Predictive Factors of Patients' Satisfaction with Telemedicine Services Adoption:
A Survey on Bangladesh's Perspective

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Abstract:- Satisfying the users is one of the crucial aspects for the successful implementation of telemedicine platforms. This study aimed to evaluate the factors associated with patients' satisfaction of telemedicine services adoption and utilization. A conceptual model was formulated, encompassing a set of hypotheses developed and assessed by employing partial least squares structural equation modeling (PLS-SEM). Using a pretested structured questionnaire, a cross-sectional survey was conducted with 384 telemedicine users (patients) in the Dhaka division of Bangladesh. The study revealed that effort expectancy, performance expectancy, and facilitating conditions significantly impact patients' satisfaction of telemedicine services adoption. The study contributes to the growing literature about the usage of telemedicine services in trying to elevate the patients' satisfaction with telemedicine services in healthcare. The findings suggest that efforts to improve patients' satisfaction and willingness to use telemedicine should focus on developing simple and useful telemedicine systems.

Keywords: - Healthcare, Patient Satisfaction, Telemedicine, Structural Equation Modeling, Bangladesh.

I.　　INTRODUCTION

Satisfaction is an essential contributor to continuance intentions which is influenced by the user's acceptance of the technology as well as the quality of the services. Telemedicine uses information and communication technologies to provide healthcare services remotely at any time and place. Despite the rapid development of telemedicine technologies, users are reluctant to utilize them. Successful implementation of any healthcare delivery, including telemedicine, depends immensely on patients' expectations and satisfaction [1,2]. Patient satisfaction (PS) is the user's expression in healthcare and is a growing concern in all aspects of healthcare [3,4]. PS of the usage of telemedicine services is emerging as one of the challenges to its optimum utilization. PS has been considered as an essential indicator of telemedicine service quality and overall healthcare system efficiency. In spite of the importance of this technology (i.e., telemedicine), there is a shortage of research on exploring patients' satisfaction with the adoption of telemedicine services. In their study, researchers[5,6] reported that in Bangladesh, ICT facilitated healthcare services are mostly explored on the healthcare providers' perspectives such as infrastructure development, technological

readiness, software development, challenges and opportunities of deploying e-health however, little is known about healthcare recipients' experiences using telemedicine services, such as patient satisfaction [7]. In contrast, the literature indicates that patient satisfaction is a significant and influential indicator in healthcare intervention [8–10]. According to Anderson and Sullivan[11], there is rising interest in consumer satisfaction as a means of assessing service quality, which is believed to be the key indicator of future reputations and growth. To successfully implement a high-quality telemedicine service, patients' perceptions and satisfaction with telemedicine and its associated factors must be assessed. Therefore, the present study aimed to examine factors associated with patient satisfaction concerning telemedicine services adoption and utilization.

Telemedicine services encompass numerous constituents that need to be studied well when evaluating patients' satisfaction with the services. Within the IS context, satisfaction comprises consumers' in-depth perception of pleasurable accomplishment of service and the loyalty of commitment to the service provider [12]. Satisfaction incorporates individuals' psychological considerations related to product or service expectations and performance perceptions. Nevertheless, in the context of healthcare, patient satisfaction is a multi-dimensional phenomenon that reflects the patient's experiences while seeking healthcare. In the present study, patient satisfaction refers to the extent of a patient's evaluations resulting from the telemedicine service experience. IS researchers conceptualize satisfaction of e-services as information and service quality, functional capability, and usefulness. The latent variables effort expectancy and performance expectancy are considered as significant factors that impact the behavioral intentions for new technology acceptance and satisfaction [13,14]. Similarly, the impact of perceived ease of use and perceived usefulness on behavioral intention has been studied in numerous technology adoption domains. It is explored that satisfaction with telemedicine services is significantly affected by the performance and ease of use of the platform. Patients' satisfaction decisions about telemedicine in developing countries could be influenced by various factors, including platform ease of use, effectiveness, facilitating condition, and enjoyment that actively contribute to the formation of the cognitive behaviors and stimulate their evaluative judgment of satisfaction decisions. Furthermore, patient satisfaction might be mediated by sociodemographic variables such as gender, age, education, and psychosocial factors.

