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Impact of Perceived Quality of E-Health Services on Patient Behavioral Intention to Use E-Health Services: A Moderating Role of Knowledge of E-Health Management

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Abstract: The objective of this study is to investigate the impact of perceived quality of e-health and the perceived usefulness of behavioral intention to use e-health services with moderating role of knowledge on e-health. A quantitative research approach was applied to examine the proposed relationships between variables of the model. A cross-sectional method was used to gather the data from Saudi patients with the help of a self-administrative survey questionnaire. Findings illustrated that IQ, system quality, and perceived usefulness have a significant and positive impact on the behavioral intention to use e-health services of Saudi patients. Moreover, results show that knowledge of e-health significantly moderates the relationship between perceived quality of e-health and perceived usefulness with the patients' intention to use e-health services. This study enriches the body of knowledge regarding e-health usage, patient intention to use services of e-health, and literacy regarding e-health. The findings of the present study improve the understanding of health care executives regarding the use of e-health services intention and how this intention can be improved.

Keywords: *Perceived quality, perceived usefulness, intention to use e-health services, e-health management knowledge.*

1. Introduction

In the healthcare sector, technology application concerning the various stakeholders is considered much important (Dogra, Bakshi, & Gupta, 2022). The Healthcare industry is considered a large and complicated industry that sometimes contains interactions among stakeholders which results in contradictory purposes and data issues (Dahleez, Bader, & Aboramadan, 2020). Various countries around the world are motivated toward the transformation of the health industry by implementing innovative technology and advanced practices (Dahleez et al., 2020). Accordingly, this study in the field states that the appropriate application of information systems (IS) significantly impacts numerous outcomes concerning individuals and organizations (Gu et al., 2021). A piece of well-timed and precise information is provided by IS to the different users at various levels of management (Hossain, Yokota, Sultana, & Ahmed, 2019; Marinho, Costa Filho, Moreira, & Machado, 2020) to achieve efficiency, better planning and to take decisions more appropriately (Paparova & Aanestad, 2020; Radhakrishnan et al., 2016). Over the last years, the contribution of the internet in the health industry is constantly increasing. This increasing trend can be attributed to the increasing demand for e-healthcare services (e-health) among many other factors. In addition, Bruhn and Batt (2015) stated that the "Internet has enabled consumers to become more proactive in managing their health."

Exploring health-related or medical information is among the most common online activities undertaken by consumers of healthcare services (Zolait, Radhi, Alhowaishi, Sundram, & Aldoseri, 2019). Pew Internet & American Life Project conducted surveys and concluded that about 75 to 80 internet users out of 100 in America have used the internet to search for health-related information, particularly by 55 percent of the household users who have broadband internet access (D. Kumar & Bansal, 2015). Furthermore, easy and appropriate availability of information searching also plays a vital role because some researchers concluded that patients prefer the secrecy of their information instead of providing personal information to the doctors (Andersen et al., 2019; Win, Hassan, Bonney, & Iverson, 2015). Another factor that motivates consumers to search online information is that the medical field is inherently treated as a "credence quality" (Spinelli & Benevolo, 2016) that is relevant to the reservations of diagnosis, care, etc. Thus, a lack of trust among doctors and customers takes place where consumers question the competency of the doctor, feel embarrassed while discussing their problems with the doctor, or face frustration with fruitless treatment (Serenko, Dohan, & Tan, 2017). Saving healthcare costs is also involved because patients who obtain benefits from e-health services save their traveling costs to visit their doctor or pharmacy (Trivedi & Saxena, 2015).

Researchers and specialists paid wider attention to the healthcare sector because of the significant and invaluable advantages of using technology and IS. In response to the increasing globalization and rapid advancements in the use of medical technology, researchers paid attention to the field. In the contemporary dynamic settings, the healthcare industry witnessed ISs with higher intensity to improve the efficiency and effectiveness of the sector (Ben-Assuli, Shabtai, & Leshno, 2015; Bitaraf et al., 2021). Currently, the application of IS in the health sector is not merely associated with the financial measures but with the more progressive and complex paradigm (Chauhan & Jaiswal, 2017). In the context of health establishments, it is called health information system (HIS) or e-health and it has become the preference for consumers because of swift and wide-ranging expansions in the medical industry and increasing expectations of patients (Shahbazi, Bagherian, Sattari, & Saghaeiannejad-Isfahani, 2021). IS helps in the collection, storage, and application of the data regarding patients (Fiza, Lizawati, Zuraini, & Narayana, 2016). Researchers believe that IS has significant potential of improving the quality of healthcare services, ensuring patient safety, improving the performance of staff and clinic, minimizing administrative mistakes, enhance access to the data of patients, improve medical choices and considerably diminish cost of service delivery (Chauhan & Jaiswal, 2017; Hoque, Bao, & Sorwar, 2017; Ibrahim, Gulihana, & Susanto, 2022; Kirkman, Hawes, & Dadds, 2016; Mishra, Mishra, Mishra, & Choudhury, 2017; Peng, Yuan, & Holtz, 2016).

