Begum et al. *Journal of Consumer Sciences* (2024), *9*(2), 163-184
DOI: https://doi.org/10.29244/jcs.9.2.163-184

JOURNAL OF CONSUMER SCIENCES

Article history:
Received
February 23, 2024

Revision submit
March 06, 2024
March 25, 2024
April 09, 2024
June 19, 2024

Accepted
June 20, 2024

Available online
30 June, 2024

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CONSUMER BEHAVIOR | RESEARCH ARTICLE

Unveiling End-users' Satisfaction and Actual Use of Blockchain in e-Health: Empirical Evidence from Bangladesh

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Abstract: Data safety and security have become threatening issues in the health industry. Against this backdrop, blockchain technology has opened up a new window for healthcare stakeholders. This research aims to enhance the understanding of the factors that influence user satisfaction and actual use behavior of blockchain technology in the electronic health sector in Bangladesh. A convenience sampling collected primary data (270 responses) from nurses, doctors, emergency staff, and laboratory technicians. AMOS and SPSS were used for analysis. The data were analyzed using descriptive statistics, assessing normality, common method bias, validity, reliability test, and regression weight analysis. The findings of this study reveal that the task characteristics, performance expectancy, information quality, and service quality of blockchain are significantly related to end-user satisfaction. Performance expectancy had the greatest weighted influence on satisfaction. End-user satisfaction reflects strong usage behavior towards blockchain technology in Bangladesh. Surprisingly, system quality does not substantially affect user satisfaction derived from blockchain technology. This study analyzes the most critical predictors of satisfaction evoked by using blockchain, particularly relevant to the context of Least Developed Countries (LDCs), such as Bangladesh. To our knowledge, limited studies have yet examined user satisfaction and actual use behavior through the lens of IS success, Task Technology Fit (TTF), and UTAUT models in Bangladesh's e-health sector. This study is anticipated to provide an opportunity for additional investigation into the potential uses of blockchain in the medical field and other commercial sectors.

Keywords: Blockchain technology, digital health, technology adoption, information system (IS) success, task technology fit, least developed countries

JEL Classification: D12, L68, O14

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PUBLIC INTEREST STATEMENT

Blockchain technology's potential to transform healthcare and marketing in this sector is significant when used to the e-health domain. The incorporation of Block chain technology into the e-health business holds significant promise for transforming healthcare practices, enhancing patient results, and facilitating the development of inventive, reliable, and patient-centric approaches by marketers.

There is a lack of scholarly literature available in peer-reviewed academic journals. The evaluation of the framework primarily relied on quantitative methods, which raises concerns regarding the absence of qualitative analysis to validate its accuracy and reliability. The primary constraint of this study pertains to the findings being specifically focused on the use of the term 'blockchain in e-health' rather than encompassing a broader range of technologies associated with the healthcare sector.

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1. Introduction

Healthcare is one of Bangladesh's most booming industries, with private hospitals as notable examples (Hossain et al., 2022). The number of private hospitals is increasing daily. Currently, quality healthcare services accompanied by modern methods of technology are necessary. Nowadays, technologically advanced systems, like e-health systems, improve healthcare. Due to the absence of clinical data integration, it is difficult for practitioners to gather knowledge promptly to support better patient care (Boore et al., 2017). In particular, when sending patient data via a network, the security of e-health systems is a problem (Boore et al., 2020). The interoperability and security difficulties in developing countries' e-health systems may be resolved using blockchain technology. Blockchain can be helpful in hospital/healthcare supply chain management. Blockchain is a global and secure technology that integrates immutability, transparency, and consensus to enable the secure recording of pseudo-anonymous interactions in a digital ledger developed by Satoshi Nakamoto in 2008 (Bell et al., 2018).