However, Davis et al.[15], through Technology Acceptance Model (TAM), clarified that intentions to use technology would determine whether a person will use the technology or not (behavior). A recent study by Kissi et al.[16] applied the technology acceptance model to predict physicians' satisfaction with telemedicine. In information systems literature, to comprehend the adoption of technology and innovations, the Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al.[13] has been applied as a robust theory. Furthermore, UTAUT has been used to predict users' intentions to continue using information technologies. The present study employed the constructs of UTAUT and a latent variable patients' satisfaction to determine the factors influencing patient satisfaction of adoption and utilization of telemedicine services. The following hypotheses were proposed in accordance with the aim and conceptual framework of the study:

H1. Effort expectancy (EE) significantly influences patients' satisfaction (PS) to utilize telemedicine services.

H2. Performance expectancy (PE) significantly influences patients' satisfaction (PS) to utilize telemedicine services.

H3. Facilitating condition (FC) significantly influences patients' satisfaction (PS) to utilize telemedicine services.

II. METHODOLOGY

A. Study design, Population, Sampling, and Data collection procedure

In the study, quantitative approach was applied employing a pretested structured questionnaire. A cross-sectional survey was conducted among the telemedicine users (patients) in the Dhaka division of Bangladesh. A quantitative approach is most appropriate for analyzing a problem through statistical data to explain an issue or social phenomena [17]. Dhaka division of Bangladesh was deliberately chosen since the healthcare sector is heavily focused in Dhaka, the capital city of Bangladesh and the proportion of telemedicine users in Dhaka is higher than others [18]. In addition, for financial and time constrains, and researchers' accessibility. Since its inception as the capital city, Dhaka's population, and social and economic diversity have risen enormously. Although the data were collected solely from five districts in the Dhaka division, the study's participants belong to various cities/districts across Bangladesh, as patients traveled to the capital city Dhaka from all over the country to receive better healthcare. Thus, we believe that the sample represents the entire country.

The target respondents of the study were Bangladeshi patients over the age of 18 who had used telemedicine platforms/applications in the last one year and consented to participate in the study. The sample size was calculated using Epi Info software. The expected frequency was assumed to be 50%, ensuring the maximum sample size. By applying a 95% confidence level and acceptable margin of error 5%, the required sample size was estimated to be 384 participants.

The study employed purposive sampling since the total number of patients who received telemedicine service in the past one year is unknown to the researchers. The study's survey method was a drop-and-collect survey, in which a paper-based questionnaire in Bengali and English was distributed in person. Three trained data collectors administered the survey. The survey was conducted from August to November 2020, and the selection process was carried out till the 384 responses were collected. A total of 13 data were excluded due to incomplete responses, and finally 373 data were considered for final analysis.

B. Ethical Issues

This study was conducted with a formal ethical approval from the Research Ethics Committee, Bangladesh University of Professionals (Ref No:23.01.902.858.24.786.51). Furthermore, all the respondents read the consent form and agreed to participate in the study. In the consent form, the participants were informed concerning the research purpose, the confidentiality of information, and the right to revoke the participation without prior justification. Data privacy and confidentiality were maintained properly at each stage.

