments through telemetry and receive immediate interventions in case of an emergency, thus reducing waiting time. The study found that privacy concern is a crucial factor influencing students' willingness to use telemedicine cabin. Therefore, we formulated the hypothesis for our study as follows:

H7: Privacy concern significantly affects behavioral intention to use telemedicine.

8) Trust

Trust (TR) refers to an individual's confidence in electronic services, specifically telemedicine in this context [100], [101]. Singh and Matsui [80] found that trust plays a critical role when using online service platforms like eCommerce, as it has an impact on user behavior. Trust is one way to encourage the adoption of digital health technology [85]. A previous study by Semiz and Semiz [36] examined various factors that impact mobile health applications, including Trust. Their study demonstrated that trust significantly influences an individual's behavioral intention to use telemedicine, indicating that it impacts patients' perception of the system and their willingness to utilize telemedicine for healthcare delivery through digital technology. As a result, this study adopts the hypothesis from Singh and Matsui [80] to examine the association between trust and behavioral intention to use telemedicine. If individuals have adequate literacy about technology, they will be able to decide whether to trust or not trust it. Adequate technological literacy will help them to assess the trustworthiness of a technology, since they have the skills to use, adapt, create, and evaluate technology in a way that benefits themselves, their community, and the environment [89].

H8: Trust significantly affects behavioral intention to use telemedicine.

9) Gender

Gender plays an important role as a moderating variable in both versions of the Unified Theory of Acceptance and Use of Technology (UTAUT) [67], [68]. Men and women generally exhibit distinct attitudes, preferences, and technological experiences that may influence their technology use and the outcomes they derive from it. For instance, in the healthcare context, women are more likely to seek information regarding their overall health condition, while men are more inclined to search for information related to a particular chronic health problem

[102]. Furthermore, men and women may also have distinct ways of interacting with healthcare technology. Women may be more influenced by factors such as perceived usefulness, social influence, and effort expectancy when adopting new technologies, while men may prioritize facilitating conditions [3]. According to Dopelt et al. [103] gender also influences level of eHealth literacy, with females demonstrating a higher level of literacy than males. Additionally, gender has an impact on people's attitudes toward privacy concerns in relation to technology [104]. Gender is viewed as a moderating factor in the relationship between these factors and the adoption of technology. However, the extent to which gender moderates technology adoption may vary depending on the specific context and type of technology being examined.

H9: Gender moderates all relationships mentioned.

10) Age

The acceptance, adoption, and use of new technologies are affected by age, making it a crucial factor to consider. According to Venkatesh et al. [67], [68], both UTAUT and UTAUT2 models recognize age as a moderating variable. Age affects how individuals interact with technology, as physical, cognitive, and sensory changes that occur with aging can limit one's ability to learn and effectively use new technologies. On the other hand, younger generations are more exposed to technology from an early age, influencing their attitudes and beliefs toward technology and making them more inclined to explore and use new technologies. In context of telemedicine, Miyawaki et al. [105] mentioned that younger individuals tend to be more familiar and inclined to use telemedicine compared to the elder ones. According to Baudier et al. [50], elder individuals typically prefer to have in-person consultations with doctors rather than using alternative methods such as telemedicine. Hence, age plays a significant role in shaping an individual's perception of technology. Thus, when studying the acceptance, adoption, and use of new technologies, age is relevant to be considered as a moderating variable. This moderating variable was categorized into three groups within the sample: adults between 17 and 25, adults between 26 and 35, and older adults between 36 and 55.

H10: Age moderates all relationships mentioned.

III. METHODS

A. Data Collection

The data collection was conducted online through a survey. The Google Form questionnaire was distributed randomly among Indonesians. The target population was people who had reached legal adult age and knew about or had used telemedicine platforms. In Indonesia, those who are eighteen or over are considered legal adults, which is related to the ability of decision-making using technology. The participants were anonymously recruited and were open to those who had prior experience or not. The online survey was participated entirely by a total of 144 respondents. Table 2 presents the findings of respondents' demographic factors such as gender, age, educational level, experience of telemedicine usage, occupation, and monthly income.

B. Instrument Developments

The research instruments were developed to design the questionnaire and were adapted from previous relevant studies. All instruments were adjusted according to the needs of this study, as seen in Table 3. INT, PE, EE, FC, SI, and PV were adapted from Venkatesh et al. [67] and Venkatesh et al. [68]. EHL was adapted from Norman and Skinner [91] and Alsahafi et al. [92]. PC was adapted from Baudier et al. [50] and TR was adapted from Singh and Matsui [80]. The questionnaire provides a 5-point Likert scale, ranging from 1 (strong disagreement) to 5 (strong agreement). The definition of telemedicine was explained, and examples of telemedicine platforms such as Halodoc, Alodokter, KlikDokter, SehatQ, etc., were also provided in the questionnaire. All instruments were adjusted to fit the specific needs of this study.

IV. RESULTS

The data analysis process consisted of three stages for the measurement model. The first stage involved conducting a measurement model on all variables and indicators in the questionnaire to assess convergent validity, discriminant validity, and construct reliability. This stage is detailed in section A. The second stage was the structural modeling stage, which examined the relationships between factors to explain causality. This stage is described in section B. The third and final stage is hypothesis testing to examine the causality of latent variables. This stage is described in section C.