Although IS has an insightful effect on the efficiency of an organization, researchers in the current literature also state that the application and maintenance of IS and enterprise resource planning (ERP) methods are usually expensive, complex, and may provide adverse outcomes (Hamdan, Ayyash, & Almajali, 2020). Although, there are many examples where e-health systems remain very fruitful and produced prosperity and welfare in the organizational outcomes (Ross, Stevenson, Lau, & Murray, 2015). On the other hand, many failure cases are also there when systems remained to fail in attaining their goals which results in the declined performance of the health unit (Shah & Peikari, 2016; Stephanie & Sharma, 2016). Despite heavy investments made by firms for the procurement and installation of customized e-health systems (Devlin, Bouamrane, McGee-Lennon, O'Donnell, & Mair, 2015), researchers found no significant evidence to confirm the success and productivity of its outcome (Bhyat, 2019). Hence, investigations are crucially required for the organization to address that IS sufficiently satisfying their operational requirements and enhance health performance and service (GÜRSEL, Yazar, & KURU, 2016). This research aims to investigate an integrative single framework by incorporating D&M (Yusif, Hafeez-Baig, Soar, & Teik, 2020), TAM (L. E. Davis et al., 2019), and IS user satisfaction reflected in medical performance, patient care and patient-doctor relation in the settings of healthcare. Integrating various frameworks of IS helps in the better contextualization of the technology impact (Pakarbudi, 2018; Radhakrishnan et al., 2016) specifically in the complex environmental context (Serrano, Garcia-Guzman, Xydopoulos, & Tarhini, 2020).

Such kind of integration is generally recognized as a better practice that improves our vision and empathetic regarding recognition, acceptance, practice, and achievement of IS (Adejo, Ewuzie, Usoro, & Connolly, 2018; Riana, Hidayanto, Hadianti, & Napitupulu, 2021; Yadegaridehkordi, Iahad, & Asadi, 2015). Moreover, this research aims to investigate the close and distant predictors of system application and IS users' satisfaction reflected in medical performance, patient care, and patient-doctor relationships. Radhakrishnan et al. (2016) emphasized the essential of further appreciation of the elements that affect recognition or opposition and user satisfaction. Similarly, Asoodar, Vaezi, and Izanloo (2016) mentioned that more studies are required to evaluate the variables that elucidate the deviations in the fulfillment of IS users. Yuan, Ma, Kanthawala, and Peng (2015) concluded that their research consisted of mixed findings regarding the relation between e-health systems and medical outcomes. In addition, they found that their study is applied in the Middle East because the region lacks research on the topic of IS and its practices (Dahleez et al., 2020; Yaseen, Dajani, & Hasan, 2016). Most of the studies on the topic are conducted in the developed world (Serrano et al., 2020; Soualmi, Alti, & Laouamer, 2021). Therefore, there is a dire need of conducting more studies to evaluate the validity of IS frameworks in developing economies (Alqatan, Noor, Man, & Mohemad, 2017; Yunusa et al.,). The objective of this study is to examine how perceived quality and perceived usefulness influence the intention to adopt e-health services and how knowledge of e-health moderates the relationship between perceived quality and perceived usefulness influence the intention to adopt e-health services.

2. Literature Review

E-Health Services: Ross, Stevenson, Lau, and Murray (2016) state that e-health (EH) is a new and rapidly progressing area of research and numerous ideas, terms, and applications are still under discussion. Moreover, no agreed-upon definition of e-health prevailed so far. In some settings, this term only refers to telemedicine. In contrast, telemedicine is also termed one of the numerous applications of e-health (Erard, 2021). In addition, Radder et al. (2016) explained that e-health is the sector made possible by the internet in the health industry. Further, Kreps described this term as the application of developing information and communication technology (ICT), particularly the internet, to enhance healthcare services. Accordingly, Ross et al. (2016) concluded an inclusive definition of e-health by focusing on the research of Eysenbach (2001) and stated that "an emerging field of medical informatics, referring to the organization and delivery of health services and information using the internet and related technologies". Besides, Gill regarding e-healthcare describes the collective application of electronic ICT in the health industry with the purpose of medical, educational, research, and managerial growth. In literature, some researchers also included interactive computer-based communication among patients and service providers likewise e-mail, chat, and other discussion platforms (Tebeje & Klein, 2021; Wilson, Heinsch, Betts, Booth, & Kay-Lambkin, 2021).