C. Research Instrument

A structured questionnaire was used as a data collection tool in the study. This data collection strategy obtains concise information directly from the respondents employing a predetermined set of questionnaires to capture their views on particular issues or phenomena [19]. All the measuring items of the constructs were adapted from literature on technology adoption, particularly telemedicine (e-health/ m-heath) adoption. The questionnaire consisted of 2 parts. The first part comprises demographic information such as gender, age, educational status, employment status, and telemedicine usages experience. The second part of the questionnaire comprehensively measures patient satisfaction and associated factors with 16 items, which yields four domains of patient satisfaction that are effort expectancy in using the telemedicine platform (4 items), performance expectancy (4 items), facilitating conditions (4 items), and patient satisfaction (4 items). The research instrument was compiled referring to Davis et al.[15], Venkatesh et al.[13,20], Zobair et al.[21], which have contextual compatibility with the study conducted. A five-point Likert scale was used in the study, and the respondents were asked to mark the most suitable option ranging from 1 to 5 on the survey form (1 = strongly disagree, 5 = strongly agree).

III. RESULTS

In the study, Partial Least Square Structural equation modeling (PLS-SEM) statistical approach was applied, and the software ADANCO version 2.2.1 was used. ADANCO is a modern software for variance-based SEM that is well suited for evaluating reliability, validity and overall model fit, and for testing hypotheses.

A. Demographics of sample

The final sample size of the respondents consisted of 373 telemedicine users. The gender distribution of participants was 255 (68.4%) males and 118(31.6%) females. In terms of age, 36.7 percent of the respondents were between 31 and 40 years. From the education level aspect, the majority were university degree holders representing 65.1 percent, and none of the

respondents was illiterate. Half of the respondents are service holders, and 56.8% had 2-4 years of experience using telemedicine in healthcare.

B. Measurement Model

The measurement model test includes indicator reliability, construct reliability, convergent validity, and discriminant validity. Loading criterion of greater than 0.60 was used to evaluate indicator reliability [22]. The indicator reliability in Table 1 under investigation shows that except for FC3 (0.316), all standardized outer loadings for each indicator in the model were higher than the threshold value of 0.60, confirming indicator reliability. Consequently, item FC3 was

removed. Construct reliability was estimated using Cronbach's alpha (α) scores and composite reliability (CR). As of Table 1, Cronbach's alpha (α) scores range from 0.708 to 0.789, and composite reliability ranges from 0.835 to 0.864, surpassing the recommended cut off value of 0.70 [23]. Moreover, convergent validity was verified by the average variance extracted (AVE). As presented in Table 1, the AVE ranges from 0.568 to 0.629, exceeding the suggested threshold of 0.50 [23,24]. Discriminant validity was assessed using Fornell and Larcker criterion. As seen in Table 2, the square root of each construct's AVE (in bold) has the highest value compared to other constructs' correlations. Thus, the Fornell-Larcker criterion has been validated.

Table 1. Measurement Model Assessment

Constructs	Indicators	Stand. Loading	Cronbach's Alpha (α)	Composite Reliability (CR)	AVE
Effort Expectancy (EE)	EE1	0.769	0.740	0.839	0.568
	EE2	0.838			
	EE3	0.775			
	EE4	0.614			
Performance Expectancy (PE)	PE1	0.780	0.789	0.864	0.614
	PE2	0.838			
	PE3	0.790			
	PE4	0.722			
Facilitating Conditions (FC)	FC1	0.883	0.708	0.835	0.629
	FC2	0.744			
	FC3	0.316			
	FC4	0.883			
Patients' Satisfaction (PS)	PS1	0.793	0.786	0.862	0.611
	PS2	0.794			
	PS3	0.830			
	PS4	0.704			

Table 2. Discriminant Validity based on Fornell-Larcker Criterion

Constructs	EE	PE	FC	PS
EE	**0.568**			
PE	0.400	**0.614**		
FC	0.290	0.134	**0.629**	
PS	0.410	0.337	0.344	**0.611**

Note: Square root of AVEs are in bold; others represent the squared correlations;

