


THE IMPACT OF DIGITAL SERVICE QUALITY TOWARD CUSTOMER ENGAGEMENT: A CASE STUDY OF TELEMEDICINE IN THAILAND

Niruth Sripawatakul^A, Wilert Puriwat^B, Danupol Hoonsopon^C



ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 20 February 2023</p> <p>Accepted 08 May 2023</p>	<p>Purpose: The aims of this study are to examine the effect of digital service quality on customer engagement with telemedicine systems and to investigate how such effects change depending on a variety of socioeconomic characteristics.</p> <p>Design/methodology/approach: The survey research with online questionnaire was conducted with 405 telemedicine experienced samples. The proposed hypotheses were tested using the Structural Equation Modeling (SEM) method.</p> <p>Findings: The results revealed that digital service quality significantly influences customer engagement. A second-order confirmatory factor analysis of the digital service quality (DSQ) construct revealed that the efficiency dimension best explained DSQ, followed by the responsiveness and interaction dimensions. The study of moderation revealed that the effect of DSQ on CE was greater in younger age groups than in older age groups. In addition, those with a higher level of formal education appear to have higher levels of CE than those with a lesser level of formal education.</p> <p>Research, Practical & Social implications: The study will help practitioners create telemedicine services that are more efficient and effective so that patients are more engaged and loyal to the telemedicine service providers.</p> <p>Originality/value: The value of the study is that it is one of the rare attempts to clarify the consequences of digital service quality from the perspective of the consumer, and it proposes several implications and recommendations.</p>
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O IMPACTO DA QUALIDADE DO SERVIÇO DIGITAL PARA O ENGAJAMENTO DO CLIENTE: ESTUDO DE CASO DE TELEMEDICINA NA TAILÂNDIA

RESUMO

Objetivo: À medida que a epidemia de COVID-19 se espalha, abordagens adaptativas de telessaúde foram rapidamente adotadas para garantir a prestação contínua de serviços vitais de saúde. Uma das áreas do sistema de saúde que mais cresce é a telemedicina. No entanto, algumas evidências empíricas sobre como o engajamento do cliente (CE) para serviços de telemedicina. Os objetivos deste estudo são (1) determinar como a qualidade dos serviços digitais afeta a forma como os clientes se envolvem com os sistemas de telemedicina (2) investigar como esses efeitos mudam dependendo da variedade de características socioeconômicas.

Desenho/metodologia/abordagem: A pesquisa survey com questionário online foi realizada com 405 amostras experientes em telemedicina. A Modelagem de Equações Estruturais (SEM) foi utilizada para testar as hipóteses propostas.

Resultados: Os resultados revelaram que a qualidade do serviço digital influencia significativamente o engajamento do cliente. Uma análise fatorial confirmatória de segunda ordem do construto qualidade de serviço digital (DSQ) revelou que a dimensão eficiência melhor explicou o DSQ, seguida pelas dimensões responsividade

^A Candidate for Doctor of Philosophy. Technopreneurship and Innovation Management Chulalongkorn University. Bangkok, Thailand. E-mail: niruth.sripa@gmail.com Orcid: <https://orcid.org/0009-0007-3545-4562>

^B Doctor of Philosophy. Chulalongkorn Business School Chulalongkorn University. Bangkok, Thailand. E-mail: wilert@cbs.chula.ac.th Orcid: <https://orcid.org/0000-0001-8891-3637>

^C Doctor of Business Administration. Chulalongkorn Business School Chulalongkorn University.

Bangkok, Thailand. E-mail: dunupol@cbs.chula.ac.th Orcid: <https://orcid.org/0000-0001-6408-4790>

e interação. O estudo da moderação revelou que o efeito do DSQ na EC foi maior nas faixas etárias mais jovens do que nas faixas etárias mais avançadas. Além disso, aqueles com maior nível de educação formal parecem ter níveis mais elevados de EC do que aqueles com menor nível de educação formal.

Pesquisa, implicações práticas e sociais: O estudo ajudará os profissionais a criar serviços de telemedicina mais eficientes e eficazes para que os pacientes sejam mais engajados e leais aos provedores de serviços de telemedicina.

Originalidade/valor: O valor do estudo é que é uma das raras tentativas de esclarecer as consequências da qualidade do serviço digital do ponto de vista do consumidor e propõe várias implicações e recomendações.

Palavras-chave: Qualidade de Serviço Digital, O Envolvimento do Cliente, Telemedicina.

EL IMPACTO DE LA CALIDAD DEL SERVICIO DIGITAL EN LA COMPROMISO CON EL CLIENTE: ESTUDIO DE CASO DE TELEMEDICINA EN TAILANDIA

RESUMEN

Propósito: A medida que se propaga la epidemia de COVID-19, se han adoptado rápidamente enfoques de telesalud adaptables para garantizar la provisión continua de servicios de atención médica vitales. Una de las áreas del sistema sanitario que más crece es la telemedicina. Sin embargo, existen algunas evidencias empíricas sobre cómo el compromiso del cliente (CE) con los servicios de telemedicina. Los propósitos de este estudio son (1) determinar cómo la calidad de los servicios digitales afecta la forma en que los clientes interactúan con los sistemas de telemedicina (2) investigar cómo cambian dichos efectos según la variedad de características socioeconómicas.

Metodología: La investigación de la encuesta con cuestionario en línea se realizó con 405 muestras experimentadas en telemedicina. Se utilizó el Modelado de Ecuaciones Estructurales (SEM) para probar las hipótesis propuestas.