TABLE 1
RESEARCH INSTRUMENTS

Variables	Items	Factors	References
INT	INT1	I intend to use telemedicine in the next several months	[67], [68]
	INT2	I intend to continue using telemedicine in the future	[67], [68]
	INT3	I will always try to use telemedicine in my daily life	[67], [68]
	INT4	I plan to continue to use telemedicine frequently	[67], [68]
PE	PE1	I find telemedicine useful (to health aspects) in my life	[67], [68]
	PE2	Using telemedicine increases my chances of meeting my need (about health aspects)	[67], [68]
	PE3	Using telemedicine helps me in managing my daily healthcare more quickly	[67], [68]
	PE4	Using telemedicine service increases my capability to manage my health.	[67], [68]
EE	EE1	Learning how to use telemedicine is easy for me.	[67], [68]
	EE2	My interaction with telemedicine is clear and understandable	[67], [68]
	EE3	I find telemedicine easy to use.	[67], [68]
	EE4	It is easy for me to become skillful at using telemedicine services.	[67], [68]
FC	FC1	I have the resources necessary to use telemedicine.	[67], [68]
	FC2	I have the knowledge necessary to use telemedicine.	[67], [68]
	FC3	Telemedicine is compatible with other technologies I use.	[67], [68]
	FC4	I can get help from others when I have difficulties using telemedicine.	[67], [68]
	FC5	Guidance will be available to me in the use of telemedicine services	[67], [68]
SI	SI1	My relatives, family, and working environment influence my intention to use telemedicine.	[67], [68]
	SI2	People who are important to me think I should use telemedicine.	[67], [68]
	SI3	Health staff and physicians encourage and support me to use telemedicine in providing healthcare services	[67], [68]
	SI4	Using telemedicine would make me have a higher status than others who do not.	[67], [68]
PV	PV1	Telemedicine enables me to use health services at a reasonable price.	[68]
	PV2	Telemedicine services are good value for money.	[68]
	PV3	At the current price, telemedicine provides a good value.	[68]
EHL	EHL1	I know what health resources are available on telemedicine.	[91], [92]
	EHL2	I know where to find helpful health resources on telemedicine.	[91], [92]
	EHL3	I know how to find helpful health resources on telemedicine.	[91], [92]
	EHL4	I know how to use telemedicine to answer my questions about health.	[91], [92]
	EHL5	I know how to use the health information I find on telemedicine to help me	[91], [92]
	EHL6	I can tell high-quality health resources from low-quality health resources on telemedicine.	[91], [92]
	EHL7	I feel confident in using information from telemedicine to make health decisions.	[91], [92]
PC	PC1	The use of telemedicine could have some consequences such as the loss of control over the confidentially of information	[50]
	PC2	The use of telemedicine could impact your private life as personal data could be used without your authorization.	[50]
	PC3	The use of telemedicine is a direct access to your personal information.	[50]
	PC4	I feel it would be very risky to provide personal information on telemedicine applications	[50]
TR	TR1	I trust the telemedicine platform, which I use to consult with healthcare professionals online.	[80]
	TR2	I believe that the telemedicine platform ensures the security of my transactions and personal health information when I use it to consult with healthcare professionals.	[80]
	TR3	I believe that the telemedicine platform will keep its promises and commitments when I use it to access healthcare services.	[80]
	TR4	I feel that telemedicine is a trustworthy way to access healthcare services online.	[80]

A. Respondent Demographics

This online survey was participated by 144 adult individuals with various educational backgrounds and occupations. The survey participants ranged in age from 17 to 55 years old. The age range of the sample covers a significant portion of the adult population, which could provide insights into the attitudes and behaviors of different age groups toward technology adoption. Table 2 presents the respondents' demographics.

According to Table 2, 99 out of the 144 respondents who completed the questionnaire were female, which represents 69.2% of the total sample. Most of the respondents were private employees (28%) and entrepreneurs (16%). Regarding age, most respondents were between 17-25 years old (53.5%), followed by the 26-35 age range (33.3%). This suggests that the sample mainly consists of young adults who can make their own decisions [108]. This finding is consistent with Miyawaki et al. [105], who reported that younger individuals tend to use telemedicine more than older individuals.

The data also show that, despite many respondents being private employees and entrepreneurs, most of them had a monthly income of less than IDR 3,000,000. This could be due to different average incomes in each province or the low-income status of Indonesia. Most respondents had a bachelor's degree, indicating a high level of education and awareness in Indonesia. However, the data suggest that education level alone does not necessarily affect income. These findings are consistent with data from APJII [109], which show that highly educated female users in the productive age group dominate the ratio of internet users to the total population each year.

The results show that the highest frequency of telemedicine usage was either close to never (46.9%) or 1-2 times (46.2%). This suggests that people still prefer face-to-face doctor encounters over virtual services. Most of the respondents were bachelor's graduates, which supports the statement that educated individuals are more likely to use

telemedicine. However, 46.9% of the respondents had never used telemedicine, indicating that the utilization of telemedicine among adults in Indonesia is relatively low compared to other countries [29].

