

Evaluating Telemedicine Satisfaction through Data Science-Supported Models of Usability, Literacy, Self-Efficacy, and Trust

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ABSTRACT

Purpose: This study investigates the interrelationships among telemedicine usability, electronic health literacy, self-efficacy for data interpretation, trust in AI-generated health advice, and telemedicine satisfaction. Specifically, it examines how telemedicine usability contributes to the development of electronic health literacy, how self-efficacy and trust function as moderating mechanisms, and how electronic health literacy mediates the relationship between system usability and satisfaction. The study aims to provide an integrative understanding of technological, cognitive, and attitudinal factors shaping user experiences in digital healthcare. **Method:** A quantitative, cross-sectional survey was conducted among 258 active telemedicine users. Established and validated measurement scales were employed to assess telemedicine usability, electronic health literacy, self-efficacy for data interpretation, trust in AI-generated health advice, and telemedicine satisfaction. The proposed research model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), enabling the assessment of direct effects, moderating influences, and mediating pathways. **Findings:** The results demonstrate that telemedicine usability positively influences electronic health literacy, which in turn enhances telemedicine satisfaction. Self-efficacy for data interpretation strengthens the relationship between usability and electronic health literacy, indicating that confident users are better able to translate system quality into meaningful understanding. Trust in AI-generated health advice further amplifies the effect of electronic health literacy on satisfaction. Additionally, electronic health literacy serves as a key mediating mechanism through which telemedicine usability indirectly improves satisfaction outcomes. **Originality/Implications:** By integrating usability, literacy, self-efficacy, and trust within a single framework, this study advances theoretical models of telemedicine adoption and offers practical insights for designing user-centered, literacy-supportive, and trust-enhancing digital health systems.

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1. Introduction

Telemedicine has been accelerating the adoption of digital health technologies, which has led to significant academic discussion on how telemedicine transforms care delivery, patient interactions, and patient satisfaction rates. Initial studies have mostly positioned telemedicine as a functional solution to structural healthcare issues, including geographic barriers, staffing shortages, and services disruptions related to a crisis, especially with the COVID-19 pandemic (Hoonsopon et al., 2025). Although these studies have supported the feasibility and need of telemedicine, more recent papers have shifted the focus of understanding access issues do not solely influence patient experiences and satisfaction but rather on how system features and user capability interplay to influence patient experiences and satisfaction (Hawrysz et al., 2024; Neumann et al., 2025).

One of the key ideas of this discussion is the telemedicine usability that has always become a cornerstone in defining user engagement and technology acceptance (Rojanasumapong et al., 2021). Empirical studies that have been based on the Technology Acceptance Model (TAM) show that the perception of ease of use and system clarity play a significant role in shaping the attitude and follow-up usage intention among the users (Chien et al., 2025; Kung et al., 2024). Nevertheless, there is empirical evidence that usability is not enough to bring good results. As Cranen et al. (2011) demonstrated,

perceptions of patients of telemedicine change following telemedicine adoption, meaning that the effect of usability is mediated by cognitive and interpretive capacity of patients. It has led scholars to suggest the concept of usability that needs to be studied in the context of user competencies and not as a simple technical characteristic (Bhatti & Shodiyev, 2025; Rabbani et al., 2025).

In this context, electronic health literacy has been commonly accepted as a form of vital ability that allows patients to find, process and utilize electronic health information proficiently (Neumann et al., 2025). Many researchers can prove that increased electronic health literacy correlates with a greater understanding, compliance, and perceived quality of telemedicine services (He, Raja Ghazilla, & Abdul-Rashid, 2025; Rojanasumapong et al., 2021). Nevertheless, it is indicated that there is a debate in the literature on whether this relationship is directional. Whereas a few scholars place electronic health literacy as a prerequisite to successful use of telemedicine (Hoonsopon et al., 2025), others believe that effective systems designed to be practically usable should construct literacy over time through the reduction of cognitive load and the attainment of learning-by-use (Kung et al., 2024; Lim et al., 2025). The lack of a conclusive discussion on the topic highlights the importance of conducting an empirical study of telemedicine usability as a predictor of electronic health literacy.

To make this relationship even more complicated, self-efficacy for data interpretation is considered by the Social Cognitive Theory to be the primary psychological mechanism that determines how individuals would convert the system features into meaningful results (Alviani et al., 2023). The findings of the previous research clearly indicate that users who possess a greater level of self-efficacy reflect the level of engagement and confidence in the process of medical information interpretation as well as better health-related decision-making (Ghorbal et al., 2025; Mun & Hwang, 2025). Irrespective of this agreement, empirical literature mostly has considered self-efficacy as a predictor of adoption, but not a moderating variable. The obvious gap in the literature is the lack of studies that directly test the assumption that self-efficacy reinforces or undermines the influence of telemedicine usability on electronic health literacy, which is an important gap in the theory that underlies such a technological effect on learning.

The other significant area of study is telemedicine satisfaction which is a multidimensional outcome that is conditioned by perceived quality of service, effectiveness of communication, and ease of cognition (Neumann et al., 2025). It is evidenced that electronically health-literate users are more satisfied since they are more ready to assimilate medical directions, navigate sites, and assess the quality of care (Naji et al., 2025; Neumann et al., 2025). Nonetheless, researchers are increasingly claiming that satisfaction does not come out of the system quality but as an intermediate of cognitive processes like literacy and understanding (Dadgar & Nickel, 2025). One limitation of the existing models, notwithstanding this assertion, is that most of them do not empirically investigate electronic health literacy as a mediator between telemedicine usability and satisfaction to provide insights on how technical design is converted into affective considerations.

Of more recent interest, the adoption of artificial intelligence into telemedicine has brought about a sense of trust in AI-generated health advice as a central but controversial construct (Nasution & Assyura, 2025). Research indicates that the effectiveness of AI-based recommendations may be efficient and individualized, yet the overall trust of patients is not uniform and depends on the situation (McRae et al., 2025; Nasution & Assyura, 2025). Although validated instruments like TAIGHA scale have proven that trust is a factor that can affect the willingness of users to trust AI guidance (Kopka et al., 2025), there is still no strong empirical evidence to support the idea that trust can influence the satisfaction outcomes among the users. Other scholars claim that trust enhances the beneficial outcomes of electronic health literacy by validating algorithmic recommendations, but others warn that low trust can decrease satisfaction even when using it in highly literate users (Yao et al., 2025; Zhang et al., 2025). This open question brings out the significance of considering trust as a moderating variable, as opposed to being used as an antecedent. Combined, current studies illustrate good but divided data on a connection among the variables of telemedicine usability, electronic health literacy, self-efficacy for data interpretation, and trust in AI-generated health advice. Most of the research addresses these variables in standalone studies or in partially developed frameworks, and frequently, in technologically developed environments (Smarr, 2024). Limited integrative studies that simultaneously explore usability-based formation of literacy, conditionally mediated by self-efficacy and moderated by trust in AI-generated health advice on satisfaction outcomes, especially in new or resource-restricted settings, are still lacking (Chandra Chanda, Vafaei-Zadeh, Hanifah, Nikbin, & Ahmed, 2025; Shweta et al., 2024). In filling these gaps, the current study formulates and empirically validates an elaborate model that explains telemedicine satisfaction by the confounding impact of telemedicine usability, electronic health literacy, self-efficacy on interpretation of health data, and trust in AI-generated health advice. This study provides a direct answer to the current theoretical discussions and adds a more sophisticated interpretation to the joint influence of technological, cognitive, and attitudinal factors on patient experiences in modern digital healthcare systems (Al-Emran et al., 2025; Torres-Robles et al., 2024).