C. Assessment of Structural Model

Upon establishing a satisfactory measurement model, the study further assessed the hypotheses. The structural model and hypothesized relationships between the constructs were tested by a standardized path coefficient (β) and t-statistics at the $p < 0.01$ level, and $p < 0.05$ [23]. The obtained result from the structural model assessment for the hypotheses is shown in Table 3 and Fig. 1. According to these results, all of the hypotheses were accepted.
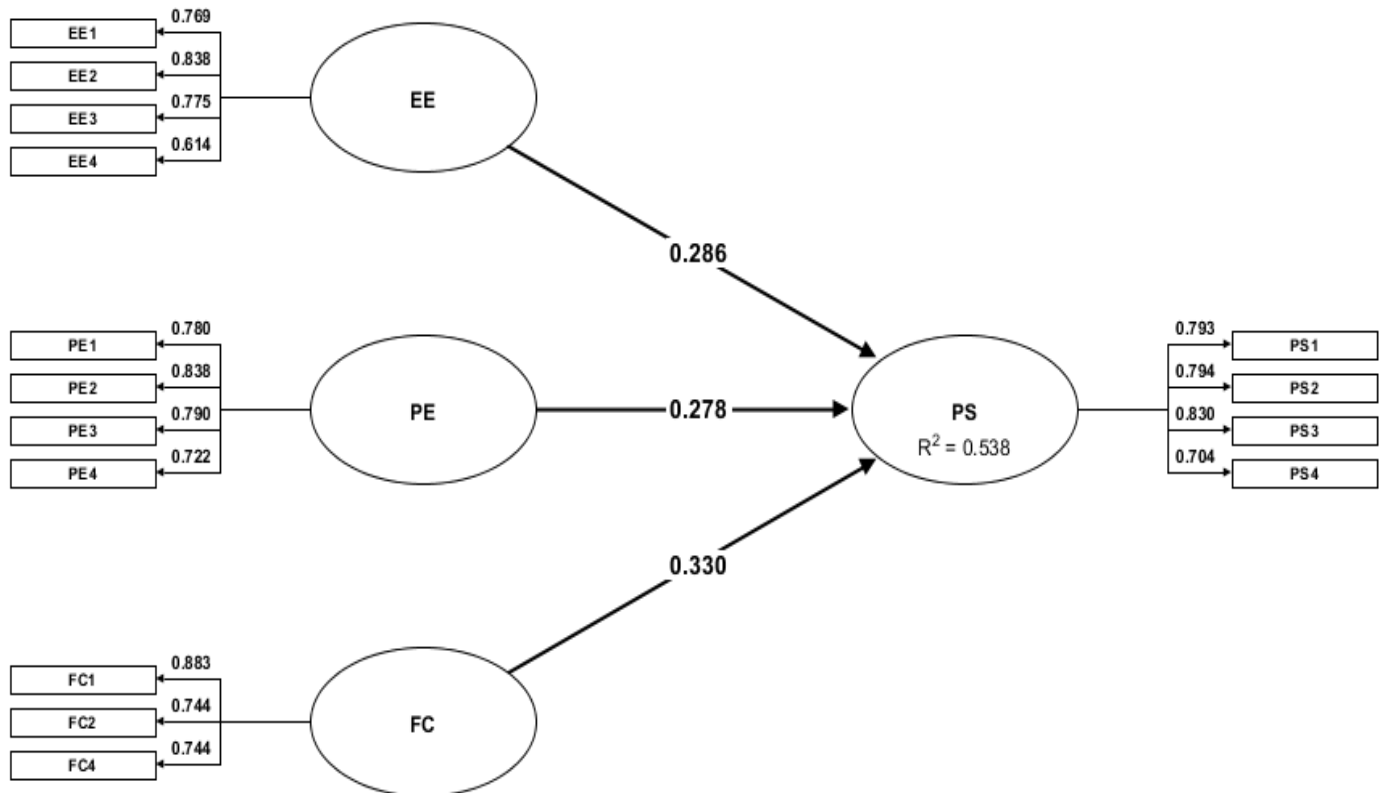
Fig. 1 Graphical representation of the model with path coefficients.