TABLE 2
RESPONDENT DEMOGRAPHICS

Demographic Variables	Categories	Frequency	Percentage
Gender	Male	44	30.8%
	Female	99	69.2%
Age	17 – 25 years old	77	53.5%
	26 – 35 years old	48	33.3%
	36 – 55 years old	18	12.5%
Educational Level	Elementary School	0	0%
	Middle School	3	2.1%
	High School	21	14.7%
	Diploma	17	11.9%
	Bachelor	84	58.7%
	Master	11	7.7%
	Doctoral	0	0%
	Not Attending School	0	0%
	Others	7	4.9%
Experience of Using Telemedicine	Never	67	46.9%
	1 - 3 times	66	46.2%
	4 - 6 times	6	4.2%
	> 6 times	4	1.8%
Occupation	Civil Employee (Neither Teacher nor Lecturer)	15	10.5%
	Teacher or Lecturer (Private School/University/College)	2	1.4%
	Teacher or Lecturer (Non-Private School/University/College)	4	1.8%
	Health Workers (Physicians, Nurse, etc.)	11	7.7%
	Entrepreneur	24	16.8%
	Retiree	1	0.7%
	Not Working	0	0%
Monthly Income	< 1,000,000	23	16.1%
	1,000,000 – 1,999,999	56	39.2%
	3,000,000 – 4,999,000	31	21.6%
	5,000,000 – 7.000,000	15	10.5%
	> 7,000,000	18	12.6%

B. Measurement Model

The measurement model test consisted of three main components, namely convergent validity, discriminant validity, and construct reliability. Following Hair et al. [106], convergent validity was assessed based on the correlation between each indicator and its corresponding latent variable or construct, with a loading factor value of 0.70 or higher being considered acceptable. Discriminant validity is aimed to ensure that each latent variable or construct is distinct and unrelated to other variables, which was evaluated using different criteria, such as Fornell-Larcker, average variance extracted (AVE), or loading factor values. Discriminant validity was deemed adequate when the square root of AVE value in the construct was greater than the construct's correlation with other latent variables. AVE value was expected to be equal to or greater than 0.50. The adequacy of discriminant validity was also determined based on the loading factor values of correlations between each indicator with their original construct and those between each indicator with other constructs. The last component was construct reliability, which was assessed based on the values of Cronbach's alpha (CA) and composite reliability (CR). A value of 0.70 or higher was considered reliable for both measures, indicating the internal consistency of each construct or latent variable and the reliability value of each indicator of a construct or latent variable. The measurement model is presented in Table 3.

Table 3 presents the findings that validate the measurement model used in the study. The convergent validity test indicates that the indicators have a strong correlation with their corresponding constructs or latent variables, as demonstrated by a loading factor value of at least 0.70. This confirms that the indicators are indeed measuring the intended construct. The discriminant validity test also confirms the adequacy of the measurement model. The AVE value of each construct or latent variable is greater than or equal to 0.50, which suggests that the measurement model is reliable in distinguishing between different constructs being measured. Additionally, the construct reliability test demonstrates the reliability of the measurement model, as indicated by the values of Cronbach's alpha and composite reliability being greater than or equal to 0.70. This indicates that both constructs or latent variables and the indicators used to measure them are consistent and dependable. In summary, these findings suggest that the measurement model used in the study is valid and reliable.

TABLE 3
RELIABILITY & VALIDITY TEST

Latent Variable	Items	Loadings Factors	Cronbach's Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)
INT	INT1	0.841	0.869	0.911	0.718
	INT2	0.825			
	INT3	0.862			
	INT4	0.861			
PE	PE1	0.834	0.89	0.924	0.753
	PE2	0.904			
	PE3	0.858			
	PE4	0.872			
EE	EE1	0.863	0.902	0.932	0.773
	EE2	0.922			
	EE3	0.909			
	EE4	0.82			
FC	FC1	0.774	0.821	0.874	0.582
	FC2	0.768			
	FC3	0.762			
	FC4	0.796			
	FC5	0.712			
SI	SI1	0.839	0.869	0.911	0.718
	SI2	0.877			
	SI3	0.881			
	SI4	0.79			
FC	FC1	0.774	0.821	0.874	0.582
	FC2	0.768			
	FC3	0.762			
	FC4	0.796			
	FC5	0.712			
PV	PV1	0.757	0.76	0.862	0.678
	PV2	0.907			
	PV3	0.856			
EHL	EHL1	0.784	0.916	0.933	0.666
	EHL2	0.875			
	EHL3	0.857			
	EHL4	0.825			
	EHL5	0.843			
	EHL6	0.771			
	EHL7	0.748			
PC	PC1	0.805	0.895	0.924	0.754
	PC2	0.901			
	PC3	0.908			
	PC4	0.856			
TR	TR1	0.765	0.888	0.923	0.75
	TR2	0.907			
	TR3	0.907			
	TR4	0.877			

C. Structural Models

R^2 (R-squared) and Q^2 (Q-squared) are both measures used to assess the goodness of fit of a structural model. According to Hair et al. [107], the purpose of R^2 evaluation measure determines the proportion of variance in the dependent variable that is accounted for by the independent variable or latent variable in the model. It is typically expressed as a percentage and can range from 0 to 1. A greater R^2 value implies that the model is more effective in accounting for the variation in the dependent variable. R^2 is classified into three levels based on the degree of correlation between the dependent and independent variables, namely weak, moderate, and strong or substantial. If the R^2 value is ≥ 0.75, it is considered strong. If the R^2 value is between 0.75 and 0.50, it is considered moderate, while if the R^2 value is less than 0.50, it is considered weak. Meanwhile, Q^2 is used to evaluate a model's ability to predict the dependent variable by utilizing out-of-sample data. Its range is from 0 to 1, and the accuracy of the model's predictions improves as the Q^2 value approaches the R^2 value. However, negative Q^2 values suggest that the model's predictions are not as good as the observed values' mean. Although there is no consensus on the acceptable Q^2 value threshold, Q^2 values greater than 0 generally indicate evidence of predictive relevance [107]. The R^2 and Q^2 measurements for this study are presented in Table 4.