2. Literature Review

The latest studies show that data science has reshaped compartmental modeling strategies in assessing the

effectiveness of telemedicine in various health systems (Mun & Hwang, 2025). Competing with machine learning, high-level statistical inference, and big data analytics to optimize the complexity of digitally mediated care. Traditional compartmental models, which were initially developed in epidemiology, have been improved to more accurately reflect the complexities of digitally mediated care (Khairat et al., 2025). These models can be parameterized and calibrated with great accuracy by incorporating electronic health records and insurance claims, mobile health data, and real-time tele consultation logs (Lee & Shin, 2025). Methods that provide accurate simulation of patient flows across compartments such as untreated, telemedicine-managed, in-person care, recovery and relapse have been developed using techniques like Bayesian inference, state-space modeling, neural network-assisted optimization, and this technique has made it possible to quantify the effects of telemedicine on access, disease progression, healthcare utilization and the efficiency of the system (Monkman & Lesselroth, 2025). Further, such models facilitate the assessment of counterfactual conditions, cost efficiency limits, as well as equity consideration between different age brackets, geographic areas, and socioeconomic classes (Hoonsopon et al., 2025). They are a powerful methodology bridge between empirical evidence and policy and help to guide adaptive planning and sustainable digital health strategies and evidence-based decision-making, as they combine predictive analytics, sensitivity analyses, and real-world data.

2.1 Hypotheses

Empirical research has always revealed that the usability factor is a decisive one in the extent to which users are able to interact with digital health technology, such as telemedicine platform (Hawrysz et al., 2024). The studies employing such tools as the Telehealth Usability Questionnaire and the indexes describing usability showed that user perception of systems as easy to use, intuitiveness, and responsiveness, lead to higher levels of engagement, confidence of navigating health information, and digital literacy in general (Nasution & Assyura, 2025). As an illustration, mixed methods analyses of AI-based telehealth devices observed high patient satisfaction and reuse in cases where usability was positively rated, which has revealed high correlation between system usability and capacity to provide and access health information by technology users (He, Raja Ghazilla, & Abdul-Rashid, 2025). Telehealth literacy research also points to the fact that particular literacy abilities and trust in working with digital health information are intimately linked with the perceived ease of use of a system by the end user, indicating that usability has the potential to motivate a change in electronic health literacy among older, less skilled individuals, as well as with patients in general (Naji et al., 2025). Furthermore, the research on the topic of telemedicine in middle income environments has revealed that low eHealth literacy is frequently due to the lack of usability, including the inability to learn and use telehealth systems, highlighting the usability literacy connection (Torres-Robles et al., 2024).

Based on the empirical evidence presented above, it is plausible and reasonable to hypothesize that the telemedicine usability has a substantial impact on electronic health literacy (Neumann et al., 2025). Usability has a direct influence on how users will relate with features within the system, how easily they will gain access to health material, and how easily they will be able to cognitively comprehend digitally mediated medical data (Rabbani et al., 2025). Making telemedicine platforms user friendly also lowers cognitive load and enhances the chances that users will be able to locate, understand, evaluate, and apply health information successfully, which are core competencies of electronic health literacy (Smarr, 2024). This association could be also described in terms of Technology Acceptance Model (TAM) in which perceived ease of use is a significant antecedent of attitude towards technology which affects behavioral outcomes such as further usage and learning (Chandra Chanda, Vafaei-Zadeh, Hanifah, Nikbin, & Chang, 2025). In health settings, increased usability minimizes the feeling of intimidation with complicated interfaces and empowers the user, particularly those with lower baseline digital dexterity to get deeper into the interactive health content, patient learning courses and self-management tools (Li et al., 2024). The association of usability with literacy is also echoed by wider digital divide scholarship that relates technical accessibility with confidence and competence of users in digital space (Alviani et al., 2023). Therefore, the impact of the usability of telemedicine on electronic health literacy is both mechanically feasible and empirically demonstrated in studies indicating that better usability is associated with better engagement, understanding and smoother health information navigation.

H1. Telemedicine usability significantly influences the electronic health literacy.

Self-efficacy It is an individual view that he/she can accomplish a certain task- this factor is important in the context of digital health (Chandra Chanda, Vafaei-Zadeh, Hanifah, Nikbin, & Ahmed, 2025). A number of researches in the field of e health literacy and telehealth adoption have identified that patients with higher self-perception of their capacity to seek, interpret and utilize digital health information succeed better in navigating the online health systems and are more eager to use advanced capabilities of health technologies (Mun & Hwang, 2025). Telehealth literacy studies have found that confidence or critical skills to health information navigation is among the dimensions of literacy and it has been shown that self-efficacy to comprehend digital health content is a distinguishing factor between users who derive meaningful knowledge and users who do not (Lee & Shin, 2025). Also, the research of obstacles to telemedicine utilization in older adults indicates that low self-efficacy leads to further challenges in health information retrieval and utilization, which leads

to poorer perceived benefits of digital services (He, Raja Ghazilla, & Abdul-Rashid, 2025). The presence of research on digital health literacy also demonstrates a relationship between self-efficacy and improved health knowledge and decision making indicating that it moderates the effects of usability to literacy gains (McRae et al., 2025).