Conclusiones: Los resultados revelaron que la calidad del servicio digital influye significativamente en el compromiso del cliente. Un análisis factorial confirmatorio de segundo orden del constructo de calidad del servicio digital (DSQ) reveló que la dimensión de eficiencia explicaba mejor el DSQ, seguida de las dimensiones de capacidad de respuesta e interacción. El estudio de moderación reveló que el efecto de DSQ en CE fue mayor en los grupos de edad más jóvenes que en los grupos de mayor edad. Además, aquellos con un mayor nivel de educación formal parecen tener niveles más altos de EC que aquellos con un menor nivel de educación formal.

Implicaciones de la Investigación: El estudio ayudará a los profesionales a crear servicios de telemedicina que sean más eficientes y efectivos para que los pacientes estén más comprometidos y leales a los proveedores de servicios de telemedicina. El valor del estudio es que es uno de los raros intentos de aclarar las consecuencias de la calidad del servicio digital desde la perspectiva del consumidor, y propone varias implicaciones y recomendaciones.

Palabras clave: Calidad de Servicio Digital, Compromiso del Cliente, Telemedicina.

INTRODUCTION

In recent years, telemedicine has grown in significance as a tool for enhancing access to healthcare, particularly in remote and underserved places. Bashshur et al. (2016) stated in a comprehensive study that telemedicine can assist in addressing regional barriers to care and enhance patient outcomes. In times of crisis, such as the COVID-19 epidemic, telemedicine can also help decrease exposure to infectious diseases and enhance patient access to care (Hollander and Carr, 2020). Healthcare expenditures for patients and healthcare systems both stand to be significantly impacted by telemedicine. Previous studies confirmed that telemedicine can lower expenses related to patient transportation, ER visits, and hospital admissions (Chanussot-Deprez, & Contreras-Ruiz, 2013). Telemedicine is defined by the World Health Organization as the provision of health care services by professionals utilizing information and

communication technology (World Health Organization, 2020). The technology enables the accurate transmission of data for disease diagnosis, treatment, and prevention. In addition, it offers healthcare service providers a platform for research and ongoing education. Due to the availability of inexpensive internet, cellphones with video cameras, and increased bandwidth, Asia is home to a burgeoning market for telemedicine services. Since its inception, the COVID-19 pandemic has increased the significance of telemedicine and gained the greatest attention. Telemedicine has the ability to play a role in humanitarian emergencies, when victims are uprooted from their homes and primary healthcare providers (Grossman et al., 2020). As one of the safest ways of patient-physician interaction, telehealth is widely utilized, it also plays a critical role in the current pandemic, where social separation is required. Countries in Southeast Asia, such as Thailand, have enacted telemedicine implementation legislation. Additionally, they have observed a rise in adoption among patients and clinicians (Shimizu et al., 2018). Nevertheless, to broaden its use and assure its long-term viability, The evidence about the use of telemedicine by patients and medical professionals must be examined in order to create a system that is user-friendly and resilient. Telemedicine's limited benefits include providing healthcare services to persons in rural or inaccessible areas, older populations with mobility issues, and safeguarding delicate patients from unnecessary exposure to the hospital's infectious environment. Added advantages of telemedicine for patients and healthcare professionals include reduced or eliminated travel and waiting period, accessibility to specialists, a lower risk of getting a new infection, and enhanced healthcare management. It also permits for frequent doctor visits, allowing for improved pharmaceutical, lifestyle, and health problem management without hospitalization (Bashshur et al., 2020).

Earlier studies showed that telemedicine can also assist lessen provider burnout, enhance work-life balance, and boost job satisfaction (Portnoy et al., 2016). Nevertheless, regulatory obstacles can obstruct the adoption of telemedicine, particularly across state lines (Dorsey, & Topol, 2020). The delivery of healthcare could change as a result of telemedicine. However, since patients are so important to the success of telemedicine interventions, its success depends on their active involvement. The success of telemedicine therapies depends on the participation of the patient. Engaged patients are more likely to follow treatment plans, produce better results, and make better use of healthcare resources (Carman et al., 2013). Customer interaction in telemedicine can raise patient happiness, lower drop-out rates, and boost the likelihood of good outcomes (Rathert et al., 2017). Despite the potential advantages of customer engagement, achieving it in the context of telemedicine is not without its

difficulties. These include patient resistance to change, access issues, and technological barriers (Rathert et al., 2017). For telemedicine to be widely used and to realize its potential benefits, it will be essential to address these issues.

Like other nations, Thailand is also turning towards an aging society. Recent statistics indicate that approximately 17% of the population is 60 or older. In addition, a physician and a nurse are responsible for the care of 1,843 and 405, respectively, Thai patients in 2017 (Khemapech, Sansrimahachai, & Toachoodee, 2019). The Ministry of Public Health has established an eHealth plan for the years 2017 to 2026 to promote equal access to medical and health care services for the Thai population. Regarding the strategy, the following are the four phases of eHealth development in Thailand (Khemapech, Sansrimahachai, & Toachoodee, 2019): (1) Investing in and constructing the framework for the anticipated one-year and six-month eHealth development phase. (2) The inclusion phase of eHealth seeks to incorporate all Thai industries into eHealth activities. This phase will likely last five years. The purpose of the third phase of eHealth transformation is to employ digital innovation to deliver unique medical services. This target is anticipated to be accomplished in ten years. (4) eHealth leadership phase to provide actual economic value to the public health system and provide Thais with a great quality of life. This major transition will take twenty years. For the delivery of dependable medical services, even telehealth or telemedicine, which is one of the strategy's main components, requires underlying information and communication technology. eHealth foundations are essential and are therefore carried out initially. In the case of telemedicine, the most significant challenges to implementing solutions include a lack of legislative regulation, an unsupportive corporate culture, conflicting aims, a lack of application expertise, and a lack of technical capabilities. To foster the development of telemedicine, four pieces of information are required: cost, infrastructure, legal and ethical considerations, and patient perception. There are two telemedicine implementation strategies. The initial step is integration into existing communities. Thailand has been a member of the Telemedicine Development Center of Asia since 2005. (TEMDEC). The first hospital to join the telemedicine initiative is Siriraj Hospital. As of 2017, 144 programs have been completed in Thailand. Moreover, most program associations are managed in Bangkok. Surgery and endoscopy are the two most common telemedicine treatments. An alternative strategy would be to develop our own system. Even basic eHealth development is in progress; the Ministry of Public Health has produced and distributed more than thirty applications for public usage. Most of them contain details on first aid, medical institutions, and diseases (Khemapech, Sansrimahachai, & Toachoodee, 2019).