Table 4 presents the R^2 and Q^2 values for various variables, and the results show that the strength of the INT variable is moderate, while the strength of the PC variable is strong. In contrast, the PE and TR variables have weak strength, which suggests that these variables are less likely to be explained by other independent variables. The R^2

results also indicate that the INT and PC variables are more likely to be explained by other independent variables. On the other hand, the weak strength of the PE and TR variables suggests that they may be affected by factors beyond the scope of the study. However, the Q^2 values for all the endogenous constructs are greater than 0, indicating that these constructs have predictive power. This means that the model can accurately predict the values of the dependent variables using the independent variables. Overall, the results suggest that the model is effective in predicting the values of the endogenous constructs.

TABLE 4
STRUCTURAL MODELS MEASUREMENT

Variables	R^2	Description	Q^2	Description
INT	0.614	Moderate	0.353	Yes
PC	0.076	Strong	0.072	Yes
PE	0.401	Weak	0.255	Yes
TR	0.351	Weak	0.286	Yes

D. Hypothesis Measurement

Based on Hair et al. [106], the hypothesis measurement was carried out by reviewing the p values and the significance level is 0.05. Fig. 2 presents the statistical analysis and measurement model and Table 5 represents the result of hypothesis measurement.

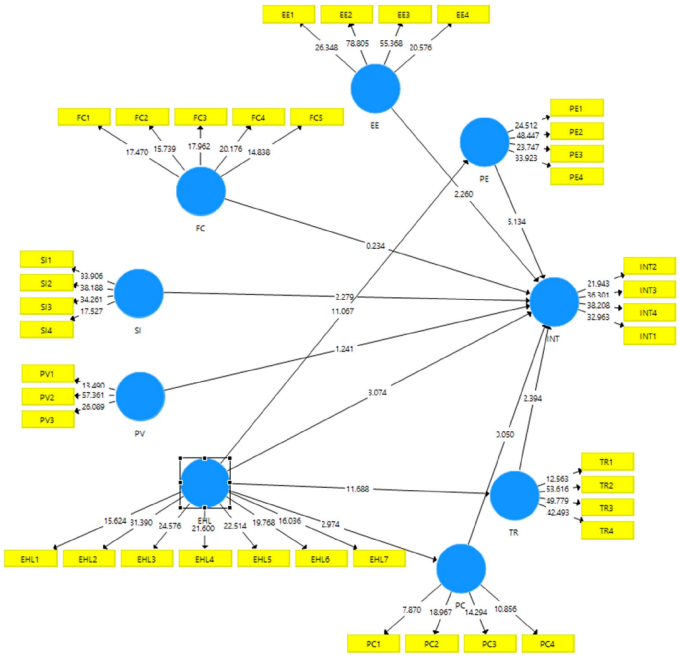

Fig. 2 Measurement Model

TABLE 5
THE SIGNIFICANCE OF THE RELATIONSHIPS IN THE MODEL

Hypotheses	Relationships	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values*	Status
H1	PE → INT	0.436	0.437	0.085	5.134	0.000	Accepted
H2	EE → INT	0.223	0.212	0.099	2.260	0.024	Accepted
H3	FC → INT	0.022	0.033	0.093	0.234	0.815	Rejected
H4	SI → INT	0.175	0.178	0.077	2.279	0.023	Accepted
H5	PV → INT	0.099	0.091	0.080	1.241	0.215	Rejected
H6	EHL → INT	-0.265	-0.263	0.086	3.074	0.002	Accepted
H6a	EHL → PE	0.633	0.639	0.057	11.067	0.000	Accepted
H6b	EHL → PC	-0.003	-0.003	0.061	0.050	0.960	Accepted
H6c	EHL → TR	0.592	0.594	0.051	11.688	0.000	Accepted
H7	PC → INT	0,054	0,044	0,097	0,562	0,574	Rejected
H8	TR → INT	0.212	0.221	0.089	2.394	0.017	Accepted

Based on Table 4, there are three hypotheses rejected, namely H3 (FC→BI), H5 (PV→BI), and H7 (PC→ BI). Meanwhile there are eight hypotheses accepted, namely H1 (PE→BI), H2 (EE→BI), H4 (SI→BI), H6a (EHL→BI), H6b (EHL→PE), H6c (EHL→PC), H6d (EHL→TR), and H8 (TR→BI).

E. Moderating Effects

To examine the moderating effects of gender and age on the research model's constructs, the path coefficients, t-values, and p-values were analyzed through bootstrapping using the SmartPLS3 Multi-Group Analysis procedure which is a statistical technique that enables to analyze differences in relationships between variables across different groups and it can be useful to examine if the relationships between variables are different across different subgroups, such as gender and age. Although UTAUT2 employed three moderating variables, such as age, gender, and experience, experience was not included as moderating variable in this study due to the uneven distribution of the population. Most respondents have either never used telemedicine or have only used it 1-3 times. Furthermore, the number of respondents who have used telemedicine 4-6 times or more than six times was insufficient to examine, which could result in an incomplete representation of the data. Table 6 represents the result measurement of the relationships of the model were moderated by gender and Table 7 represents the result measurement of the relationships of the model moderated by age.