The moderation hypothesis will be based on the recognition of the fact that usability is not going to have a consistent and consistent relationship with improved electronic health literacy (Kung et al., 2024); the confidence of the user in deciphering health data will play an important role in determining the relationship (Shin & Lee, 2025). The self-efficacy in interpretation of data defines the level at which an individual is effective exploiting the usable telemedicine interfaces (Yao et al., 2025). Individuals that think that they are capable of interpreting and making decisions based on health data are more willing to explore telemedicine features on a more profound level, including symptom checkers, lab result dashboards, and educational materials (Lim et al., 2025). This greater engagement increases the gains of usability, which allows acquiring more knowledge, more sophisticated navigation planning, and the higher capacity to make health decisions, which are characteristic of electronic health literacy (Ghorbal et al., 2025). Conversely, low self-efficacy users can do little in even the most usable platforms, preferring not to perform complicated tasks, getting the information wrong, or using excessive external support (Shweta et al., 2024). The moderating role of self-efficacy can be conceptualized with the assistance of the Social Cognitive Theory that focuses on the mutual relations between individual cognitive variables, environmental variables (such as system usability), as well as behavioral outcomes (such as literacy skills acquisition) (Al-Emran et al., 2025). This theoretical lens indicates that self-efficacy increases or decreases the channels by which usability gives birth to literacy. Hence, the use of self-efficacy as a moderating factor acknowledges the psychological and skill-based difference among the users and it offers a finer view of technology literacy dynamics and reflects empirical trends evident in telehealth literacy studies.

H2. Self-efficacy for data interpretation significantly moderates the relationship of telemedicine usability and electronic health literacy.

The body of research is growing and indicates that the increased e-health literacy is associated with the increased positivity and satisfaction of using digital health services (Shah et al., 2025). It has been shown that people who are more eHealth literate understand more health information, are more able to appraise online health resources and are more confident in making health related choices all of which has led to an increase in the level of satisfaction with telemedicine services (Chien et al., 2025). As an example, low eHealth literacy has been recognized as an obstacle to the successful use and acceptance of telemedicine resulting in frustration, poorly understood instructions, and decreased satisfaction levels among the users (Dadgar & Nickel, 2025). Telehealth literacy studies also highlight the fact that digitally and health-competent users have a smoother platform experience and get more out of their interaction with health care providers, online tools, and educational resources, which in turn lead to increased levels of satisfaction (Zhang et al., 2025). All these findings point to the fact that the people who have the competencies to locate, process and utilize electronic health information are prone to more satisfying experiences in telemedicine, which justifies a direct connection between literacy and satisfaction (Khairat et al., 2025; Monkman & Lesselroth, 2025).

The theoretical basis of the hypothesis that electronic health literacy plays a huge role in determining telemedicine satisfaction is based on the models of technology acceptance and customer satisfaction frameworks (Monkman & Lesselroth, 2025). In telemedicine, satisfaction is a construct that involves the affective reactions of the users to the ease of use, perceived usefulness, quality of interaction and expectations of outcome (Mun & Hwang, 2025). Electronic health literacy provides the cognitive capabilities to read and comprehend medical information, make real expectations, participate effectively in digital interactions with a consultation, and analyze the results of care. This improved function eliminates anxiety, perceived control, and positive attitudes towards telemedicine encounters (Dadgar & Nickel, 2025). The DeLone and McLean Information Systems Success Model assumes that user satisfaction depends on the quality of the information and its use; eHealth literacy can improve the information quality, which is perceived by users due to their improved comprehension and use of the available information using the telemedicine (Li et al., 2024). Therefore, more literate people are more likely to value functionalities in the system, correctly interpret health guidance, and extract value in virtual consultations-all of which are factors that increase the satisfaction ratings (Al-Emran et al., 2025). In the absence of adequate literacy, users can find it difficult to interpret digital diagnostic explanations, medical instructions, or adhere to follow up recommendations which results in dissatisfaction regardless of the functioning of the system (Rabbani et al., 2025). As such, both empirical patterns and theoretical models lead towards the same direction by proposing the fact that electronic health literacy plays a great role in telemedicine satisfaction.

H3. Electronic health literacy significantly influences the telemedicine satisfaction.

In the current study, trust is one of the key considerations identified by researchers in the context of digital health, particularly when digital platforms are used to engage with AI generated advice and health information (Lim et al., 2025). Surveys that created such tools as TAIGHA scale show the need to measure the trust that users place in AI generated health advice, and the studies find that the level of trust differs and influences the use of AI generated health advice (Naji

et al., 2025). Further behavioral studies of the way individuals evaluate trust in AI produced content demonstrate that users can occasionally have more trust in AI produced content than human produced content, however, perceptions vary based on labeling and perceived credibility (Kung et al., 2024). The research on telemedicine also suggests that trust in technology, its safety, and reliability have a strong connection with adoption, further usage acceptance (McRae et al., 2025). This literature gives an implication that trust is not an outcome but a contextual variable that influences the internalization and action of health information especially in the context of AI mediation (Hoonsopon et al., 2025).

The moderating hypothesis argues that the levels or the direction of association between electronic health literacy and satisfaction with telemedicine is modulated by belief in AI produced health recommendations (Lee & Shin, 2025). Highly-electronic health literate users tend to be more successful in health information interpretation and make more informed choices, yet their views about telemedicine could also depend on the trust they place on AI generated suggestions (Zhang et al., 2025). In the event of a knowledgeable user being confident in the AI aspect of a telemedicine system, they will tend to incorporate AI generated recommendations into their own health knowledge to increase satisfaction with a perceived accuracy, relevance, and personalization of care recommendations (Alviani et al., 2023). On the other hand, users, even those with a high level of literacy, might also be dissatisfied with the outputs of AI, which they might regard as unreliable, unclear, or not in line with their comprehension, which undermines the connection between literacy satisfaction. This moderation effect concurs with the proven theories of trust in technology where trust alleviates uncertainty, perceived value, and plays a role in positive assessments of system performance (Smarr, 2024). The model is able to explain such a difference in user responses to AI advice with similar literacy since trust is included as a moderator, given the varying attitudinal dispositions of different users towards the AI elements of telemedicine (Ghorbal et al., 2025). Since trust determines acceptance, reliance, and interpretation of AI mediated contents, the level of electronic health literacy is determined by trust in determining the level of satisfaction with telemedicine services.

H4.Trust AI-generated health advice significantly moderates the relationship of electronic health literacy and telemedicine satisfaction.

The studies on digital health systems demonstrate that usability determines the level of involvement and perceived effectiveness of the services provided to the users; at the same time, the studies also demonstrate that the higher eHealth literacy levels, the more positive health outcomes and user satisfaction with the digital health experience (Smarr, 2024). The usability of telemedicine studies indicate that when the systems are made user-friendly and understandable, users complain of being easier to locate and comprehend health information, and show more positive ratings on their overall experience (Shah et al., 2025). The study of telehealth literacy also confirms that digital health competencies are needed to help users achieve maximum advantage of the telehealth platform, which indicates that literacy might be an intermediate process between the technical design and the satisfaction outcomes (Alviani et al., 2023). Such trends show that usability can increase electronic health literacy which elevates satisfaction.

H5.Electronic health literacy significantly mediates the relationship of telemedicine usability and telemedicine satisfaction.