After the COVID-19 pandemic, Thailand appears confident regarding the future of telemedicine. Telemedicine will become increasingly accessible and generally accepted in the future years as a result of developments in telecommunications technology and a shift in consumer behavior.

Nevertheless, aged and fragile populations may find it difficult to utilize telemedicine because it demands a solid understanding of technology and devices for effective communication. In telemedicine, the absence of a physical examination can cause patient anxiety and potentially hinder the patient-doctor relationship. Few problems are related with the use of telemedicine regarding patient confidentiality and private medical data. Few organizations deny telemedicine consultations insurance coverage, and there is no defined medicolegal structure or regulating agency in place for telemedicine to address issues like as confidentiality, misbehavior, and liabilities. These may contribute to a lack of confidence and distrust in the use of telemedicine. As a result of the advent of the COVID-19 epidemic, most Southeast Asian nations have modified their laws to minimize these hurdles to telemedicine and broaden the reach of mobile health (Intan Sabrina, & Defi, 2021). Studies from the past have been looked at as potential causes of telemedicine service acceptability (Serrano, Mendes, Lizarelli, & Ganga, 2020). Patients' attitudes toward telemedicine have been influenced by the perceived importance of security and confidentiality in healthcare. The disease's intricacy and, subsequently, the severity of its symptoms, may also influence the patient's decision to utilize telemedicine. This issue has to do with how a patient feels about risk and, as a result, how eager they are to use a telemedicine service. Nevertheless, there are few articles discussing in the marketing perspective such as customer engagement, and brand loyalty towards telemedicine service usages.

There is a need for more research on the function of digital service quality and customer engagement in telemedicine despite the increased interest in it to increase access to healthcare. While earlier studies have emphasized the value of patient outcomes in telemedicine, there hasn't been much research done specifically on how patient outcomes are affected by patient engagement and the quality of the digital services they receive. Therefore, examining the connection between customer engagement, digital service quality, and patient outcomes in the context of telemedicine, with a focus on formulating plans for enhancing customer engagement and digital service quality to enhance patient outcomes, will provide useful theoretical and practical implications. Such research has the potential to guide the creation of successful telemedicine interventions that can boost patient happiness, decrease healthcare costs, and

improve access to care. By exploring hitherto untapped regions, this research contributes to the body of knowledge on patient participation in telemedicine. It analyzes the service quality of telemedicine services as one of the antecedents of patient participation in telemedicine. In addition, it explores the various socioeconomic variables as moderators of a patient's impression of telemedicine use. We designed a conceptual model based on digital service quality and consumer engagement for this objective.

The current study article is broken into five sections, the first of which is devoted to the literature on digital service quality and customer engagement concepts. The third section outlines the research's data collection methodology. The fourth section discusses the analysis's conclusions and major findings. In the fifth and sixth sections, the study finishes with a few recommendations for future researchers, while the sixth section analyzes the limitations and suggests directions for additional study.

LITERATURE REVIEW

Digital Service Quality

The SERVQUAL model, created in 1985 by Parasuraman, Zeithaml, and Berry, has 5 dimensions: tangibles, reliability, responsiveness, and assurance. This methodology assesses how well an e-service contributes to the perceived value of its users. The SERVQUAL paradigm has been extensively used to gauge service quality in online settings. Later, WEBQUAL, a new scale created by Loiacono, Watson, and Goodhue (2002), assesses 12 factors including business, design, flow, informational fit to job, innovativeness, integrated communication, interaction, intuitiveness, response speed, substitutability, trust, and visual appeal. Because of its intangibility, heterogeneity, and inseparability, service quality measurement is challenging. Through the customer perception concept, the concept of service quality has been studied and improved throughout the last many decades (Tam, 2023). According to Barnes and Vidgen (2001), the WebQual model is founded on communication theory, which stresses the relationship between customers and e-commerce. Yoo and Donthu (2001) propose the SITEQUAL methodology for measuring the quality of e-services utilizing website layout and hardware. As internet firms are structured differently than traditional organizations, SERVQUAL lacks the key elements for evaluating the quality of online service. Parasuraman, Zeithaml, and Malhotra (2005) provide a framework for evaluating the characteristics of e-service quality, which includes system availability, contact, compensation, efficiency, fulfillment, privacy, and responsiveness. Later, Rowley (2006) defines numerous

elements of e-service quality, which include website characteristics, accessibility, security, responsiveness, dependability, information, communication, and delivery. Zeithaml, Parasuraman, and Malhotra (2002) define e-service quality as the extent to which a website facilitates the provision of services that cater to customers' demands not only during the buying experience but also after the purchasing process. Santos (2003) defines e-service quality as the extent to which an online service provider meets client expectations. The term indicates that it is necessary not just to attract customers' attention but also to maintain them for an extended period. Therefore, a firm must focus on each phase, beginning with service navigation and ending with service completion. Consequently, e-service quality encompasses all services, such as information, agreements, fulfillment, and after-sales services (Xu, Blankson, & Prybutok, 2017).