TABLE 6
MODERATING VARIABLE GENDER

Hypotheses	Relationship	Male			Female		
		Path Coefficient	t-value	P Values	Path Coefficient	t-value	P Values
H1	PE → INT	0.533	2.747	0.006	0.343	3.421	0.001
H2	EE → INT	0.093	0.426	0.670	0.291	2.478	0.014
H3	FC → INT	0.026	0.112	0.910	0.021	0.192	0.848
H4	SI → INT	0.156	0.685	0.494	0.176	2.096	0.037
H5	PV → INT	0.134	0.667	0.505	0.089	0.820	0.413
H6	EHL → INT	-0.231	1.270	0.205	-0.287	2.354	0.019
H7	PC → INT	0.011	0.069	0.945	0.012	0.156	0.876
H8	TR → INT	0.153	0.790	0.430	0.295	2.878	0.004

According the result, the effects of PE is significant among both male (β=0.533, t-value=2.747) and female (β=0.343, t-value=3.421) respondents. However, EE (β=0.291, t-value=2.478), SI (β=0.176, t-value=2.096), EHL (β=-0.287, t-value=2.354), and TR (β=0.295, t-value=0.004) are significant among female respondents.

TABLE 7
MODERATING VARIABLE AGE

Hypotheses	Relationship	17 - 25			26 - 35			36 - 55		
		Path Coefficient	t-value	P Values	Path Coefficient	t-value	P Values	Path Coefficient	t-value	P Values
H1	PE → INT	0.377	3.359	0.001	0.641	3.828	0.000	0.100	0.911	0.913
H2	EE → INT	0.138	0.999	0.318	0.438	2.847	0.005	0.420	1.256	0.738
H3	FC → INT	0.055	0.447	0.655	-0.220	1.564	0.118	0.630	0.818	0.441
H4	SI → INT	0.229	2.118	0.035	0.128	0.852	0.395	-0.199	0.859	0.817
H5	PV → INT	-0.024	0.188	0.851	0.177	1.308	0.191	-0.112	1.007	0.912
H6	EHL → INT	-0.246	1.872	0.062	-0.151	0.898	0.370	-0.569	1.259	0.652
H7	PC → INT	-0.010	0.134	0.894	-0.008	0.071	0.944	-0.140	0.747	0.852
H8	TR → INT	0.318	2.545	0.011	-0.065	0.498	0.619	0.877	0.837	0.295

According the results, the effects of PE is significant among young adults 17 – 25 years old (β=0.377, t-value=3.359) group and 26 – 35 years old (β=0.641, t-value=2.828). Effort expectancy is significant among 26 – 35 years old (β=0.438, t-value=2.847). Trust is significant among 17 – 25 years old group (β=0.318, t-value=2.545).

V. DISCUSSION

A. Hypothesis Measurement Results

Finally, this study examined the factors affecting individuals' intentions to use telemedicine. To determine the key predictors of telemedicine usage intention, this study has employed the UTAUT2 model. Apart from the original items of UTAUT2, this study also employed several additional factors such as eHealth literacy, privacy concern, and trust. UTAUT2 theory is relevant and provides a good predictive model to explore adoption for a healthcare context [46], [48]. According to the results, performance expectancy, effort expectancy, social influence, eHealth literacy,

and trust were found to have considerable influence and play a significant role to affect intention to use telemedicine.

Consistent with earlier studies conducted by Venkatesh et al. [67], [68] performance expectancy (β= 0.436, *t-value* = 5.134) has significant effect on technology adoption. In the context of healthcare, Alam et al. [3], Schmitz et al. [46], and Serrano et al. [40] view performance expectancy as a driving factor for telemedicine acceptance and one of the important determinants of people's intention to use the digital healthcare platform. When people perceive telemedicine as a helpful technology for virtual healthcare access, their likelihood of using telemedicine increases [61]. For instance, users can schedule a virtual appointment with a doctor or consult with a healthcare professional online. In essence, people who recognize the usefulness of telemedicine in facilitating virtual healthcare access will know that telemedicine is an alternative when they cannot meet a doctor in person. Furthermore, the findings suggest that people today recognize the importance of telemedicine and view it as a useful tool for accessing healthcare services virtually. In addition, telemedicine is seen as a solution for avoiding common inconveniences such as long wait times, travel, and traffic congestion that can make it difficult to meet with a doctor in person [36], [40], [50], [85].

This study also found that effort expectancy (β= 0.223, *t-value* = 2.260) significantly affects individuals' intention to use telemedicine, which indicates that people tend to use a technology if they perceive the easiness of using it, which is aligned with previous study by Sabbir et al. [61], which suggests that if telemedicine usage is straightforward and easy, individuals are more inclined to utilize it. In the context of telemedicine, consumers tend to use the service to make virtual doctor appointments or virtual encounters with healthcare professionals if the system provides easy access and understandable user experience. In other words, the more the telemedicine platform provides lack of technical difficulties and is easy for consumers to use and navigate without confusion or frustration, the more people are likely to use it. It may involve the clarity of instructions, the simplicity of the interface, and the use of familiar and recognizable features.