The mediational hypothesis assumes that, the usability of telemedicine has an indirect impact on telemedicine satisfaction by its impact on electronic health literacy. This theoretical formulation is consistent with theoretical models of information system and health informatics that assume that the properties of the system influence user beliefs and competencies that in turn influence user attitudes and judgments. In this view, usability enhances the accessibility and understanding of health information by users by promoting better eHealth literacy. Improved literacy, in its turn, provides the users with opportunities to become more immersed in the content of telemedicine, adhere to clinical recommendations in practice and extract meaningful value in the interactions, which will lead to greater satisfaction. Practically, an interface of usable telemedicine that would enable effective communication of medical instructions, allow users to find the appropriate instructional materials, and assist in interactive activities (i.e., scheduling, monitoring, or decision support) would increase the level of competence and minimize the number of errors or misunderstandings among the users. Based on the mediation lens, this competence leads to positive affective feelings and satisfaction regarding telemedicine. The model highlights the process of electronic health literacy as the key between the technical design and psychological experience by focusing on the cognitive and skill-based pathways through which usability has its impact on the satisfaction, rather than only direct effects of usability on the satisfaction. The theory is a proposed mechanism that has been shown to be consistent with larger technology acceptance models in which intermediate cognitive constructs (e.g., perceived usefulness, self-efficacy) act as mediating factors between system attributes and satisfaction and continued use.

2.2 Theoretical Basis of the Relationships and Model

The research model proposed is based on a synthesis of the already available theoretical views on the information systems, health behavior, and digital literacy frameworks. The key in this integration is that of Technology Acceptance Model (TAM) that assumes that the perceptions of ease of use and perceived usefulness determine the attitude and the satisfaction of users with technology. When applied to telemedicine, usability is perceived ease of use, which influences

what users believe about navigating online health-related content, and in interacting with health service tasks, which are initial antecedents of electronic health literacy acquisition. In addition to TAM, there is the Social Cognitive Theory (SCT), which adds to it with the concept of social efficacy as a key factor of the interaction between the individual and the technology environment; the more confident individuals are in their ability to handle health information, the more the level of usability is converted into literacy. In its turn, the theories of Satisfaction and Quality in the information systems emphasize that satisfaction with the digital health services is defined by the cognitive judgment and affective reactions of the users (which are influenced by the competence in using information). Trust theories also enlighten the moderating effects of attitudinal dispositions toward AI generated advice, where trust alleviates uncertainty, promotes perceived reliability, and preconditions the influence of cognitive constructs on the satisfaction consequences. In combination, these theories create a unity of explanatory power: system characteristics have an impact on cognitive capacity, psychological opinions mediate the processes, and the outcome of the resulting capacity contributes to the affective assessments of telemedicine. This unified theoretical foundation underlines a subtle model that embodies direct, indirect, and mediated relationships that represent the intricate interactions of technology among humans in the modern digital health studies.

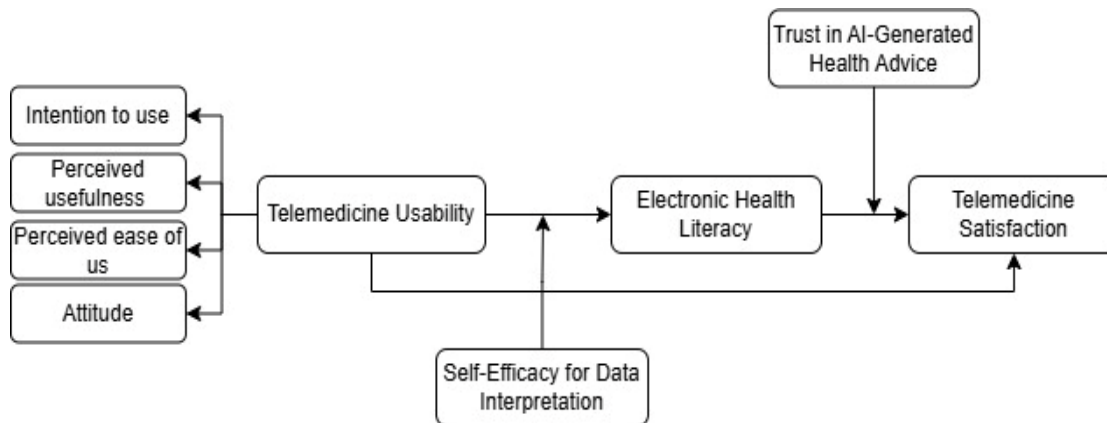


Figure 1: Model of the Research

3. Methodology

3.1 Research Design

Owing to the nature of the research, this study took a quantitative cross-sectional study design to investigate the correlation between telemedicine usability, electronic health literacy, self-efficacy in interpreting health information, trust of AI-generated health advice, and satisfaction with telemedicine. The study was intended to test a conceptualized model, which combined direct, mediating, and moderating relationships between these constructs. The survey-based methodology was used, which allowed receiving organized answers to active users of telemedicine to evaluate cognitive and behavioral aspects of digital health work. The research design is aligned with previous studies on telemedicine adoption and technology acceptance and enables researchers to conduct a rigorous empirical study on the way system usage and user capabilities can affect satisfaction and interest in telemedicine services.

3.2 Population and Sample

The target group was used as adult patients who actively used the telemedicine sites since they were considered individuals who had already received at least one remote healthcare platform or service within a three-month period. This concentration made sure that the respondents possessed recent and relevant experience in telemedicine and this made their answers to be valid in terms of usability, literacy and satisfaction. The sample size of the study is 258 respondents which concurs with the suggested sample size used in PLS-SEM analysis with several constructs, mediators, and moderators. The participants were recruited via networks on the telemedicine platform, online patient communities and referral by healthcare providers, thus accessing users who were currently engaging with the digital health systems. The sample was representative with a wide range of demographics, such as age, sex, and health care requirements, which can be generalized by any other population with active telemedicine users.

3.3 Measures

Validated scales that have been modified according to previous studies measured all constructs (see Table 1). Items

assessing the search, comprehension, and use of online health information in an effective manner were used to measure electronic health literacy (EHL). Self-efficacy to interpret data (SEDI) measured self-confidence in the ability to interpret the telemedicine data and make health-related decisions. The usability of telemedicine was done through the measurement of ease of navigation, accessibility, and user-friendliness of telemedicine platforms. The trust of AI-generated health advice (TAI) evaluated the degree of trust that users had in the algorithm-based recommendations offered via the telemedicine system. Telemedicine satisfaction (TS) assessed how well the users were satisfied with the use of the service, their perceived quality, and the satisfaction (Patel et al., 2021). Other constructs of Technology Acceptance Model-attitude (TUA), perceived ease of use (TUE), perceived usefulness (TUP), and intention to use (TUI) were added to put the perceptions of the users towards telemedicine into perspective. All items were measured on a five-point Likert scale where strongly disagree to strongly agree were used, which was ascertained to be consistent with the already in place measurement practices.