TABLE 3: ANALYSIS OF PATH COEFFICIENT THROUGH PLS-SEM

Hypothesis	Hypothesized Relationship	Path Coefficients (β)	Standard Deviation (STDEV)	t Value	p Value	Remarks
H1	EE -> PS	0.286	0.059	4.866	0.000	Supported
H2	PE -> PS	0.278	0.049	5.605	0.000	Supported
H3	FC -> PS	0.330	0.041	8.068	0.000	Supported

IV. DISCUSSION

The objective of the study was to examine factors associated with patient satisfaction concerning telemedicine services adoption and utilization. To achieve the objective, three constructs, namely effort expectancy, performance expectancy, and facilitating conditions were hypothesized to have a significant relationship with patients' satisfaction concerning telemedicine services adoption for healthcare. The findings demonstrate that the relationships between effort expectancy (EE) and patients' satisfaction (PS) ($β = 0.286$, $t = 4.866$, $p < 0.01$), performance expectancy (PE) and patients' satisfaction (PS) ($β = 0.278$, $t = 5.605$, $p < 0.01$), and facilitating conditions (FC) and patients' satisfaction (PS) ($β = 0.330$, $t = 8.068$, $p < 0.01$) were statistically significant. Thus, the PLS-SEM results supported all the formulated hypotheses. These findings are consistent with previous empirical studies in healthcare context [21,25]. Additionally, the combination of the three predictors accounts for 53.8% of the variance of patients' satisfaction with telemedicine services adoption.

This study makes several significant contributions to the literature. The affecting factors of patients' satisfaction with telemedicine service in the context of Bangladesh remain a relatively unexplored research area and, to the researchers' knowledge, this is the first study that applies UTAUT to investigate these. It offers practical guidelines of telemedicine service satisfaction with potential antecedents in a developing country context. The findings of this study may lead the policymakers and practitioners to devise a strong awareness program to motivate telemedicine users. This program should highlight that using telemedicine applications/platforms is easy to use, increases the accessibility of healthcare, benefits the users (patients and health professionals) by saving time and cost, and is safe and secure.

Moreover, according to the results, policymakers, implementers, practitioners, developers, and organizations should consider offering their users an easy, useful, and high-quality telemedicine platform to drive patients' satisfaction with telemedicine. Hence, practitioners should employ simple platforms that give patients' confidence to meet their expectations with minimal difficulties. The more satisfied patients, the more likely they will use telemedicine services in the future.

D. Limitation

Although the findings of this study are valuable, the research has several limitations that future researchers should consider. First, this study surveyed only Dhaka division of Bangladesh. Future studies might include additional division for the generalizability and scalability of the findings. Second, this study reflected only the patient's satisfaction with telemedicine service. Future research should evaluate the healthcare professionals' or organizations' satisfaction toward telemedicine services, and this may provide an additional indication. Third, this study focused on three key factors influencing patients' satisfaction with telemedicine services. Future research could include other factors, such as trust, enjoyment, and task-technology fit. Finally, this study was limited to Bangladesh. Combining this study with cross-sectional data from similar developing countries would provide a broader view of antecedents of telemedicine adoption satisfaction in a global context.

V. CONCLUSION

The consideration of patients' opinions aids in the development of suitable policies and administrative practices, as well as the prioritization of resource allocation for improvement and delivery of high-quality healthcare. The study developed a conceptual framework to evaluate the influencing factors of patients' satisfaction with the use of telemedicine services. The study found a strong positive relationship between patients' satisfaction of telemedicine services with EE, PE, and FC of the telemedicine systems. Thus, the study reveals that these predictive variables play a significant role in patient's satisfaction towards telemedicine services adoption. This research suggests that concerned authorities, stake holders, and healthcare professionals can boost user confidence in adopting telemedicine applications by improving users' effort expectancy, performance expectancy, and facilitating conditions.

ACKNOWLEDGMENTS

Consent for publication

All authors have provided their consent for the manuscript to be submitted for review and publication.

Declaration of conflicting interests

The Author(s) declare(s) that there is no conflict of interest.

Funding

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