Social influence (β= 0.175, t-value = 2.279) also has a considerable influence and plays a significant role in telemedicine, which supports the accepted hypothesis H4. This hypothesis is supported by previous studies [6], [61]. A study by Alam et al. [3] mentioned that relatives and family suggest some people or doctors use telemedicine. The reality supports this : most Indonesian people are impressionable and tend to depend on other people's opinions to make a decision in using technology like e-commerce [110]. This means, behavior of consumers is significantly influenced by the opinions and recommendations of their peers, relatives, family, and friends who recommend the use of online service platforms, including telemedicine [81]. Seeing a technology is widely used in the surrounding environment, can encourage individuals to follow the trend and be influenced to adopt and utilize it themselves [52], [111].

This study also found that trust (β= 0.223, t-value = 2.260) was identified as a significant factor in the utilization of digital health service platforms. As found by Singh and Matsui [80], trust is crucial in using online service platforms because there is no direct interaction. This also applies to the use of telemedicine services, as consultations and treatments are conducted online without involving face-to-face meetings with doctors or healthcare professionals. Therefore, trust becomes one way to encourage the adoption of digital health technology, including telemedicine, so that users feel comfortable and confident in using the service. This can be achieved by taking steps such as ensuring the security of online transactions, protecting customer information, and providing fast and responsive communication services to users.

The ability to understand and use electronic health information, known as eHealth literacy (β= -0.265, *t-value* = 3.074), plays an important role in telemedicine. This finding supports the idea that having higher eHealth literacy leads to better use of telemedicine, as evidenced by a study by Alsahafi et al. [92] about personal health records. This may be because higher digital health literacy can improve individuals' self-efficacy, which in turn can encourage them to take better care of themselves. Another study by Li et al. [112] suggests that behavior in using the internet also affects eHealth literacy. Furthermore, this construct also has been shown to influence performance expectancy (β= 0.633, t-value = 11.067), trust (β= 0.212, t-value= 2.394), and privacy concerns (β= -0.003, t-value= 0.050), which in turn, affects their adoption. In this context, trust encompasses several aspects such as privacy, reliability, and security [3]. This could be due to the fact that individuals who are literate in using the technology or the internet are able to recognize harmful or unlawful content on the internet, communicate effectively online, protect their personal information, and take steps to ensure their online security [90]. Adequate eHealth literacy can also enhance the efficiency and effectiveness of telemedicine adoption, as individuals with higher eHealth literacy are more likely to adopt and use telemedicine platforms proficiently. Patients are more likely to consider using digital health services if they trust that their personal information is protected by healthcare providers [113]. This finding is consistent with previous studies which have shown that trust is a crucial factor affecting people's willingness to adopt new technologies [114]. Individuals' level of technology literacy is a determining factor in their

ability to make informed decisions about trust toward the technology [115]. As results show, enhancing eHealth literacy is crucial as it enables individuals to effectively utilize and navigate online health resources and information. In the context of telemedicine, it is essential for patients to have the ability to comprehend and utilize telemedicine platforms to remotely access healthcare services. Patients with low eHealth literacy may face challenges in using telemedicine platforms, which can hinder their ability to access healthcare services. Communicating effectively in this context generally refers to being able to convey a message clearly and accurately through online channels and involves being familiar with various forms of digital communication and choosing the most appropriate one for a given situation. Some previous studies have suggested that low eHealth literacy is linked to social inequalities in internet access [28], [112]. Therefore, it is important to improve factors like literacy to encourage greater eHealth literacy and promote the use of telemedicine. Other studies suggest that age and gender can also affect eHealth literacy, highlighting the need for telemedicine systems that are easy to understand for people of all ages and genders [116], [117].

However, there were also several hypotheses that were not supported, namely facilitating condition, price value, and privacy concern. This indicates that these factors are not considered to have significant roles in the study.

Facilitating conditions (β= 0.222, *t-value* = 0.815) was found has no significant effect on individual's behavioral intention to use telemedicine. This hypothesis is aligned with previous studies [6], [15], [39], [46]. This suggests that, currently, people do not face any major challenges related to technical infrastructure or requiring help with using technology. Consequently, they tend to have adequate facilitation or knowledge to access telemedicine themselves [15]. Meanwhile, facilitating conditions tend to affect actual usage rather than behavioral intention to use and are also affected by an individual's age [6]. The outcome is not surprising and reasonable as Indonesia boasts a significant number of individuals who use gadgets and smartphones. Additionally, internet usage is more prevalent among the younger adult's generation in Indonesia, particularly those who were born and raised in the digital age [109]. As a result, they are more familiar with technology and have grown up using various digital devices and platforms. This familiarity makes them more confident in using technology and less likely to encounter difficulties when using it [15]. However, this result must be also related with the evidence that Indonesia consists of not only urban and rural regions. Indonesians who live in regencies with less dense populations and a high number of rural regions experience low mobile internet connectivity because the providers tend to prioritize urban areas with a dense population [109].

The lack of significant effect of price value (β= 0.099, *t-value* = 1.241) on behavioral intention to use telemedicine may suggest that people in Indonesia do not prioritize the cost of healthcare services when considering using telemedicine. This finding goes against previous studies that have also examined price value as a factor, given that Indonesia is a developing country and many individuals, particularly in rural areas, may be concerned about the cost of visiting a hospital, including transportation costs [3]. However, the study by Alam et al. [118] also suggests that the current socioeconomic situation in the country may be reflected in people's perception of price value. Octavius et al. [41] also support this finding that if the cost of consultation is covered by national or private health insurance, people may be more willing to use telemedicine. Therefore, it appears that most Indonesians believe that using telemedicine can save them money on transportation, parking, and medical bills, making the cost of healthcare services less of an issue for them [119].