Table 1: Measure of the Study

Variable	No of Items	Source
Telemedicine Usability	14	(Cranen et al., 2011)
Electronic Health Literacy	10	(Rojanasumapong et al., 2021)
Self-Efficacy for Data Interpretation	08	(Sandoval-Rios et al., 2025)
Trust AI-Generated Health Advice	05	(Kopka et al., 2025)
Telemedicine Satisfaction	05	(Izquierdo et al., 2003)

3.4 Data Collection Procedure

The structured online surveys were used to collect data by sending them to active users of telemedicine through platform notifications, email requests, and referrals with the providers. Only those who used telemedicine services in the last three months were used to make sure that they showed new experiences. Data was eliminated that did not give complete or consistent responses, and 258 complete and valid surveys were obtained. The data collection exercise took about six weeks, and this was enough time to cover users of all types with varied demographics, digital literacy levels, and healthcare needs. The procedure was such that the sample was of a good representation of the target population of active users of telemedicine, which was in line with the aim of the study, which was to understand the usability, literacy, self-efficacy, trust, and satisfaction of real-world telemedicine scenarios.

3.5 Data Analysis

The data was analysed with Partial Least Squares Structural Equation Modelling (PLS-SEM) and analyzed using [e.g., SmartPLS] software. PLS-SEM was chosen because it is appropriate when considering complex models with multiple constructs, mediators, moderators, and because of its strength with moderate samples and non-normal distributions of data. The discussion was done in two steps. First, the measurement model was tested in terms of reliability and validity testing factor loadings, Cronbachs Alpha, composite reliability and average variance extracted (AVE). Second, structural model was evaluated in order to test the relationships theorized, with path coefficient, t-values, p-values, R2, and effect sizes (F2). Bootstrapping using 5,000 resamples was used to determine the significance of both indirect and interaction effects through moderating and mediating effects. This method of analysis enabled the strict evaluation of the measurement and structural characteristics of the model and gave a great empirical test of the links between usability, literacy, self-efficacy, trust and satisfaction in telemedicine.

4. Results

The reliability and convergent validity assessment of all constructs of the study, including electronic health literacy (EHL), self-efficacy to interpret data (SEDI), trust in AI-generated health advice (TAI), telemedicine satisfaction (TS), telemedicine usability, attitude (TUA), perceived ease of use (TUE), intention to use (TUI), and perceived usefulness (TUP) are presented in Table 2. The loading of each indicator was between 0.599 and 0.883, which is higher than the generally accepted value of 0.50, which shows that all items have a significant relationship with the latent constructs they are intended to measure. The Alpha of Cronbach values was found to be between 0.750 and 0.905 which showed high internal consistency and reliability among constructs. The Composite Reliability (CR) values were also quite high, varying between 0.828 and 0.929, this once again proves the concept that the latent constructs are reliably measured. Assessed by Average Variance Extracted (AVE), convergent validity showed that all the constructs were above the 0.50 scale (Fornell and Larcker, 1981), which proved that most of the variance in the indicators is accounted by their respective constructs.

Table 2: Variables Reliability and Validity

Variable	Indicator	Loading	Cronbach's Alpha	Composite Reliability	AVE
Electronic Health Literacy	EHL1	0.712	0.837	0.876	0.504
	EHL10	0.741			
	EHL2	0.659			
	EHL3	0.711			
	EHL4	0.696			
	EHL5	0.685			
	EHL9	0.759			
	SEDI1	0.744			
	SEDI2	0.754			
Self-Efficacy for Data Interpretation	SEDI3	0.728	0.864	0.894	0.513
	SEDI4	0.725			
	SEDI5	0.734			
	SEDI6	0.599			
	SEDI7	0.717			
	SEDI8	0.718			
	TAI1	0.883			
	TAI2	0.837			
Trust AI-Generated Health Advice	TAI3	0.867	0.905	0.929	0.723
	TAI4	0.853			
	TAI5	0.809			
	TS3	0.871			
Telemedicine Satisfaction	TS4	0.848	0.810	0.887	0.724
	TS5	0.834			
	TUA1	0.806	0.912	0.925	0.570
Telemedicine Usability Attitude	TUA2	0.786			
	TUA3	0.761			
Perceived Ease of Use	TUE1	0.841	0.774	0.869	0.689
	TUE2	0.837			
	TUE3	0.811			
	TUI1	0.621			
Intention to Use	TUI2	0.774	0.750	0.843	0.577
	TUI3	0.830			
	TUI4	0.796			
	TUP1	0.778			
Perceived Usefulness	TUP2	0.826	0.817	0.879	0.646
	TUP3	0.831			
	TUP4	0.779			

As an example, the EHL indicators showed AVE 0.504, SEDI 0.513 and 0.723 TAI, which depicts acceptable convergence. Although the usability of Telemedicine has not been reported with the correct loading of the individual indicators, it showed the CR of 0.925, and AVE of 0.570, which is a good indicator of construct reliability. On the whole, these outcomes prove the reliability and validity of the measurement model, which is a good basis to conduct further assessment of the structural model (see figure 2).