To the best of our knowledge, few empirical studies have been conducted in Bangladesh regarding blockchain technology (Hussain et al., 2022). Hussain et al. (2022) provided an overview of the literature on Bangladesh's adoption of blockchain technology. Similarly, Kabir and Islam (2021) explored the adoption of blockchain in the Bangladeshi banking system. Many authors use blockchain technology in various fields in Bangladesh (Hossain et al., 2022; Sikder, 2023). Despite the Bangladeshi government's efforts to integrate various technologies in the e-health sector and execute pilot projects, many tasks fell short of expectations due to a lack of public awareness (Hylock & Zeng, 2019). Stakeholders in the least developed countries (i.e., Bangladesh) must clearly understand how blockchain technology applies to e-health. Only a few empirical studies have used the integrated model of IS success (IS), task technology fit (TTF), and UTAUT in their research (Alazab et al., 2021). Most variables are drawn from the two main theories, including IS success model and the task-technology fit model. To fill these gaps, this research was conducted to understand the factors contributing to the study's examination of how user satisfaction and actual usage behavior are derived from the task characteristics, performance expectancy, information quality, service quality, and system quality of blockchain in the Bangladeshi e-health sector.

The authors conducted a comprehensive analysis of recently published research papers on blockchain technology, focusing specifically on the context of Bangladesh. *Firstly*, the current investigation is a remarkable contribution to the existing body of literature, as it is one of the initial empirical types of research that substantiates a framework for comprehensive study encompassing many critical aspects derived from the domains of the IS success model, TTF, and UTAUT. *Secondly,* this research will be invaluable for those interested in technology, software engineers, and entrepreneurs seeking to devise a well-informed strategy for integrating blockchain technology in Bangladesh or other less-developed countries. *Thirdly,* this study is anticipated to act as an opportunity for additional investigation into the potential uses of blockchain in the medical field and other commercial sectors. The empirical verification of the blockchain acceptance model may be conducted in subsequent research. *Lastly,* individuals, healthcare professionals, diverse organizations, and researchers can use this technology to transmit electronic patient data securely across numerous platforms.

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2. Literature Review

2.1 Blockchain

Numerous studies have provided evidence of blockchain's potential to enhance healthcare data exchange and facilitate various diagnostic applications data (Ahmad et al., 2021; Ratta et al., 2021). A different study utilizing the development of a proprietary blockchain infrastructure utilizing the Ethereum protocol has been undertaken to facilitate the secure and reliable use of medical sensors (Griggs et al., 2018). This infrastructure also addresses security issues associated with remote patient monitoring systems. This technique ensures the preservation of patient history in a secure and up-to-date manner, thereby protecting the safety and integrity of information (Li et al., 2021). One potential use of private blockchains is to track and store individual clinical data (Yaqoob et al., 2021). Individuals engaging in this personalized healthcare approach can conveniently access, monitor, and effectively oversee their specific clinical information and healthcare synopsis (Jabbar et al., 2020; Haleem et al., 2021). Implementing blockchain technology offers a reliable and distributed foundation for simplifying various information transfers related to clinical research. This approach facilitates data dissemination to several research teams (Kubendiran et al., 2019). Experts increasingly focus on applying blockchain technology to guarantee the safe upkeep and exchange of medical data, owing to its growing prominence in distributed computing (Coppolino et al., 2021). For instance, Irving and Holden (2016) suggested a hybrid framework that employs blockchain technology to safeguard digital medical records.

2.2 Information Systems Success Model

DeLone and McLean (2003) analyzed over 100 empirical studies from 1981 to 1988 reporting measures of information system (IS) success. The success elements outlined in the IS success model were examined, and their compatibility with the unique characteristics of the blockchain technology was assessed. Information quality, which pertains to the dependability and correctness of the blockchain data and its usability, is a problem for the output quality of the blockchain system (Yaqoob et al., 2021). An appropriate person has access to the required data at the appropriate time, and the contents of the information system must be easy to understand for users to control (Almasarweh et al., 2023; Muda & Ade Afrina, 2019). The evaluation encompassed various factors, including performance attributes, functionality, and usability. Accessibility, web design, simplicity of navigation, and operating elements are all system quality criteria that can be used to define an IS system's ease of use (Lee & Sung, 2023). Service quality metrics consider the degree to which a service provider facilitates the execution and utilization of blockchain technology (Alazab et al., 2021). One-path causality was applied in this study; that is, satisfaction leads to use, and user satisfaction is among the most crucial indicators of total IT success used to evaluate perception (Muda & Ade Afrina, 2019).