The privacy concern (β= 0,054, *t-value* = 0,562) hypothesis was not supported by the findings, indicating that individual concerns about the privacy of their personal health information did not significantly affect their intention to use telemedicine. This result is contrary to previous research that has identified privacy concerns as a significant factor influencing adoption of digital health technologies [6], [120]. Meanwhile, privacy itself was defined as "…right to control access to places, locations, and personal information along with use and control rights to these goods…" and we need to start considering our perspective about the value of privacy as technology advances [121], [122]. Privacy is a critical issue in the electronic health domain because of the sensitivity of health data [96]. This finding is in contrast with the fact that privacy concern has been very important to health system adoption as electronic service usage may increase their awareness that their information will be misused by others without their authorization [97], [98]. This finding is supported by Devina et al. [123]. It is reasonable that the adoption of telemedicine is not greatly impacted by privacy concerns, as many users of these applications tend to disregard the extensive privacy policy section and continue without thoroughly reading it. This is likely due to a general lack of awareness and limited understanding about privacy in regard to using digital services, which is prevalent among most Indonesians. [95], [123].

B. Moderating Effects

The study revealed diverse outcomes in relation to the moderating variables of age and gender. Notably, there were notable differences observed between male and female adults regarding their effort expectancy and trust.

Performance expectancy is significant among young adults 17 – 25 years old (β=0.377, t-value=3.359) group and 26 – 35 years old (β=0.641, t-value=2.828), Effort expectancy is significant among 26 – 35 years old (β=0.438, t-value=2.847) and trust is significant among 17 – 25 years old group (β=0.318, t-value=2.545). These variables were found to have a significant effect on individuals under 35 (26 – 35 years old). This finding contradicts study by Schmitz et al. [46] where they found that performance expectancy and effort expectancy are more crucial for adults over the age of 35. However, Alam et al. [3], suggested that younger people tend to perceive technology as more useful compared to older individuals. According to Baudier et al. [50], younger individuals possess greater awareness of the risks to their personal information compared to older adults. This perception of risk may have an impact on their trust when it comes to using telemedicine.

Additionally, regarding gender as moderating variable, the effects of performance expectancy is significant among both male (β=0.533, t-value=2.747) and female (β=0.343, t-value=3.421) respondents. Meanwhile, effort expectancy (β=0.291, t-value=2.478), social influence (β=0.176, t-value=2.096), eHealth literacy (β=-0.287, t-value=2.354), and trust (β=0.295, t-value=0.004) were discovered to have a stronger and more significant impact on women. In terms of performance expectancy, it is possible that rather than men, women may be more likely to take into account the potential usefulness of telemedicine before deciding to utilize it [3]. Generally, women are more receptive to the opinions of others and give greater importance to social influence when deciding to adopt new technologies [67]. Also, women are generally more attentive to the effort required for a task and more sensitive to the effort-reward trade-off. Women may also have higher standards for ease of use and may be less tolerant of technologies that require a lot of effort to use [3], [67]. Additionally, women may have more responsibilities and time constraints that make ease of use and efficiency more important to them when considering the adoption of new technologies [67], [92], [124]. Since women tend to be more influenced by social factors when it comes to adopting new technologies, including telemedicine, women may be more likely to trust telemedicine if they receive positive feedback and recommendations from their social network [102].

C. Contributions and Implications

Finally, this research contributes to the existing literature on telemedicine adoption by examining relationships between constructs and identifying factors that impact people's willingness to use virtual healthcare services. The study employed the UTAUT2 model to expand its usefulness in the context of telemedicine in Indonesia. The study found that performance expectancy, effort expectancy, and social influence, which are original constructs of the UTAUT and UTAUT2 model, have a significant, direct, and positive impact on the intention to use telemedicine. Other constructs such as eHealth literacy, privacy concern, and trust were also incorporated, and the results showed that eHealth literacy and trust had a significant impact on the adoption of telemedicine. The study concluded that the intention to use telemedicine is influenced by several factors, namely performance expectancy, effort expectancy, social influence, eHealth literacy, and trust, while facilitating condition, price value, and privacy concern did not show a significant impact. These findings offer insight into improving and advancing telemedicine in the future.

Since performance expectancy and effort expectancy were found to affect telemedicine adoption, then it is important consider the design of telemedicine platforms in future. The design should prioritize user-friendliness to ensure ease of use and accessibility for patients, simple and comprehensible instructions to enable quick understanding, ease of operation, an enjoyable user experience during remote care through telemedicine will be an excellent consideration to improve the quality of care so that the interactions between doctors and patients satisfying design, and usefulness in providing efficient functionality. It is also important to integrate secure and reliable technology into the telemedicine system regularly, assess and upgrade the system consistently. This enables healthcare providers to improve the outcomes quality and reduce costs effectively and efficiently [125].