Theoretical Background: A health information system is explained as a socio-technical setup that incorporates all subsystems prevailing in the healthcare setup and combines all human resources in their assigned roles of information handling (Atallah, 2017) with the help of technology and coordination among each other (Loute, 2021). E-health comprises many different forms that are not only HIS but include "electronic health record (EHR)", "computerized physician order entry (CPOE)", "electronic prescribing (e-prescribing)", "clinical decision support systems (CDSS)", and "bar-coded medication administration (BCMA)"(Salahuddin et al., 2020). Despite the development of theories and methodologies, the application of IS is facing numerous long-term challenges in general and particularly in the healthcare system (Al-Fadhli, Othman, Ali, & Al-Jamrh, 2017). Moreover, the installation of IS in healthcare systems requires huge investment and heavy costs (Ben-Assuli et al., 2015). For this reason, managers and investors in the field are more concerned about the outcomes that whether this investment will result in the improved performance of the business or not (Mou, Shin, & Cohen, 2017).

Understanding of various dimensions leading toward IS success is needed for the organizations to safeguard the benefits of investment with improved efficiency, performance, and effectiveness (Hoque et al., 2017). In the presence of various IS stakeholder groups with different stakes, the criteria for success are different for each of the groups. Therefore, there must be a comprehensive model incorporating all the essential dimensions of success (Bitaraf et al., 2021). For system developers as well as for organizations, it is very important to understand in what ways people using ISrecognize and develop user acceptance, and satisfaction. By understanding this, organizations can achieve the appropriate application of their investments in e-technology (Radhakrishnan et al., 2016). One of the most commonly used IS models is the "Technology Acceptance Model (TAM)" which explains the procedure of technology adoption, acceptance, and implementation by the people (Alqatan et al., 2017; Kumar & Shenbagaraman, 2017; Mortenson & Vidgen, 2016). Accordingly, TAM is the most recognized model in the context of the healthcare system because of its applicability and strength that is used to study the acceptance and application of e-health systems (Geng et al., 2020; Shachak, Kuziemsky, & Petersen, 2019; Singh, Singh, Jaiswal, & Chauhan, 2017).

Davis (1985) established TAM which provides strong theoretical support to the scholars (Al-Jabri & Roztocki, 2015) because of its wider application for more than 30 years in various domains and disciplines of studies by a large number of scholars (Alqatan et al., 2017). Two major elements of the model that are "Perceived Usefulness" and "Perceived Ease of Use" influence acceptance of IT, the satisfaction of users, and determine the actual application of this system (Chauhan & Jaiswal, 2017; MAAMUOM, 2016). However, external social, political, and cultural variables impact these constructs (Surendran, 2012). In contrast, TAM is criticized by critics because of its simplicity (Dovrat, Meron, Shachak, Golodets, & Osem, 2019), its emphasis on system usage, and features with less recognition of accomplished tasks (Wu & Chen, 2017). This model is easy to combine with other competing models (Radhakrishnan et al., 2016). In return, many amendments are witnessed in the original model and researchers combined it with other models to meet the requirements of the studies (Amarenco et al., 2018; Guan, Chen, Fang, & Qiu, 2020). Accordingly, D&M (Urbach & Müller,

2012) model significantly plays a role. Researchers reviewed the present definitions of IS success and recommended that it is measured by using various interacting elements including quality of service, reliability of the information, method of information application in the system, satisfaction level of system users, and overall influence of systems on organization and users (Zaman, Hossain, Ahammed, & Ahmed, 2017).