2.3 Task-Technology Fit (TTF)

TTF theory states that for technology to be successfully adopted, people must voluntarily accept and utilize it (Almasarweh et al., 2023; Alyoussef, 2023). The task-to-technology fit framework evaluation is widely used to determine how information technology affects performance. TTF influences the impact of task and innovation attributes on the utilization and effectiveness of technological results (Howard & Rose, 2019). Task-technology fit involves the correlation among individual capabilities, mobile technology system capacity, and work requirements. This study

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focuses on the task characteristics that may be achieved in the knowledge context by implementing blockchain technology (Alazab et al., 2021).

2.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

According to UTAUT, many distinct points of view regarding users' behavioral intentions might be integrated (Venkatesh et al., 2012). UTAUT is one of the most widely used and recognized theories for analyzing information system adoption and acceptability. UTAUT posits that latitude toward technology is the most crucial factor affecting usage behavior. UTAUT has added factors to overcome the lack of explanation of individual-related or external variables (Wang et al., 2018). UTAUT is expected to improve explanatory power capabilities, especially for newly developed technologies, by overcoming the limitations of explaining technology acceptance compared to previous concepts and frameworks about social psychology and technology acceptance, from 17-53% to 70% (Wamba & Queiroz, 2020).

2.5 Relationship between Task Characteristics and Satisfaction

Task characteristics are unique aspects of a task that can be accomplished using information. While an inadequate TTF might result in unfavorable attitudes toward the technology and lessen users' intention to use it, an excellent TTF can encourage users to adopt the technology and help them feel good about it (Gan et al., 2017). The task aspects of this study encompass learning elements that can be achieved by utilizing blockchain technologies. The aforementioned components encompass peer mentoring, scholarly efforts, and instruction on blockchain technology. Howard and Rose (2019) emphasized the impact of task features on the utilization of technology research. The size of the TTF depends on the extent to which the tasks and technology used within the blockchain domain work together. The ability to complete tasks effectively influences people's intent to adopt blockchain technology (Almasarweh et al., 2023). This prior knowledge of task characteristics resulted in the formulation of the following hypothesis:

H1: Task characteristics significantly influence user satisfaction

2.6 Relationship between Performance Expectancy and Satisfaction

Performance Expectancy (PE) measures how much technology increases consumer productivity (Venkatesh et al., 2012). Therefore, PE represents the degree to which healthcare providers believe that technology may enhance the effectiveness of their services. PE influences consumers' intention to adopt new technologies adequately (Hoque et al., 2017). However, previous research on the use of blockchain technology has yielded consistent results. Considering UTAUT, higher levels of user satisfaction have a noteworthy additional impact on utilization intention (Maziriri et al., 2023), ultimately determined by performance expectations (Alazab et al., 2021). When performance expectancy is paired with ISS and TTF data, there is a robust connection between usage intention and satisfaction (Lin et al., 2019).

H2: Performance expectancy significantly influences user satisfaction

2.7 Relationship between Information Quality and Satisfaction

The information system's ability to provide accurate data to all business departments and tailor the data to a specific user or department is shown by information quality. Users should be able to analyze the data offered by the information system (Alberto

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& Riza, 2023); relevant information is available to the appropriate person at the proper time (Muda & Ade Afrina, 2019). As part of the success dimension, data and content quality are examined as characteristics of an IS's success (Shahzad et al., 2021). The extent to which patients find the information credible, accurate and trustworthy. Blockchain technology that successfully utilizes these features is more likely to assist patients in comparing medical records, improving their user experience, and making informed decisions regarding healthcare services. A prominent concept states that the quality of the information is crucial in deciding how pleased consumers are and whether they intend to use blockchain (Shahzad et al., 2021). Thus, the following hypothesis is postulated:

H3: Information quality significantly influences user satisfaction

2.8 Relationship between System Quality and Satisfaction

System quality is the degree to which a system fulfills individual demands and meets user satisfaction standards (Kuska et al., 2024). One aspect of a blockchain's system quality is determined by how well the platform helps users complete tasks from upstream to downstream (Alazab et al., 2021). The usability of a technology refers to how easily a user can accomplish a particular purpose (e.g., searching for individual information). Reliability is the ability of a technology to operate consistently (i.e., function effectively when necessary). Adaptable systems can modify their content to satisfy shifting user expectations. Finally, the response time of the blockchain technology describes how soon the system answers data queries or actions. Blockchain technology must meet all these requirements. Thus, the following hypothesis is postulated:

H4: System quality significantly influences user satisfaction

2.9 Relationship between Service Quality and Satisfaction

Service quality is determined by users' opinions on the system's safety, dependability, and trustworthiness (Alazab et al., 2021). According to Tarhini et al. (2019), interactivity and customization (satisfaction, revenue and free enhancements) are two of the most potent elements of service quality. The majority of information system features improve the quality of commodities as opposed to services, and until the standard of the services is evident, it is impossible to assess the efficiency of the information system (Lin et al., 2019). DeLone and McLean proposed five service quality metrics: transparency, dependability, promptness, certainty, and sensitivity. Blockchain technology systems have up-to-date hardware, software, and auxiliary resources that serve users. Therefore, if individuals believe that blockchain provides a good quality of service, they are often willing to accept it (Alazab et al., 2021). Consequently, service quality influences blockchain applications in the field of e-health. Thus, the following hypothesis is postulated:

H5: Service quality significantly influences user satisfaction

2.10 Relationship between User Satisfaction and Actual Use

The extent to which customers think that the system can meet their needs is user satisfaction (Chatterjee et al., 2018). Higher satisfaction levels can improve IS usage and impact employees' work-life balance when utilizing blockchain technology technologies in the e-health industry. The US has been recognized and systematically confirmed as a meaningful measure of IS success and should be considered a vital aspect of blockchain technology adoption (Efiloğlu Kurt, 2019). Research on developing technology, such as blockchain, which utilizes wireless devices such as smartphones, discovered that the US favorably influences the use of wireless networks. It has been verified that the US contributed to the usage of IoT (Chatterjee et al., 2018). According to the present investigation, a relationship exists between employees' usage of blockchain technology and their level of satisfaction in the e-health sector. Employees who think blockchain technologies are incompatible with their demands will remain displeased and hesitant to use the system. However, if the system fits employees' demands, they will be content and glad to use it. Consequently, the following hypothesis is supported:

H6: User satisfaction significantly influences actual use

3. Conceptual Framework

The conceptual framework of this study is illustrated in Figure 1.

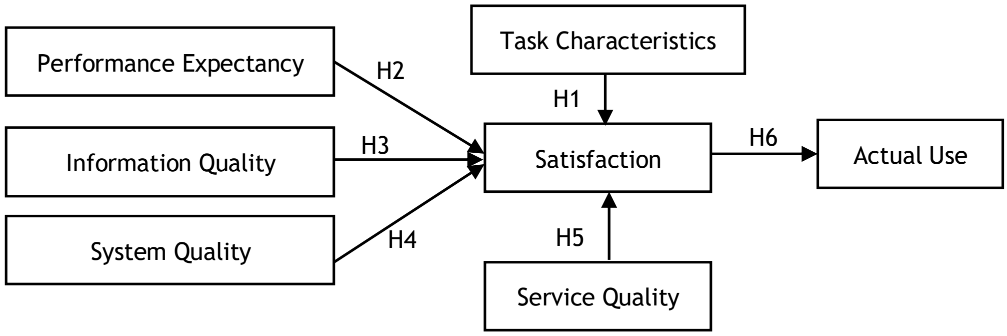

Figure 1. The proposed conceptual framework

Figure 1 presents the hypotheses of this study :
H1: Task characteristics significantly influence user satisfaction
H2: Performance expectancy significantly influences user satisfaction
H3: Information quality significantly influences user satisfaction
H4: System quality significantly influences user satisfaction
H5: Service quality significantly influences user satisfaction
H6: User satisfaction significantly influences actual use