The study offers healthcare professionals and providers insights to improve the quality of care by promoting and fostering virtual healthcare and telemedicine in society through clear communication. Clear communication is crucial to inform patients about virtual healthcare and telemedicine. This involves providing detailed explanations about the advantages, disadvantages, and procedures, such as accessing virtual healthcare services, using required technology, and preparing for virtual consultations. It is also important to provide information about the various virtual services available, along with their potential benefits and risks. Effective communication is necessary to ensure that patients and healthcare providers have a complete understanding of the available services in telemedicine.

Furthermore, to develop and promote telemedicine itself also need to consider the knowledge of the health practitioners, especially doctors who become telemedicine consultants, since the quality of care delivered either in-person or virtual through telemedicine depends on the quality of the doctors because a doctor who provides poor quality care during in-person visits is likely to provide the same level of care during telemedicine consultations [126]. The quality in this context refers to responsibilities as a professional medical doctor, which should obey

ethical, legal, and profession disciplinary. Telemedicine relies heavily on verbal communication between doctors and patients, which may limit the ability to observe nonverbal cues and perform physical examinations necessary for accurate diagnosis and treatment. However, healthcare professionals must ensure patient confidentiality and maintain the privacy of medical records, supporting documents, diagnoses, and medication recommendations. Furthermore, telemedicine general practitioners (doctors) have a responsibility to recognize their own limitations and delegate certain cases to other healthcare providers with the appropriate expertise. This approach ensures that patients receive the best possible care and that healthcare providers operate within their scope of practice. Failure to do so may affect professional disciplinary action. Therefore, it is crucial for telemedicine general practitioners to be mindful of their capabilities and seek help from other healthcare providers as needed [127]. Based on a report, out of 58,500 doctors registered as telemedicine consultants, only 30% are actively providing virtual healthcare services [128]. This may indicate that the adoption of telemedicine among health practitioners still needs to grow. Thus, adequate training, particularly for physicians who will be utilizing telemedicine, is necessary for successful implementation of the technology [25].

In addition, healthcare providers that implement telemedicine must integrate real and virtual healthcare delivery. In other words, telemedicine should not replace traditional healthcare, but rather be integrated with it. One way to achieve this could be by using telemedicine for initial consultations or follow-ups, while still offering in-person visits as needed. Such an approach would enable healthcare providers to provide a hybrid model that combines the advantages of telemedicine with the best possible care for their patients.

Since this study found that social influence significantly affect telemedicine adoption, then word-of-mouth marketing and recommendations from friends, family, and colleagues can play a crucial role in promoting and increasing the adoption of online service platforms in Indonesia, including telemedicine. Online healthcare providers may benefit from investing in marketing strategies that involve word-of-mouth promotion or engaging with influencers to promote their services. In simpler terms, users are more likely to be interested in or use a particular online healthcare service if someone they trust recommends it to them. It is also important to educate people about telemedicine and the potential advantages of this platform [3]. Because, merely providing digital health service platform is insufficient for enhancing patient involvement, and it is necessary to educate users to promote meaningful use [42]. Consumer awareness of telemedicine applications can be raised by means of public service or advertisements. To illustrate, telemedicine can be promoted through both social media and traditional media [36].

Furthermore, it is important to improve the availability of internet connection in remote areas and assist disadvantaged and vulnerable groups. While certain medical specialties require in-person examinations, telemedicine can be a beneficial tool for diagnosis and treatment in some areas. Hence, it is important to expand and improve telemedicine services to ensure equitable access. Further studies should also be conducted to investigate their potentials [129]. It is also crucial to improve antecedent conditions such as perceived ease of use, security of the system, and response time in their systems. The telemedicine providers should enhance the user experience and improve awareness toward privacy [14]. Although privacy concern was not identified as a significant issue in this study, it is important to establish policies, regulations, and procedures to ensure the information security and safeguard individuals' privacy through effective data and information management [130]. This study expects that the healthcare sector in Indonesia, can provide better and more adequate healthcare services in the future, especially through telemedicine.

D. Limitation

The study has several limitations, one of which is a small sample size. As Indonesia is an archipelago with diverse cultures and characteristics in each region, the sample from this study cannot represent the population of each region in Indonesia as a whole. Thus, further research with a larger sample size is necessary to better represent the population of each region and examine the cultural or regional characteristics. Moreover, the research solely focused on users or patients' perspective, and future studies can explore the practitioners or healthcare professionals' perspective regarding the adoption of digital health service platforms. Furthermore, the study only examined a few factors and overlooked other relevant factors related to digital health service platforms adoption. Therefore, future research should consider examining other relevant factors in the context of adopting digital health service platforms.

VI. CONCLUSION

Finally, this study examines the factors that affect the behavioral intention of Indonesian adults to use telemedicine services. The study employs the UTAUT2 model and emphasizes the importance of understanding the factors that influence the adoption of telemedicine services. This understanding can help in developing and implementing effective strategies to encourage the usage of such services. The results show that performance expectancy, effort expectancy, social influence, eHealth literacy, and trust are significant factors that affect the

intention to use telemedicine services, while facilitating conditions, price value, and privacy concern have no significant effects. These findings are consistent with previous studies conducted in the context of telemedicine, and the UTAUT2 model is found to be a good predictive model for examining adoption in healthcare. The results suggest that the usefulness, ease of use, influence of significant others, knowledge or literacy, and trust in the service encourage people to use the platform. In the future, telemedicine platforms must consider an easy-to-learn user experience to promote the dissemination of telemedicine services and increase the willingness to use these platforms.

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