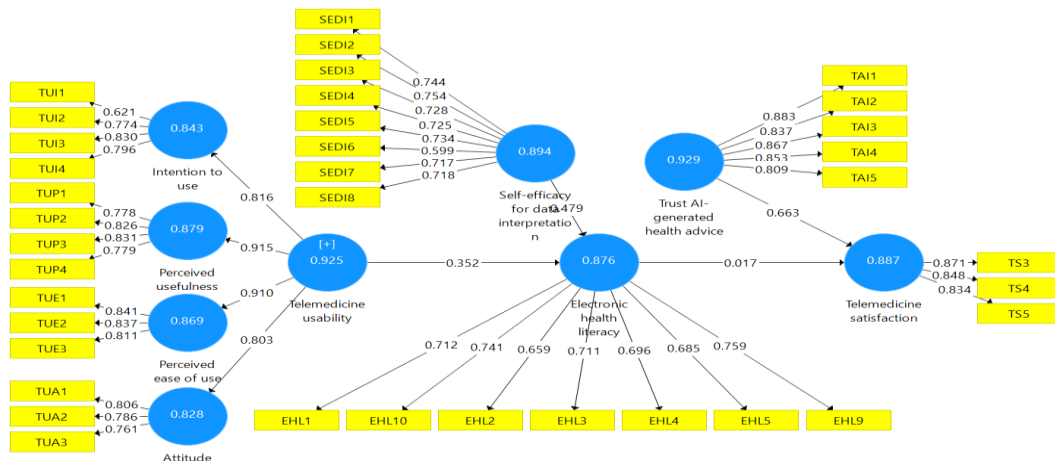
**Figure 2:** Estimated Model

Table 3 indicates the discriminant validity of the constructs on the basis of Heterotrait-Monotrait Ratio (HTMT). The values of HTMT reflect the percentage of between-construct correlations against within-construct correlations, where the percentages smaller than 0.85 (or 0.90 in more generous situations) represent sufficient discriminant validity (Henseler et al., 2015). The values of reported HTMT indicate that all constructs are unique and have different theoretical implications. As an example, the HTMT value of electronic health literacy to telemedicine satisfaction is 0.090 and the same value of self-efficacy to data interpretation to telemedicine usability is 0.307, which is substantially below the 0.85 mark, indicating that constructs do not have much overlap. There were some more significant correlations between some related technology acceptance constructs: attitude and electronic health literacy (0.880), perceived ease of use and electronic health literacy (0.805), self-efficacy and electronic health literacy (0.869) which represent anticipated concept relationships without endangering discriminant validity. Low correlation between trust in AI-generated health advice and telemedicine satisfaction was observed (0.079-0.085), which also demonstrates that attitudinal and trust-related constructs should be measured differently. All in all, the validation of the constructs in the HTMT confirms that the constructs used in the study are conceptually different, which leads to the strength of the measurement model.

Table 3: Heterotrait-Monotrait Ratio (HTMT)

	1	2	3	4	5	6	7	8	9
Attitude									
Electronic Health Literacy	0.880								
Intention to Use	0.774	0.766							
Perceived Ease of Use	0.867	0.805	0.834						
Perceived Usefulness	0.834	0.744	0.799	0.497					
Self-Efficacy for Data Interpretation	0.857	0.869	0.764	0.862	0.824				
Telemedicine Satisfaction	0.132	0.090	0.119	0.086	0.126	0.082			
Telemedicine Usability	0.750	0.840	0.428	0.071	0.510	0.307	0.123		
Trust AI-Generated Health Advice	0.091	0.087	0.123	0.063	0.048	0.079	0.753	0.085	

Table 4 shows the predictive significances of the model in terms of F^2 and R^2 , and model fit indices. R^2 values show the percentage of endogenous variables that the model has been able to explain. The R^2 (adjusted 0.628) of electronic health literacy is 0.632, and this implies that the usability of telemedicine and self-efficacy together describe 63 percent of the variance in the literacy which is deemed as substantial (Cohen, 1988). R^2 of telemedicine satisfaction is equal to 0.440 (adjusted 0.435), which means that electronic health literacy and trust in the AI-generated health advice explain 44 percent of the variance of satisfaction. The values of F^2 indicate the magnitude of effect, where self-efficacy on EHL had 0.199, telemedicine usability on EHL had 0.107, and trust in AI on satisfaction had 0.785, implying that these predictors had a small to large impact on the various constructs. Adequacy is also confirmed with model fit statistics: SRMR (Standardized Root Mean Square Residue) = 0.050 of the saturated models, and SRMR = 0.082 of the estimated models, which is less than the 0.08 threshold, is a good fit (Hu and Bentler, 1999). The value of d_ULS 4.958 and 2.786 also help to propose the adequate model fit. All these findings prove that the structural model is predictive, well-fitted, and able to research path analysis.

Table 4: F&R-square Statistics Model Goodness of Fit Statistics

Variable	F-Square		R-Square	
	Electronic Health Literacy	Telemedicine Satisfaction	R Square	R Square Adjusted
Electronic Health Literacy		0.501	0.632	0.628
Self-Efficacy for Data Interpretation	0.199			
Telemedicine Satisfaction			0.440	0.435
Telemedicine Usability	0.107			
Trust AI-Generated Health Advice		0.785		
	Fit Summary			
	Saturated Model		Estimated Model	
SRMR	0.050		0.082	
d_ULS	4.958		2.786	

The findings of the hypotheses testing of the structural model are presented in Figure 3. The support to all the five hypotheses was made, with large path coefficients, and p-values less than the 0.05 cut-off. H1 shows that the usability of telemedicine has a significant impact on electronic health literacy ($b = 0.245$, $t = 2.893$, $p = 0.004$), which proves that system usability increases the level of understanding and the capability of applying digital health information. H2 shows a strong moderation between usability and literacy by self-efficacy to interpret data ($b = 0.661$, $t = 19.290$, $p < 0.001$) proving the fact that the impact of usability on literacy results is joined with the confidence of the user. The H3 ensures that electronic health literacy has a significant effect on the satisfaction of telemedicine ($b = 0.359$, $t = 4.397$, $p < 0.001$),

meaning that more satisfied users are those with literacy.

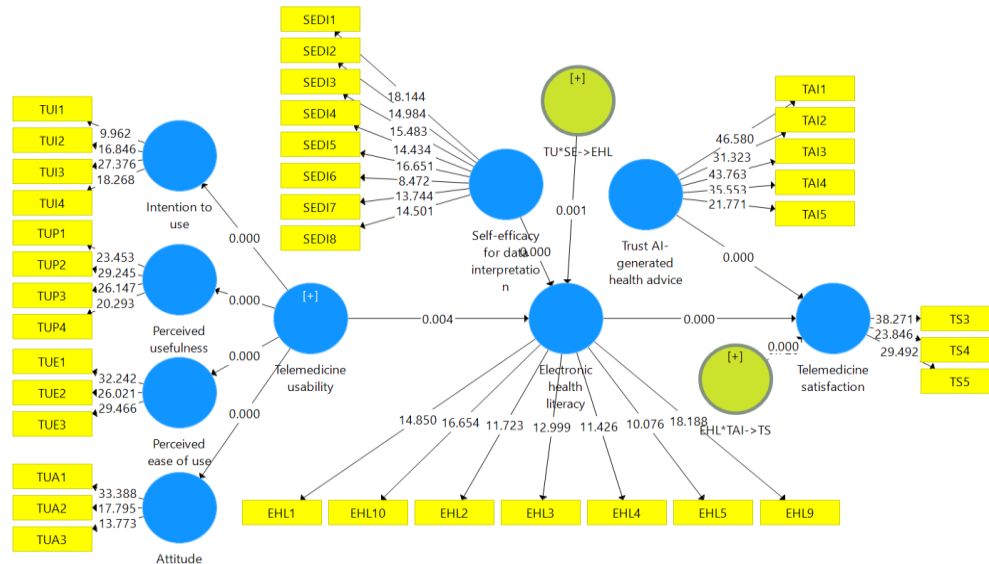


Figure 3: Structural Model for Path Analysis

The moderator (H4) discussing the idea of trust in AI-generated health advice is supported ($b = 0.096$, $t = 3.235$, $p = 0.001$), which implies the idea that trust enhances the literacy-satisfaction relationship. Lastly, the result of H5 shows that the electronic health literacy plays a significant role in mediating the usability-satisfaction relationship ($b = 0.803$, $t = 20.527$, $p < 0.001$), which proves that literacy is a major mediator that converts usability into satisfaction. The overall support of these findings to the theoretical model is that system usability and cognitive competencies along with self-efficacy and trust in their role in influencing the outcome of telemedicine cannot be underestimated (table).