Healthcare Industry and Service Quality: In the services industry, the healthcare sector is one of the fastest-rising sectors (Horodnic, Apetrei, Luca, & Ciobanu, 2018). In the US, health expenditure is forecasted to average increase by about seven percent (Bae, Lage, Mo, Nelson, & Hoogwerf, 2016). For attaining a competitive edge, increased support, sustained profitability, and quality of service have significantly become important concerning the business strategy of various organizations in the health sector (Horodnic et al., 2018). In general, objective measures were used to assess the quality of services such as death rate or disease rates. However, researchers in the last two decades focused on the role of patients in describing quality in the health sector (Moore et al., 2015; Razmak & Bélanger, 2017). Though researchers conducted a great number of studies to address the quality of services and their evaluation (Ackerman et al., 2021; Agarwal et al., 2019; Campos, Negromonte Filho, & Castro, 2017; Lin, Wei, & Gan, 2019; Salminen et al., 2018) some of the researchers have the opinion that most of these studies emphasized on the establishment of service quality frameworks that are generic (e.g. Asubonteng, McCleary, and Swan (1996) developed SERVQUAL scale).

However, there are only a few research works that emphasized the establishment of service quality frameworks that are "context-specific" (Bruhn & Batt, 2015). In addition, it was highlighted that largely applied research used the SERVQUAL scale (Gram & Rönkkö, 2018)concerning the health care settings resulted in the mixed results consisting of an original five-factor structure (Lim et al., 2018) ranging from six and seven dimensions (Cengiz & Fidan, 2017) or even 12 dimensions (Schena et al., 2021). By studying the extensive literature on healthcare, numerous models were used to assess healthcare quality (Machida, Sutton, Williams, Wellman, & Sanford, 2019; Zineldin & Vasicheva, 2017). Razmak and Bélanger (2017) highlighted that by comparing identified dimensions of healthcare literature, it is found that their findings are significant in line with the findings of marketing literature. Accordingly, Razmak and Bélanger (2017) developed a new measure to evaluate the service quality of healthcare. They recommended that four key dimensions control the perception of customers concerning service quality. These dimensions include interpersonal, technical, environmental, and administrative quality.

Hypotheses Development

Information Quality (IQ): IQ is defined by Yakubu and Dasuki (2018) as a desirable feature of an IS output and its productivity for the customers. Some important characteristics of information discussed in the literature are timeliness, uniqueness, scope, format, accessibility, correctness, precision, uniformity, applicability, understandability, conciseness, practicality, consistency, relevance, and adequacy. Similarly, Häyrinen, Mattila, Berghäll, and Toppinen (2015) researched IQ to evaluate the input and output of the IS and found that completeness and accuracy are the most widely applied dimensions among the numerous dimensions of measuring IQ. In addition, Cohen and Welling (2016) concluded IQ is an important predictor of productivity results and satisfaction of end-users. They defined it as the content and format of outputs of this system to confirm its usability, appropriate detail, meaningfulness, easy understanding, and readability that leads towards the decision making and task accomplishment. Information gathered from patients as a result of interaction between patients and service providers must be supportive for management decisions as well as for doctors. Information is recognized as valuable when it has characteristics of accuracy, relevance, organization and is displayed in useable form comfortably. Accurate and updated information is significant not only for the provision of quality clinical services but also for ongoing health services, the appropriate level of healthcare maintenance, research regarding medical and health, and preparation and administration of health services (Ault-Brutus & Alegria, 2018). Therefore, the following hypothesis based on the above-debated literature is proposed.
Hypothesis 1: IQ has a significant influence on the behavioral intention to use e-health services.

System Quality (SQ): Umaroh and Barmawi (2021) defined SQ as a desirable feature of an IS that deals with the usability characteristic and performance metrics. Important characteristics of SQ include availability,

efficiency, sophistication, suitability, customization, data correctness, ease of understanding and application, flexibility, incorporation, interactivity, turnaround time, consistency, response time, system correctness, and system structures. Additionally, Airaksinen et al. (2020) determined SQ as a success factor of IS that measures the system processing information and its characteristics are included easy usability, ease of understanding, and effectiveness of the system. In contrast, Cohen and Welling (2016) defined it from a non-traditional viewpoint as the experience of the system user from a technical, operational, and design perspective. While evaluating system attributes by users, this experience is significant likewise consistency, response time, and ease of application. Furthermore, Alazzam, Al Khatib, Mohammad, and Alassery (2021) while measuring SQ, emphasized consistency, accuracy, response time, and incorporation and found that a higher degree of SQ may deliver suitability, privacy, and early responses to the users. Hence, responsiveness and easy-to-learn attributes were found more relevant to the satisfaction of users among all the above-discussed attributes (Cohen & Welling, 2016). Therefore, the following hypothesis is proposed based on the above literature.
Hypothesis 2: SQ has a significant influence on the behavioral intention to use e-health services.