The effect of digital service quality on patient outcomes in telemedicine has been the subject of numerous studies. For instance, a study by Sim & Lee (2021) discovered that patient satisfaction with telemedicine interventions was significantly influenced by the usability of a telemedicine platform. Another study by Jasemian (2008) discovered that patient trust and confidence in telemedicine depended on the technology's dependability. Additionally, studies have pinpointed particular aspects of the quality of digital services that are crucial for telemedicine. Patient satisfaction in telemedicine consultations was significantly influenced by the audio and video quality. patient involvement and satisfaction depended on how simple it was to use a telemedicine platform (Pogorzelska, & Chlabicz, 2022). There are not enough studies analyzing the connection between customer engagement and digital service quality in telemedicine, despite the significance of these two elements. Few studies have particularly looked into how these aspects connect in the context of telemedicine, even if prior studies have looked at the impact of consumer involvement and the quality of digital services on patient outcomes. Therefore, there is a need for research that examines the connection between customer engagement and the quality of digital services in telemedicine, with a specific emphasis on identifying methods for maximizing both factors to enhance patient outcomes. Such research has the potential to guide the creation of successful telemedicine interventions that can boost patient happiness, decrease healthcare costs, and improve access to care.

Customer Engagement

In marketing literature, only a few authors have defined the term “customer involvement (CE)”. Similar phrases include “brand engagement”, and “consumer engagement”. Patterson,

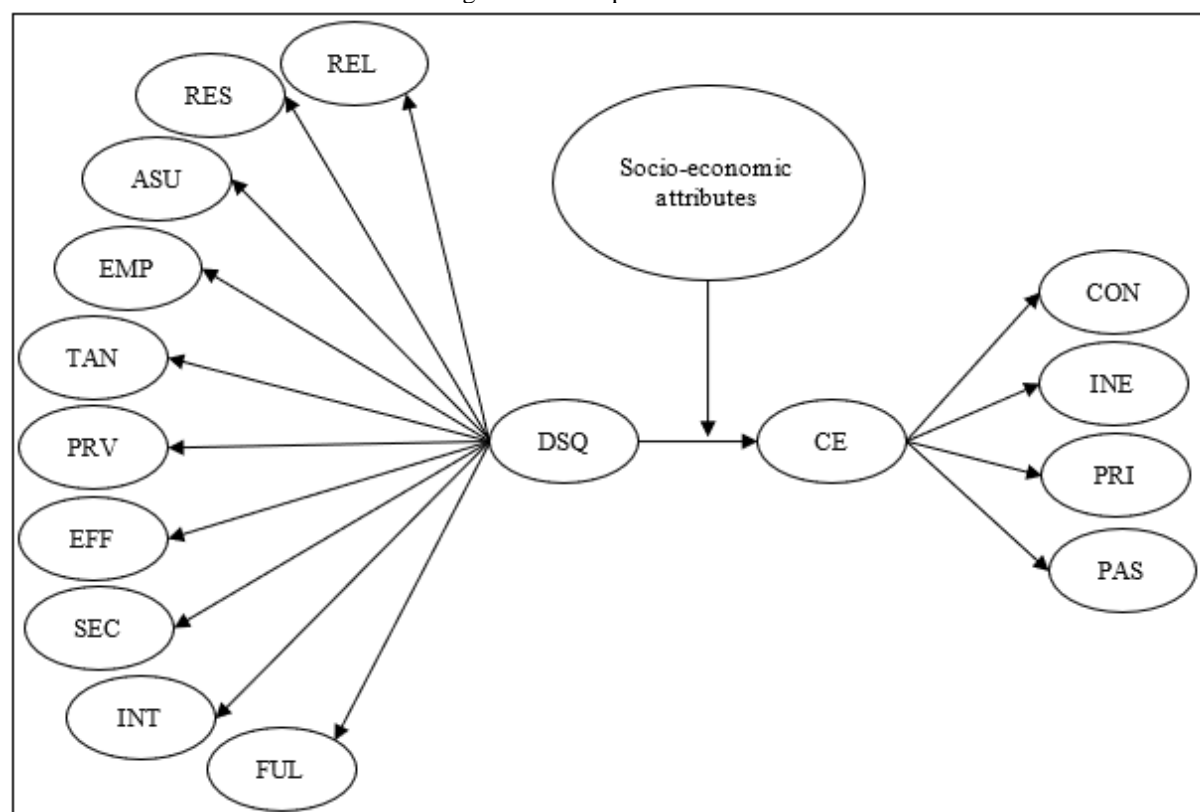
Yu, and De Ruyter (2006) define customer engagement as physical, cognitive, and emotional presence of a consumer in their interaction with a service business, whereas Hollebeek (2011) defines customer brand engagement as the level of a customer's motivated, brand-related, and context-dependent mental state characterized by a specific level of cognitive, emotional, and behavioral activity in brand encounters. According to Vivek (2009), the concept of relationship marketing has shifted from "marketing to" to "marketing with". Customers and businesses co-create value, particularly in service-dominant logic as opposed to goods-dominant reasoning. Companies are attempting to get clients to engage in non-transactional behaviors outside buy intents (Verhoef, Reinartz, & Krafft, 2010). There is currently no unanimity in marketing literature regarding the definition and dimensions of customer involvement (Cheung, & To, 2011). The concept of customer interaction can be divided into two categories: unidimensional and multidimensional. For unidimensional conceptualization, just the behavioral components of client involvement are emphasized. Multidimensional conceptualization, on the other hand, identifies cognitive, emotional, and behavioral sub-dimensions of consumer engagement (Hollebeek, 2011). Brodie, Hollebeek, Jurić, and Ilić (2011) gave a thorough analysis of customer involvement definitions and concepts and described customer engagement as a psychological state resulting from interactive, cocreative consumer encounters with a focal object in focal service interactions. It occurs within a particular set of context-dependent parameters, producing varying levels of CE, and exists as a dynamic, iterative process inside service partnerships that cocreate value. CE plays a crucial role in a nomological network governing service interaction, in which other relational notions are antecedents or outcomes of repetitive CE processes. It is a complex term with specific cognitive, emotional, and behavioral expressions. Gallup (2011) developed an 11-question metric of customer engagement called CE11 to quantify customer engagement. Gallup's study of the dynamics of rational loyalty (L3) and emotional attachment (A8) CE11 measures rational formulations of loyalty based on three important characteristics (L3): overall satisfaction, intent to repurchase, and intent to refer. In addition, eight measures of emotional attachment are added (A8). The overall customer engagement score, or CE11, is the most accurate indicator of customer loyalty. Gallup designed the eight A8 questions as paired markers of four emotional states: trust in a brand, belief in its integrity, pride in the brand, and enthusiasm for it. CE11 assesses three essential aspects of a customer's rational evaluation of a brand and adds eight questions regarding emotional attachment. Establishes the reasonable attitude of a buyer toward a brand. Then, the A8 captures what occurs in a customer's mind when a product earns his trust and corresponds with