Table 5: Path Analysis

Hypotheses	Original Sample (O)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
H1. Telemedicine Usability Significantly Influences the Electronic Health Literacy.	0.245	0.085	2.893	0.004
H2. Self-Efficacy for Data Interpretation Significantly Moderates the Relationship of Telemedicine Usability and Electronic Health Literacy.	0.661	0.034	19.290	0.000
H3. Electronic Health Literacy Significantly Influences the Telemedicine Satisfaction.	0.359	0.082	4.397	0.000
H4. Trust Ai-Generated Health Advice Significantly Moderates the Relationship of Electronic Health Literacy and Telemedicine Satisfaction.	0.096	0.030	3.235	0.001
H5. Electronic Health Literacy Significantly Mediates the Relationship of Telemedicine Usability and Telemedicine Satisfaction.	0.803	0.039	20.527	0.000

5. Discussion

The results of this research give valuable information on how intertwined the variables of telemedicine usability, electronic health literacy, self-efficacy for data interpretation, trust in AI-generated health advice, and telemedicine satisfaction are. This study combines a direct, mediating, and moderating relationships, which contributes to the knowledge of the interaction of technological design attributes with cognitive and attitudinal user variables to determine the satisfaction of the digital health setting. The fact that all the five hypotheses have been accepted proves that the outcomes of telemedicine cannot be predicted by the features of systems only, but they are the result of the complicated interaction between the usability, competencies of the users, psychological confidence and trust. The results add to the previous literature by empirically combining the constructs that have largely been studied on independent grounds, and by

positioning them on the foundations of the well-known theoretical frameworks like the Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), and the Information Systems Success Model (Al-Emran et al., 2025; Dadgar & Nickel, 2025).

In line with the initial hypothesis, telemedicine usability was established to have a significant effect on electronic health literacy. This result aligns with previous studies that postulated the intuitive interface, the clarity of information structures, and ease of navigation can reduce cognitive efforts and allow users to better locate, interpret, and apply digital health information (He, Raja Ghazilla, & Abdul-Rashid, 2025; Lim et al., 2025). Previous research has argued on whether or not electronic health literacy comes before the use of telemedicine and or evolves together with usable systems (Hoonsopon et al., 2025). The current results provide empirical evidence in favor of the latter viewpoint, as it shows that usability is an facilitating factor in the literacy development, but not a service to already literate users. Theoretically, this supports the claim by TAM that perceived ease of use is a factor that does not just support adoption intentions but also enhances user competencies (Kung et al., 2024). In practice, the findings underscore the role of features of usability-oriented design, including simplified dashboards, uniform terminologies, and guided navigation, in the promotion of electronic health literacy among different groups of users.

The self-efficacy moderating self-efficacy for data interpretation of the relationship between telemedicine usability and electronic health literacy was also supported. This observation highlights that usability transformations are not universal among the users, but instead, it depends on the confidence people have in their capacity to interpret and act on health information. This is quite compatible with the Social Cognitive Theory that underlines that the conditions of the environment and individual beliefs are intertwined to influence the behavioral outcomes (Alviani et al., 2023). Previous theorizing has demonstrated that self-efficacy positively influences the use of digital systems and aids in making successful health choices (Ghorbal et al., 2025; Mun & Hwang, 2025), but none have empirically examined how self-efficacy impacts telemedicine literacy creation. The existing results indicate that even telemedicine platforms which can be highly utilized do not necessarily contribute to electronic health literacy when the users are not sure of their ability to interpret medical information. This indicates the necessity of complementary interventions e.g. user training, explanatory prompts and decision-support tools to enhance self-efficacy and make use of usable systems to the fullest extent possible to build literacy. Combined, the first two hypotheses show that there is a synergistic relationship between the usability of telemedicine and self-efficacy in the construction of electronic health literacy. These results underline the fact that literacy development can be most successful in case technological design and user empowerment strategies are harmonized. This multidimensional framework builds upon the current study of telemedicine by showing that the usability of the system is no longer completely sufficient to guarantee meaningful user learning and highlights the criticality of considering the psychological preparation and the technical quality (Rabbani et al., 2025).

The third hypothesis was validated, and electronic health literacy showed to have a significant effect on the satisfaction of telemedicine. The findings are also consistent with the previous reports on the topic that found users with the capacity to process the digital health information to a satisfactory degree are more satisfied with the services of telemedicine, as they gain better understanding and communication and enhance their perception of the quality of care (Naji et al., 2025; Neumann et al., 2025). These results confirm the cognitive aspect of satisfaction, which means that satisfaction does not emerge due to system performance only, as well as the capability of users to derive the meaning of the information delivered. Practically, this means that healthcare organizations ought to invest in literacy-enhancing characteristics, i.e., the learning material, visuals, and simplified medical terms, to enhance satisfaction outcomes as opposed to implementation of only functional system upgrades.

The fourth hypothesis proved the moderate effect of trust in AI-generated health advice on the relationship between electronic health literacy and telemedicine satisfaction. In particular, the beneficial effect of literacy on satisfaction was greater among the users who believed in AI-generated recommendations. This observation adds to the ongoing discussion on the role of trust in AI-mediated healthcare, as the anxieties about transparency, accountability, and reliability tend to be present alongside the perceived advantages of efficiency and personalization (McRae et al., 2025; Nasution & Assyura, 2025). Although increased literacy empowers users with the capacity to analyze health information, trust is what decides whether this analysis will lead to such positive experiences and satisfaction. This is in tandem with the latest theories of trust transfer to digital healthcare that assume that trust in intelligent systems increases positive user results (Kopka et al., 2025; Zhang et al., 2025). In practice, the findings imply that to leverage the potential of electronic health literacy to the fullest, it is necessary to promote the development of trust using explainable AI features, evidence-based recommendations, and support of clinicians.