Perceived Usefulness (PU): PU is concerned with the features of IS that are fitted with the needs and expectations of users' jobs (Gürsel et al.,). Thus, PU is defined as the subjective beliefs of the users associated with the numerous benefits of HIS use to achieve the goals of the job in clinical practice (Ibrahim et al., 2022). This indicates that people recognize or reject the use of IS according to their own belief that to what extent it will help them in performing their jobs or will enhance the performance of their job (Hennemann, Beutel, & Zwerenz, 2017). PU influences the intention of the users (Dahleez et al., 2020). Moreover, Arkorful, Shuliang, Muhideen, Basiru, and Hammond (2020) while studying the perceptions of doctors and EHR recognition concluded that PU strongly and positively influences the attitudes of doctors towards EHR. Similarly, Sansone and Gagnon (2015) concluded that a large part of behavioral intentions towards using EHE is explained by PU and claimed that these findings are in line with the large number of previous studies.Therefore, following hypothesisis proposed based on the above literature.
Hypothesis 3: PU has a significant influence on the behavioral intention to use e-health services.

Knowledge of E-Health Management: E-health knowledge is associated with the combination of abilities and knowledge that enable productive sharing of technological-based health devices, including the capability of information recovery tactics and appropriate sharing of health ideas (Bautista, 2015; Longhurst et al., 2019). Potential issues that may create hurdles in the way of effective application of e-healthcare important to be highlighted. Medical and health associated websites are used by people to increase their health information, practice their disease-management abilities, reduce their nervousness regarding treatment and save time and money that is required to visit a doctor (Frempong, Chai, Ampaw, Amofah, & Ansong, 2020; Liebschner et al., 2019). Knowledge is considered an integral element of health literacy among people. It is an idea, ability, practice, and insight that create the framework for generating, assessing, and applying that information. Health literacy gained wider attention in recent years because of its impact on improving psychological health information, reducing stigma, and enhancing help-seeking attitudes (Chesser, Burke, Reyes, & Rohrberg, 2016; Hosseinzadeh et al., 2020). Baumeister, Kraft, Baumel, Pryss, and Messner (2019) explained basic health knowledge as the combination of basic terminologies that describe the primary systems and functions associated with health. Further, Lane and Aldoory (2019) elucidated conceptual knowledge as technical information.

The abilities required to "behave in a health-promoting way, "which is frequently experimental, situation-based, and concerned with routine practices. 72% of internet users obtain health-related information from an online source in the USA (Glicksberg et al., 2018). In contrast, information about biomedical organizations, and how they are associated with each, is important for several reasons including vigilance and decision-taking (Us, Pimonenko, Tambovceva, & Segers, 2020). Knowledge is also a vital component of the innovation-decision process because it clarifies the doubts about the advantages and disadvantages of innovation (Hosseinzadeh et al., 2020). In addition, knowledge discovery is recognized as a growing domain in computer science that ranges from the catalogs to images and "natural language processing (NLP)" (Alshahrani, Stewart, & MacLure, 2019). Scholars and health practitioners are attracted by the new expansions of text-computing approaches in health to comprehend the data in various dimensions instead of just reading it to establish a new database of knowledge (Piad-Morffis, Gutiérrez, & Muñoz, 2019). Accordingly, e-health

administration is facing the key issue of information and knowledge sharing (KS) because there is active coordination among different health-related stakeholders (Van Den Heuvel et al., 2018).

Hence, it is essential to manage information, knowledge, information apparatuses, and technology in contemporary healthcare organizations to attain competitiveness, decision-making support, managing patients, financial management, resource allocation, resource planning, strategic management, and modifying institutional practices. Health-care organizations operate in an active environment which is why they are required to have capabilities of information gathering likewise medical data based on the evidence or the ideal required rules of practice, sharing of information internally and externally, integrating innovative knowledge, and working out information for supporting managers in decision making (Cummings, Shin, Mather, & Hovenga, 2016). So, Sengan et al. (2022) designated that KS behavior of medical practitioners may be referred to as a compassion signal of their helpful nature and motivations toward the patients. Zheng et al. (2017) concluded that knowledge of medical practitioners may enhance economic benefits for them. Therefore, the following hypothesis based on the above-debated literature is proposed.
Hypothesis 4: Knowledge of e-health management has a significant moderating role in the relationship of IQ to the use of e-health services.
Hypothesis 5: Knowledge of e-health management has a significant moderating role in the relationship of SQ with the intention to use e-health services.
Hypothesis 6: Knowledge of e-health management has a significant moderating role in the relationship of PU with the intention to use e-health services.