something so beneficial or enjoyable in his experience that it becomes a defining moment in his day.

CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

This research intends to explore the effect of digital service quality (DSQ) towards customer engagement in telemedicine context. DSQ in our study adapted from previous literature review (Parasuraman et al., 1985; Loiacono, 2001; Yoo and Dinthu, 2001; Parasuraman et al., 2005; Zeithaml et al., 2002; Santos, 2003; Xu et al., 2017) comprises of ten components: namely, reliability, responsiveness, assurance, empathy, tangibles, privacy, efficiency, security, interaction, and fulfillment. On the on hand, customer engagement contains 4 dimensions; namely, confidence, integrity, pride, and passion adapted from the CE11 metric concept developed by Gallup (2011). Based on a review of the literature, we proposed the conceptual framework depicted in Figure 1.

Figure 1. Conceptual framework



Note: DSQ = digital service quality; REL= reliability; RES = responsiveness; ASU = assurance; EMP = empathy; TAN = tangibles; PRV =privacy; EFF = efficiency; SEC = security; INT = interaction; FUL = fulfillment; CE = customer engagement; CON = confidence; INE = integrity; PRI = pride; PAS = passion

Utilizing this paradigm, the hypotheses have been verified:

Previous studies have confirmed the positive effect of service quality on customer perception and attitudes (Alsabbagh, 2023; Alsuwaidi, 2023). Additionally, most research that has looked into the connection between the quality of digital services and customer engagement have discovered a favourable correlation. For instance, the study of Alalwan et al. (2017) on Jordanian mobile banking services indicated that service quality has a favourable impact on consumer engagement.

The perceived quality of digital services, according to Fan, Shao, and Dong (2022) research on Chinese e-commerce platforms, is a strong predictor of customer engagement behaviour. Based on this literature, the authors propose the hypothesis that DSQ influences customer's engagement.

Hypothesis 1: DSQ significantly influences customer's engagement (CE).

There is evidence to suggest that socio-economic attributes can moderate the effect of digital service quality on customer engagement. For example, a study by Ryu and Han (2010) showed that the effect of website quality on patron engagement in quick-casual eateries is moderated by age. Particularly, younger customers were more impacted by website quality than older customers in terms of engagement. Another study by Loiacono, Watson, and Goodhue, (2007) discovered that the influence of website quality on e-commerce engagement is moderated by age. Particularly, younger customers were more impacted by website quality than older customers in terms of engagement. Gefen, Karahanna, and Straub (2003) also found that age moderates the effect of website quality on engagement in online shopping. Based on what has been reviewed, the authors propose the hypothesis that socio-economic attributes moderate the effect of DSQ on CE.

Hypothesis 2: Socio-economic attributes moderate the effect of DSQ on CE.

RESEARCH METHODOLOGY

Design of Research and Data Collection

A quantitative approach utilizing a survey questionnaire was utilized to assess the stated research hypotheses and evaluate the proposed model. The data collected using a strategy of purposive sampling was analyzed using Structural Equation Modeling (SEM). According to Anderson and Gerbing (1988), the sample size should include at least 150 people. Kline (1998), however, recommend that a minimum of 200 participants or five cases per parameter is required for an appropriate SEM analysis. Initially, throughout the inquiry, participants were provided with examples of telemedicine delivery services. Respondents were asked to answer survey

questions based on their perceptions of the telemedicine service that they had recently encountered. With 42 observable variables, the minimal sample size for this investigation was 210 participants. After data collection and screening for analysis, 405 valid surveys were gathered, reaching the minimum sample size requirement.

Questionnaire Development

Two sections comprised the questionnaire. In the first section, demographics and behavior were discussed. In the second portion, items for measuring telemedicine service perception were included. In this research, DSQ consists of ten elements: namely, reliability, responsiveness, assurance, empathy, tangibles, privacy, efficiency, security, interaction, and fulfillment. The questionnaire items were used and modified from previous research. To evaluate the customer's engagement, the authors adapted a fifteen-item scale from Gallup (2011). On a Likert scale ranging from 1 to 5, 5 represented "strongly agree or always" and 1 represented "strongly disagree or never". Table 1 contains a listing of each construct measured by the questionnaire's 42 items.