Lastly, the fifth hypothesis proved the relationship between telemedicine usability and telemedicine satisfaction mediated by electronic health literacy. Such an observation confirms the Information Systems Success Model that states that system quality has an indirect effect on satisfaction via user competencies (Dadgar & Nickel, 2025). The mediation effect elucidates how the improvements in usability result in satisfaction: usability increases literacy, which subsequently influences good user assessments. This observation holds critical implications to the practitioners, which means that efforts

to make usability and encourage the interpretive capacity of users should be balanced to attain meaningful satisfaction returns.

All these findings have shown a multidimensional model of telemedicine satisfaction, where telemedicine usability is a foundational enabler, electronic health literacy is a central mediating mechanism, and self-efficacy to interpret data and trust in artificial intelligence-generated health advice is a critical moderator. The fact that these relationships have been empirically validated contributes to the theoretical knowledge of digital health adoption and provides practical recommendations to system designers, health providers, and policymakers. Finally, the findings indicate that the best results in telemedicine are attained in terms of an integrated approach that incorporates a user-centered approach, literacy design, psychological empowerment, and trust in AI-powered healthcare tools.

5.1 Implications of the Study

The given study makes a number of valuable contributions to the theoretical literature on digital health, telemedicine, and the adoption of technology. First, it expands the Technology Acceptance Model (TAM) and incorporates the concepts of telemedicine usability and electronic health literacy, proving that system design characteristics may determine not only behavioral intention but also cognitive competencies, which are the basis of successful health management. The study supports the moderating role of self-efficacy in data interpretation and trust in AI-generated advice, thus, contributing to the development of the Social Cognitive Theory in the context of digital health, namely that personal cognitive and attitudinal factors are critical in determining the effect of technology on the results. Additionally, the research complements and extends the Information Systems Success Model by demonstrating that electronic health literacy mediates the connection between system usability and satisfaction with the significance of the user competencies as a tool through which technology effectiveness is achieved. Together, both results provide a more integrative, nuanced framework that can be used to explain direct, mediating, and moderating impacts of telemedicine adoption, bridging current classical technology acceptance constructs and new digital health competencies. By placing usability, literacy, self-efficacy, and trust together in one empirical model, the study gives a theoretical basis to further studies which aim to learn the cognitive, technological, and attitudinal factors which determine the effectiveness of digital health.

Practically, the results can offer practical implications to healthcare providers, telemedicine system developers, and policymakers who want to maximize the use and satisfaction of digital health. To begin with, enormous implication of telemedicine usability on electronic health literacy signifies the importance of user-oriented design principles, such as user-friendly interface, oriented navigation, and accessible educational resources, which can contribute to more efficient patient engagement in telehealth systems. Second, the moderating impacts of self-efficacy and trust show that technology is not enough, and the health systems are to introduce patient training programs, instructional tutorials, and building confidence interventions to enhance the ability to interpret health data and apply AI-driven suggestions. Third, the fact that electronic health literacy mediates between satisfaction and improvement highlights the importance of an intervention targeted at the functional aspect of the system as well as the development of user competencies to make sure that the usability can be converted into meaningful results. Lastly, AI advice should be cultivated based on transparency, recommendations that are explainable, and AI-driven based evidence since this concept determines how literacy is converted into satisfaction. In sum, these practical findings inform designing the overall telemedicine plans, which are technologically and skill-based, and trust-centered, thus facilitating the effectiveness of engaging, satisfying, and improving the quality of care among the patients.

5.2 Limitations and Future Research Areas

Regardless of the input of this study, there are various limitations that have to be admitted which also indicate some opportunities of further research. First, the researchers adopted a cross-sectional research design, which does not allow concluding about the causal relationships between telemedicine usability, electronic health literacy, self-efficacy, trust, and satisfaction. Longitudinal studies would give a better idea of how such relationships will change with time, especially when patients will have experience with telemedicine platforms. Second, the data were gathered mainly using self-report data in the form of questionnaires and are therefore susceptible to social desirability bias and response bias which could also influence the validity of variables in self-efficacy and satisfaction. To supplement the self-reported data, future studies may include objective usage indicators, platform records or observation to support validity. Third, particular healthcare settings were sampled, which may not be generalizable in other populations, settings, and healthcare system. Future research may be done by expanding the study to other geographical areas, ethnic groups, and social-economic status to determine whether the resulting patterns are still present in the wider context and to identify any possible modifying impacts of demographic factors.

The research also had a limited scope of the contributes to choose the constructs, like telemedicine usability, literacy,

self-efficacy, trust, and satisfaction, and other aspects, including privacy concerns, perceived risk, technological anxiety, or organizational support, were not studied. It is possible that in the future, these other variables can be added to the research to create more spillover models of telemedicine adoption and outcomes. The analysis was also in large part an AI-generated advice as a moderator, although the fast-changing environment of digital health encompasses multiple AI modalities, virtual assistants, and predictive analytics that can have a dissimilar impact on trust and satisfaction. Future research would be able to compare how various AI applications are applied to patient experiences and outcomes. Lastly, the qualitative type of research such as interviews or focus groups may serve as an addition to quantitative results to gain a better idea of patient perception, barriers, and facilitators pertaining to telemedicine usability, literacy development, and trust and contribute to the theoretical and practical knowledge in the field.

6. Conclusion

In conclusion, one can say that this paper provides a very solid argument that the usability of telemedicine, electronic health literacy, self-efficacy, and trust in AI-generated advice are the primary predictors of telemedicine satisfaction. Each of the five hypotheses is accepted that proves that the correlation between the usability of the system and its literacy, self-efficacy and system literacy relevance, trust and literacy relevance, and literacy as a mediator between system usability and satisfaction are established. The findings demonstrate the mutual dependence of technological, cognitive, and attitudinal factors on the formation of successful patient engagement with digital health platforms. This research integrates these constructs in order to develop one conceptual model and extrapolate theoretical frameworks such as the TAM, Social Cognitive Theory, and information systems success Model, and give a comprehensive account of how telemedicine systems can influence user results. It is also found that the most important position is played by the consideration of the system design and user empowerment in the process of maximizing the performance of the telemedicine. In an attempt to understand the development of telemedicine, the study has significant practical implications on the side of healthcare providers, developers of telemedicine, and policy makers, which are founded on the importance of user-centered design, literacy-building interventions, confidence-enhancing programs, and trust-building approaches to AI-based recommendations. Clearly indicating the mediation and moderation processes that result in telemedicine satisfaction, the study provides feasible recommendations on the way a holistic telemedicine solution is created to reach the highest level of utility, competency development in patients, and trust in new technologies. Ultimately, this research study will be used to design and advance the theory and practice of digital health by offering the evidence-based methods of tackling patient interaction and satisfaction and the general health outcomes. Further research relying on the results may add further to our understanding of telemedicine adoption, assist in developing more efficient digital health intervention, and offer equal functional conditions of a high-quality care in more technologically-mediated healthcare systems.

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