3. Methodology

The purpose of the current study was to investigate the impact of perceived quality of e-health services on patient behavioral intention to use e-health services. The current study also investigated the moderating role of knowledge on e-health on the relationship of perceived quality of e-health services with patient behavioral intention to use e-health services. This study was cross-sectional and the data were gathered from the Saudi patients. The study was conducted on Saudi patients. The unit of analysis was the individual in the current research. A questionnaire of self-administered nature was applied for the collection of data from the respondents of the study. This data collection technique is one of the suitable techniques to be applied to gather the primary data due to cost and time efficiency and effectiveness (Sekaran & Bougie, 2016). The convenience sampling method was employed to gather the data from the patients. Furthermore, the G*Power software version 3 was also applied to check the adequacy of the sample size (Faul, Erdfelder, Lang, & Buchner, 2007). This study got a sample size of 140 at a statistical power of 0.95 at the 5% level of significance. The 280 survey questionnaires were disseminated which was twice to sample size to cater to the complications of the low response rate. Out of 280 disseminated survey questionnaires, 198responses were received and able to use in the analysis. The questionnaire includes a cover letter and questions related to the variables. The cover letter elucidates the purpose of the study and the privacy of the collected data. The scale items to measure the variables were adapted from the existing studies.

4. Analysis and Discussion

The present study analyzed the collected data by using 2nd generation software, represented to "Partial Least Squares Structural Equation Modeling" (PLS-SEM). The Smart-PLS statistical software was employed to examine the projected association among the variable of the current study (Henseler et al., 2014).

Assessing the Outer (Measurement) Model: The outer model (Measurement model) is used to investigate the configuration of the model on the bases of some particular quality principles (Henseler et al., 2014). The outer model was investigated in three stages, composite reliability (CR) was investigated in the first stage and then convergent validity and discriminant validity were estimated. CR was evaluated by loading values, the value of alpha whereas, the values of VAE were used to examine the convergent validity of the variables, and Fornell and Lacker (1981) criteria and the value of HTMT were applied to test the discriminant validity and. The value of loadings must be higher than 0.50, the value of alpha (α) must be greater than 0.6 and CR must be above 0.7 to fulfill the composite reliability standards (George & Mallery, 2003). AVE's value must be

above 0.5 to achieve convergent validity. Results of the measurement model are illustrated in Figure 1 and Table 1, Table 2, and Table 3.