Table 1. Constructs and Observed Variables in this study

Constructs	Items	Observed Variables
Reliability	REL1	The telemedicine service is precise.
	REL2	The telemedicine order service is complete.
	REL3	Its records for telemedicine delivery services are always reliable.
Responsiveness	RES1	Adequate responsive time.
	RES2	Prompt service.
	RES3	Timely response.
Assurance	ASU1	Thoroughness of a medical examination
	ASU2	Instructions on medications/follow-up care.
	ASU3	Competence of health workers
Empathy	EMP1	Telemedicine staff meets the required services.
	EMP2	Telemedicine staff responded quickly to any demand.
	EMP3	Telemedicine staff were well-informed and so they explained well.
Tangible	TAN1	All system functions for the telemedicine service work perfectly.
	TAN2	The telemedicine service allows me to finish the operation quickly.
	TAN3	The telemedicine service has no problem being accessed.
Privacy	PRV1	I think it's important for this company's telemedicine delivery service to have a privacy statement to make sure that customer information is kept private.
	PRV2	I think that providing third-party verification to verify the organization's telemedicine delivery service authenticity for patients is vital.
	PRV3	I think that the telemedicine service of the organization does not share patients' personal information with others.
Efficiency	EFF1	The telemedicine service is easy to use.
	EFF2	The information on this telemedicine delivery service is valuable.
	EFF3	I can count on the information I get from this telemedicine delivery service.
Security	SEC1	This telemedicine delivery service will not misuse my personal information.
	SEC2	I feel safe in my telemedicine delivery service transactions.
	SEC3	I felt the risk associated with telemedicine delivery services was low.
Interaction	INT1	My interactions with the telemedicine service were of great quality.

	INT2	I would say that the telemedicine service demonstrates real concern and attention for my unique situation.
	INT3	I believe the telemedicine service provides patients with pleasant and friendly service.
Fulfillment	FUL1	Treatments through the telemedicine service are available within a suitable time frame.
	FUL2	This telemedicine delivery service makes exact promises about the delivery of treatments.
	FUL3	This telemedicine delivery service delivers what I order quickly.
Confidence	CON1	This telemedicine delivery service provider has a name I can always trust.
	CON2	This telemedicine delivery service provider always delivers on what it promises.
	CON3	Never disappoint me.
Integrity	INE1	This telemedicine delivery service provider always treats me fairly.
	INE2	If there is a problem, I can always count on the company that delivers telemedicine to find a fair and satisfying solution.
	INE3	This telemedicine delivery service provider is trustworthy.
Pride	PRI1	I feel proud to be the telemedicine service provider's customer.
	PRI2	This telemedicine delivery service provider always treats me with respect.
	PRI3	I am always treated with courtesy by this telemedicine delivery service provider.
Passion	PAS1	This telemedicine delivery service provider is perfect for patients like me.
	PAS2	I can't imagine a world without this telemedicine delivery service provider.
	PAS3	This telemedicine delivery service provider is the ideal service for individuals like me.

RESULTS AND DISCUSSIONS

Descriptive Statistic Results

The population of Thailand is diverse, and so are their healthcare needs and preferences. By examining the implementation and effectiveness of telemedicine services in Thailand, it is possible to better understand how cultural, social, and economic concerns might affect the adoption and use of telemedicine in other nations. The data was gathered using computer-assisted telephone interviews (CATI). Respondents were informed beforehand in a clear and accurate manner about the use of personal data collected for this study. Although the data from this research study will be used for the analysis, it will not be feasible to identify individuals because the data will be given in aggregate form. Respondents described their most recent interaction with telemedicine services. They then answered the questionnaire based on their perceptions of the telemedicine services they received. 405 valid survey responses were submitted for data analysis. Most respondents were female (53.8%), aged between 36 and 45 years (57.4%), with a bachelor's degree (50.2%), and earning less than \$664 a month (40.4%).

Hypotheses Testing with the Structural Equation Modeling

A two-step modeling approach was applied to examine the proposed hypotheses. Initially, the measurement model is evaluated using confirmatory factor analysis (CFA). To confirm that our measuring constructs appropriately explained the proposed conceptual

framework, we would assess both convergent and discriminant validity. As was previously illustrated, the DSQ is a higher-order construct with ten dimensions which are reliability (REL), responsiveness (RES), assurance (ASU), empathy (EMP), tangible (TAN), privacy (PRV), efficiency (EFF), security (SEC), interaction (INT), and fulfillment (FUL). All ten constructs are composed of 3 measurement items. CE is the second order construct of four elements, which are confidence (CON), integrity, (INE), pride (PRI), and passion (PAS). In total, there are 42 measurement items. Cronbach's alpha was discovered to range between 0.82 and 0.97. Tables 2 and 3 illustrate the outputs of the measuring model.

Table 2. Measures of convergent validity

Construct	Item code	Item loadings	CR	AVE	Cronbach's alpha
Reliability	REL1	0.881	0.954	0.784	0.914
	REL2	0.897***			
	REL3	0.879***			
Responsiveness	RES1	0.944	0.978	0.884	0.934
	RES2	0.931***			
	RES3	0.946***			
Assurance	ASU1	0.926	0.929	0.708	0.823
	ASU2	0.802***			
	ASU3	0.790***			
Empathy	EMP1	0.926	0.941	0.746	0.885
	EMP2	0.901***			
	EMP3	0.755***			
Tangible	TAN1	0.928	0.981	0.898	0.887
	TAN2	0.960***			
	TAN3	0.954***			
Privacy	PRV1	0.925	0.966	0.833	0.941
	PRV2	0.856***			
	PRV3	0.955***			
Efficiency	EFF1	0.948	0.963	0.823	0.979
	EFF2	0.954***			
	EFF3	0.813***			
Security	SEC1	0.885	0.958	0.803	0.958
	SEC2	0.922***			
	SEC3	0.880***			
Interaction	INT1	0.923	0.952	0.781	0.895
	INT2	0.879***			
	INT3	0.847***			
Fulfillment	FUL1	0.814	0.941	0.742	0.920
	FUL2	0.927***			
	FUL3	0.839***			
DSQ	REL	0.834	0.975	0.678	-
	RES	0.848***			
	ASU	0.816***			
	EMP	0.806***			
	TAN	0.828***			
	PRV	0.778***			
	EFF	0.876***			
SEC	0.815***				

	INT	0.839***			
	FUL	0.759***			
CON	CON1	0.746	0.880	0.581	0.895
	CON2	0.785***			
	CON3	0.755***			
INE	INE1	0.856	0.930	0.707	0.899
	INE2	0.852***			
	INE3	0.814***			
PRI	PRI1	0.789	0.903	0.633	0.917
	PRI2	0.801***			
	PRI3	0.796***			
PAS	PAS1	0.782	0.902	0.631	0.869
	PAS2	0.805***			
	PAS3	0.795***			
CE	CON	0.831	0.937	0.672	-
	INE	0.793***			
	PRI	0.756***			
	PAS	0.733***			

Notes: DSQ and CE are the second-order constructs; *** $p < 0.001$. Fit indices: Chi-square = 738.447; df = 393; CMIN/df = 1.879; GFI = 0.922; NFI = 0.912; TLI = 0.956; CFI = 0.945; RMSEA = 0.041

Table 3. Discriminant validity

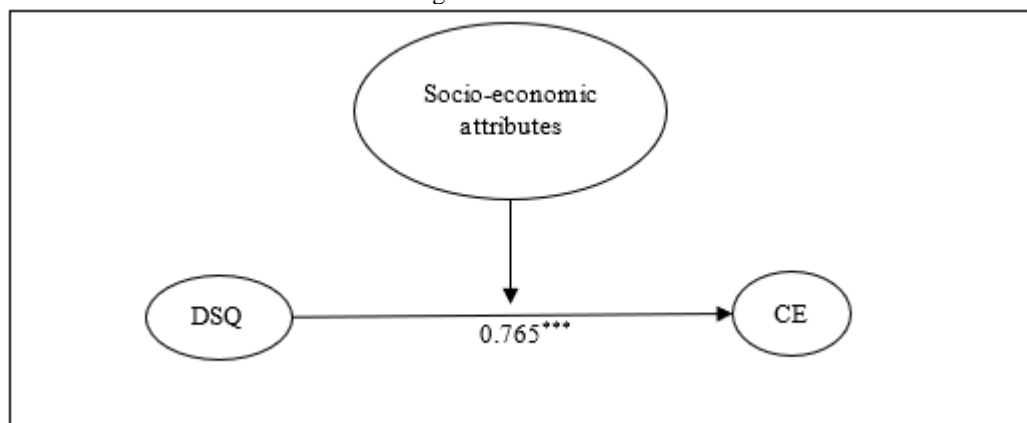
	DSQ	CE
DSQ	0.824	
CE	0.589	0.820

Notes: The bold diagonal elements in the table represent the AVE square root for each variable utilized in the study. Elements that are not diagonal denote relationships between concepts.

The model fits well when constructs are investigated, as shown in Table 2. Measures of convergent validity include item loading (standardized estimates), average variance extracted (AVE), and composite reliability (CR). According to Hair, Gabriel, and Patel (2014), these metrics must have $AVE > 0.5$ and $CR > 0.7$. This demonstrates that convergent validity has been acknowledged. As shown in Table 3, the discriminant validity test has been administered. The study had adequate discriminant validity because estimated inter-construct correlations were less than the square root of each construct's AVE.

After testing the measurement model, we investigated the structural model to determine our recommended hypotheses. Figure 2 depicts the path model and the connections between all constructions. Path analysis results indicate that the model adequately fits the data.

Figure 2. SEM results



Notes: *** $p < 0.001$; Fit indices: Chi-square = 738.447; $df = 393$; CMIN/ $df = 1.879$; GFI = 0.922; NFI = 0.912; TLI = 0.956; CFI = 0.945; RMSEA = 0.041; The 2nd order constructs of DSQ not shown in the figure.

Table 4. Structural parameter estimates

Hypotheses	Relationship	Estimate (b)	Result
H1	DSQ → CE	0.765***	Supported

Notes: R^2 (Customer Engagement) = 0.511; *** $p < 0.001$

The results of the postulated path model reveal a model that adequately fits the data. Table 4 displays the results of testing the hypothesis, which indicate its importance. The results confirmed the link between the DSQ and CE (H1: $b = 0.76$, t -value = 6.543, sig 0.001).

To investigate H2 and the moderation effects. Age, education, and income moderating variables were initially converted to binary variables by the authors. The research established ratios for evaluating the moderation hypothesis. Utilizing a statistical package developed by Gaskin and Lim (2016) for studying moderation effects using regression weights and critical ratios for various parameters, the ratios of the differences in factor loadings between socioeconomic characteristics groups were calculated. After assessing the associated models for every binary group separately, the authors analyzed the regression weights and critical ratios for group differences (see Table 5).

Table 5. Pathwise moderation effect: Group differences

		Structural path and direction CE → DSQ			Result
		B	p-value	t-value	
Gender	Male	0.754	0.000	1.323	Not Supported
	Female	0.769	0.000		
Age	Younger (under or equal to 49 years of age)	0.801	0.000	5.311***	Supported
	Older (over 49 years of age)	0.683	0.000		
Education	Low (lower than a bachelor's degree)	0.642	0.000	5.289***	Supported
	High (undergraduate degree or higher)	0.790	0.000		
Income	Low (less than or equal 2,110 USD)	0.761	0.000	1.213	Not Supported
	High (more than 2,110 USD)	0.772	0.000		

Note: *** $p < 0.001$

Table 5 reveals that DSQ has a statistically significant and positive effect on CE for both male ($b = 0.754$, $p < 0.001$) and female ($b = 0.769$, $p < 0.001$) participants. We could not find any statistically significant differences between the genders (Z score = 1.323). Both younger ($b = 0.801$, $p < 0.001$) and older ($b = 0.683$, $p < 0.001$) participants had a significant and positive effect of DSQ on CE. The DSQ had a stronger impact on CE for younger individuals than for older participants (Z -score = 5.311). DSQ significantly and positively influenced CE across groups with lower than a bachelor's degree ($b = 0.642$, $p < 0.001$) and groups with undergraduate degree or higher ($b = 0.790$, $p < 0.001$). The results indicate that DSQ has a significant impact on CE for higher education groups compared to lower education groups (Z -score = 5.289). Regarding income, we found no statistically significant difference between the high- and low-income groups (Z score = 1.213). The results of the moderating effect support H2.