Figure 1: Inner Model Assessment

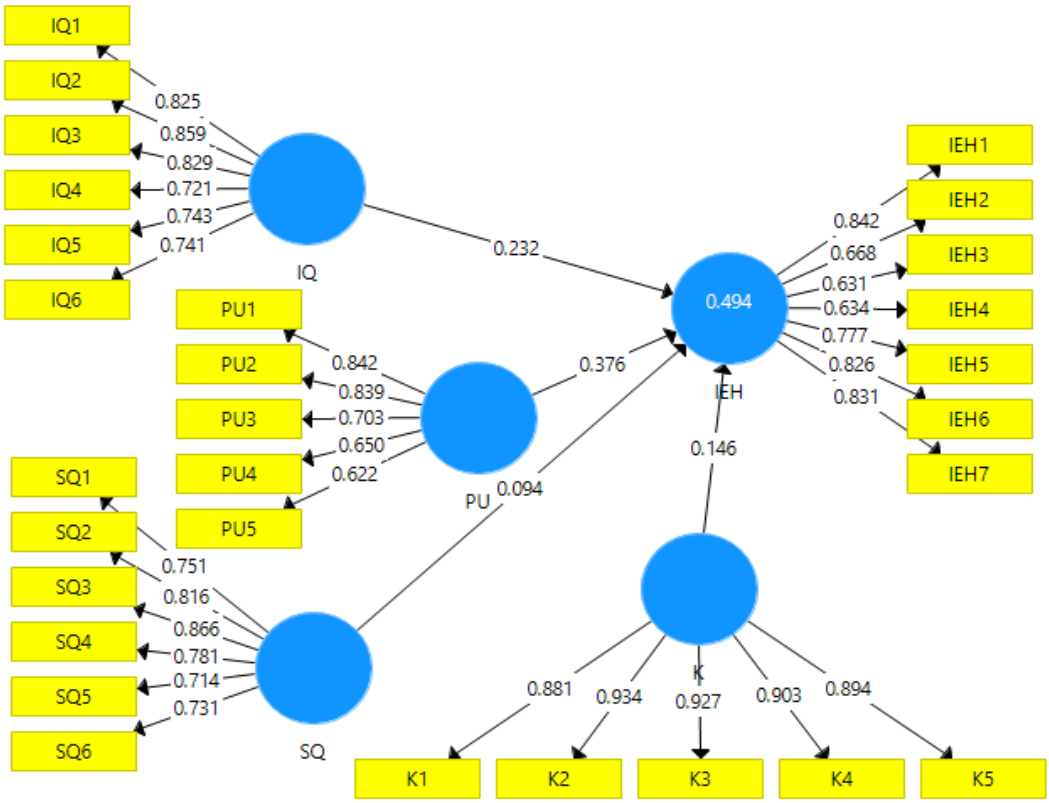

Table 1: Reliability and Validity

Construct	Indicators	Loadings	Cronbach's alpha	Composite Reliability	AVE
Behaviour Intention to use E-health (IEH)	IEH1	0.842	0.866	0.898	0.562
	IEH2	0.668			
	IEH3	0.631			
	IEH4	0.634			
	IEH5	0.777			
	IEH6	0.826			
	IEH7	0.831			
Information Quality (IQ)	IQ1	0.825	0.877	0.907	0.621
	IQ2	0.859			
	IQ3	0.829			
	IQ4	0.721			

	IQ5	0.743			
	IQ6	0.741			
System Quality (SL)	SQ1	0.751	0.869	0.902	0.606
	SQ2	0.816			
	SQ3	0.866			
	SQ4	0.781			
	SQ5	0.714			
	SQ6	0.731			
Perceived Usefulness (PL)	PU1	0.842	0785	0.854	0.543
	PU1	0.839			
	PU3	0.703			
	PU4	0.650			
	PU5	0.622			
Knowledge on E-health (K)	K1	0.881	0.947	0.959	0.824
	K2	0.934			
	K3	0.927			
	K4	0.903			
	K5	0.894			

Table 1 indicated that the loading values for all items are higher than 0.5 and alpha (α) values of all constructs are more than 0.7, this shows that the study attains reliability. CR values are greater than 0.7 and the AVE values are more than 0.5 that endorsing the convergent validity.

Table 2: Fornell-Larcker Criterion

	IEH	IQ	K	PU	SQ
IEH	0.749				
IQ	0.520	0.788			
K	0.541	0.405	0.908		
PU	0.645	0.489	0.643	0.737	
SQ	0.542	0.469	0.631	0.657	0.778

Table 2 indicated the outcomes of Fornell and Lacker (1981). Findings indicated that the current study attains the discriminant validity because the AVE's square root of every construct is higher than the correlation with other constructs of the model.

Table 3: Heterotrait-Monotrait Ratio (HTMT)

	IEH	IQ	K	PU	SQ
IEH					
IQ	0.585				
K	0.602	0.449			
PU	0.772	0.576	0.753		
SQ	0.620	0.531	0.681	0.771	

Table 3 shows the value HTMT ratios that are below 0.85 which approves the discriminant validity (Kline, 2011).

Structural Model Assessment: After the endorsement of the reliability and validity of the measurement model, researchers can examine the projected relations within the variables of the model. The inspection of the structure model comprises the assessment of the relationship between the construct of the model. The structure model was assessed by using the PLS-SEM algorithm and bootstrapping procedure (Chin, Marcolin, & Newsted, 2003; Kousar, Zafar, Sabir, & Sajjad). The output of the structure model valuation is presented in Figure 2 and Table 4.