CONCLUSIONS

The goals of this study are to (1) ascertain how users' interactions with telemedicine systems are influenced by the quality of digital services, and (2) investigate how these impacts vary based on different socioeconomic factors. A survey study using an online questionnaire was carried out with 405 telemedicine practitioners as samples. Through the use of structural equation modeling (SEM), the proposed hypotheses were put to the test. The findings showed that consumer engagement is highly influenced by the quality of digital services. The efficiency dimension best predicted is the digital service quality (DSQ) construct, followed by the responsiveness and interaction dimensions. This was found by a second-order confirmatory factor analysis. According to the moderation study, younger age groups were more affected by DSQ on CE than older age groups were. Furthermore, people with more formal education seem to have higher levels of CE than people with less formal education.

The COVID-19 pandemic has affected numerous facets of our daily lives and spawned the "New Normal" phenomenon, which includes the acceleration of the digital transformation process. Due to the COVID-19 outbreak, the utilization of telemedicine in Thailand rose significantly. Telemedicine is one of the means through which patients can have access to medical treatments while avoiding direct interaction with medical service providers. In accordance with this premise, the authors intend to determine how the quality of digital services influences how customers interact with telemedicine systems, as well as how these effects vary based on several socioeconomic factors. Structural Equation Modelling (SEM) was used to validate provided hypotheses based on an empirical survey study involving 405 participants.

The results indicate that digital service quality influences customer engagement significantly. The efficiency dimension explains DSQ the most thoroughly, followed by the responsiveness and interaction dimensions. Privacy is one of the primary concerns of customers who speak with a virtual doctor, consistent with the findings of prior studies. As with other digital service platforms, the perception of end-user efficiency is a vital condition for customer engagement (van Velsen, Tabak, & Hermens, 2017). In addition to the telemedicine patient interaction strategy, a linked health care model will be created by connecting medical devices to home health service platforms (Kvedar, Coyle, & Everett, 2014). Efficiency will enable the collection and transmission of data to health care specialists for analysis and follow-up. It will also persuade patients to participate more directly with their own gadgets, reducing costs and improving system efficiency. The triage method would be adopted to achieve maximum effectiveness. Telemedicine provides the means to execute triage at the point of care (Bashshur et al., 2020). In addition to the advantages and value benefits of telemedicine, responsiveness is another factor to consider. This dimension incorporates all aspects of the medical care process, such as prevention, diagnosis, treatment, follow-up, and rehabilitation. Images, test results, consultation and diagnosis, and credit care information are shared between patients, physicians, and virtual hospital platforms. The responsiveness component is a golden chance to develop creative and efficient delivery systems within the framework of the national health reform through creating value (Bashshur, Shannon, Krupinski, & Grigsby, 2011). The use of telemedicine is impossible without interactive communication between patients and medical personnel. Real-time service-encounter exchanges among the human and technological actors involved in the process, and to educate telemedicine providers on crucial design considerations for telemedicine (LeRouge, Garfield, & Collins, 2012). The study of moderation revealed that the effect of DSQ on CE was greater in younger age groups than in older age groups. In addition, those with a higher level of formal education appear to have higher levels of CE than those with a lower level of formal education. These results suggest that people are aware of the advantages of telemedicine as an option for receiving medical care.

This study provides useful practical implications. Firstly, in order to increase consumer engagement and boost patient outcomes in telemedicine, healthcare providers and governments should understand how crucial it is to optimize digital service quality. This can be accomplished via a variety of techniques, including the provision of user-friendly telemedicine platforms, the assurance of dependable and high-quality equipment, and the implementation of individualized treatment plans. Healthcare providers can increase consumer engagement by raising the quality

of their digital services, which could result in better patient outcomes and more patient satisfaction with telemedicine. Therefore, to increase customer engagement and telemedicine's overall success, efforts should be made to optimize the quality of digital services used in telemedicine interventions. Secondly, depending on many socioeconomic factors, such as age, income level, and education level, the effect of digital service quality on consumer involvement in telemedicine may differ. As a result, it's critical that healthcare professionals and legislators consider the various demands of various patient populations while creating and putting into practice telemedicine interventions. To increase customer engagement and promote patient outcomes, efforts should be made to customize the quality of digital services to the demands of various patient populations. Patients with lesser levels of education, for instance, may benefit from more help and advice in utilizing telemedicine technology, while older patients may need telemedicine platforms that are simpler and more user-friendly. Healthcare providers can improve the quality of digital services to boost customer engagement and boost patient outcomes in telemedicine by taking the socioeconomic features of various patient populations into account. By utilizing telemedicine technologies, patients can lower their likelihood of hospitalization. The ramifications of these discoveries are numerous. Using the notion of digital service quality, the outcomes of this research aimed to increase knowledge of the elements impacting telemedicine consumer engagement.

LIMITATION AND FURTHER RESEARCH

Despite this study's theoretical and practical contributions, its limitations are acknowledged. First, there may be additional factors that influence telemedicine customer engagement, such as medical history, and whether they present to the clinic with an acute or chronic condition. Second, the data for the study were obtained in Thailand. The results should be carefully generalized to other nations with distinct cultures. This future research will also enable the capture of the effects of cultural variations.

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