Figure 2: Structural Model Assessment

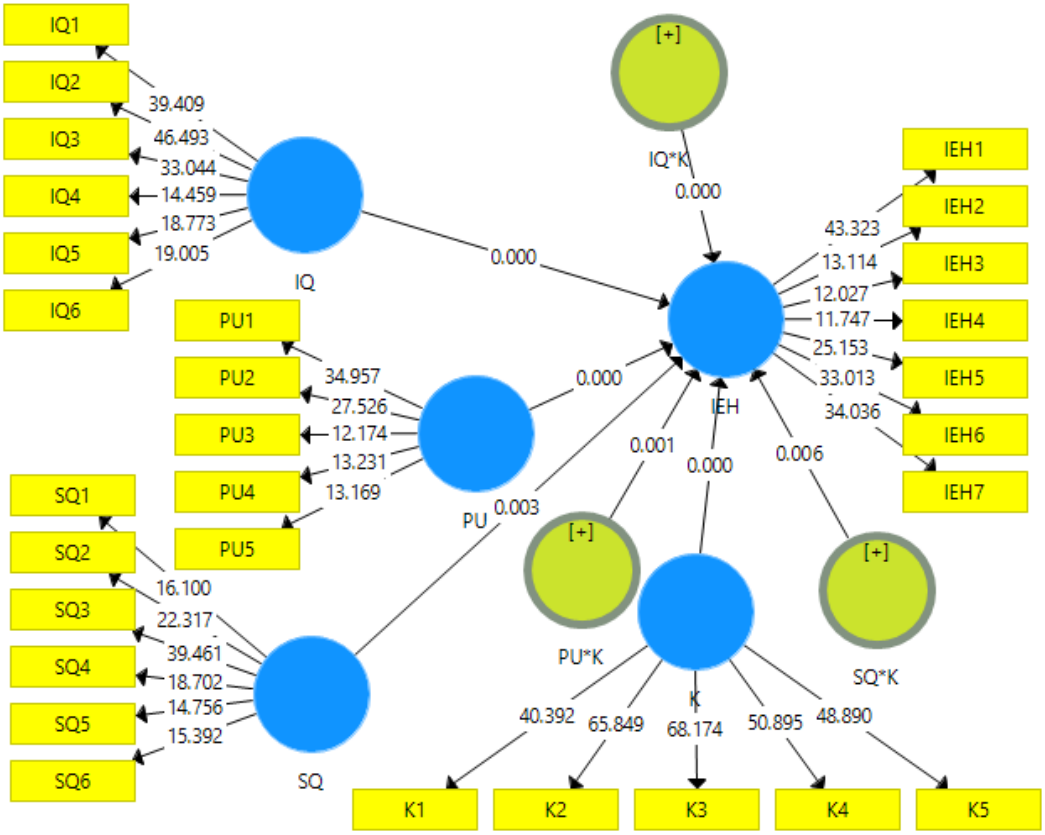

Table 4: Structural Model Assessment

Hypotheses	Relationship	Beta	STD	T Value	P Values
H_1	IQ ->IEH	0.240	0.062	3.901	0.000
H_2	SQ ->IEH	0.490	0.059	8.305	0.003
H_3	PU ->IEH	0.389	0.087	4.491	0.000
H_4	IQ*K ->IEH	0.171	0.058	2.948	0.000
H_5	SQ*K ->IEH	0.178	0.083	2.145	0.006
H_6	PU*K ->IEH	0.203	0.075	0.271	0.001

Table 4 illustrated the output of the structural model. The findings indicated that IQ has a significant relationship with the intention to use E-health services (β= 0.240, P= 0.000). So, H_1 was supported on statistical grounds. Furthermore, SQ also significantly affects the IEH services (β= 0.490, P= 0.003), and perceived usefulness also has a significant influence on the IEH services (β= 0.389, P= 0.000), therefore H_2 and H_3 were also supported on statistical grounds. Furthermore, knowledge of e-health has a significant moderation effect on the relationship between IQ and IEH services (β= 0.171, P= 0.000). Findings revealed that the knowledge of e-health significantly moderates the relationship of SQ with IEH services (β= 0.178, P= 0.006), thus H_5 was supported. Lastly, this study also found that the knowledge of e-health significantly moderates the relationship of perceived usefulness with IEH services (β= 0.203, P= 0.001).

5. Conclusion and Recommendations

The aim of the current study is to investigate the impact of perceived quality of e-health services on patient behavioral intention to use e-health services. The current study also investigated the moderating role of knowledge on e-health on the relationship of perceived quality of e-health services with patient behavioral intention to use e-health services. The results of the current study elucidated that IQ and SQ have a positive impact on the behavioral intention to use e-health services among Saudi patients. The results of current research are in line with the study of Dahleez et al. (2020) and Razmak and Bélanger (2018), who argued that quality does matter and impacts to intention to use. Furthermore, the findings of the current study show that knowledge of e-health significantly moderates the association of IQ, SQ, and PU with IEH services among Saudi patients. According to Hosseinzadeh et al. (2020), Knowledge of e-health management services is an important element that affects the use of services. This study offers substantial implications for health care executives, policymakers, and project directors to efficiently set their processes and make them sustainable, avert unexpected difficulties and improve their allocated resources. Moreover, health care organizations may advance their quality of e-health services and improve their overall performance. Health care executives may improve the knowledge of patients on e-health services to add value in the adoption of e-health services. This study focused only on the Saudi patients, where this can be investigated in a population other than Saudi Arabia.

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