4. Methods

4.1 Research Design

The cross-sectional study strategy used in this research involved collecting data from hospitals, clinics, emergency rooms, and lab technicians between September 2023 and December 2023. Google Forms were distributed to the respondents' online surveys to collect preliminary data.

4.2 Sampling

The target population of this study was Bangladesh. The sample size was 270, encompassing a wide range of participants from all healthcare service providers, including nurses, doctors, emergency staff, and laboratory technicians. The survey instrument employed in this study employed a convenient non-probabilistic sampling approach because a suitable sampling frame was unavailable. Quantitative data are more affordable than other approaches regarding statistical analysis and offer privacy

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and anonymity. It is also available on several platforms, enabling it to connect with various demographics (Al-Adwan et al., 2022).

4.3 Measurement

The latent component variables in the proposed design were created using prior studies and adjusted to fit the specific context of blockchain implementation in Bangladesh's e-health industry. Chang, Wang and Yang (2009), Al-Shibly (2011) adopted object Information Quality (IQ), System Quality (SQ), and Service Quality (SVQ). The Task Characteristics (TC) and Performance Expectancy (PE) measures were taken from Goodhue and Thompson (1995) and Venkatesh et al. (2012). DeLone and McLean (2003) provided items on User Satisfaction (US). Table 1 lists the indicator variables and operational definitions used in this study.

Table 1. Determinant aspects of blockchain: operational definition and indicators

Constructs	Operational Definition	Survey Questions
Information Quality (IQ) (Bailey & Pearson, 1983)	The ability to provide accurate data to all business departments and tailor that data to the specific user or department is shown by information quality	IQ1: The blockchain system gives you the precise information you require. IQ2: The blockchain system offers current data. IQ3: The blockchain system offers enough data.
System Quality (SQ) (Alshibly, 2014)	A system that fulfills individual demand and meets user satisfaction standards is known as system quality.	SQ1: The blockchain system is user-friendly. SQ2: The blockchain interface is easy to use. SQ3: The blockchain system offers quick access to information.
Service Quality (SVQ) (Chang et al., 2009)	Users' perceptions of the system's safety (security), dependability, and trustworthiness	SV1: The blockchain provides users with correct timing information for services. SV2: You feel secure while using the blockchain for your transactions. SV3: The blockchain serves each user individually.
Task Characteristics (TC) (Goodhue & Thompson, 1995)	The distinct features of a task that can be accomplished through the use of information	TC1: I must always be learning. TC2: I frequently need communication while studying. TC3: I frequently need relevant feedback while gaining knowledge.

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Table 1. Determinant aspects of blockchain: operational definition and indicators (Continue)

Constructs	Operational Definition	Survey Questions
Performance Expectation (PE) (Venkatesh et al., 2012)	The measure of how much using technology increases consumers' productivity	PE1: Using blockchain technology in the e-health sector increases the chances of getting health solutions. PE2: Using blockchain technology helps to manage daily healthcare activities more quickly. PE 3: I find the blockchain technology e-health sector very useful.
User satisfaction (SAT) (DeLone & McLean, 2003)	To what extent customers think the system can meet their needs is known as user satisfaction	SAT1: I am pretty pleased with the data I obtain from the blockchain. SAT2: I have a favorable opinion of the blockchain technology. SAT3: My interaction with the blockchain is very satisfying.
Actual Use (AU) (Taylor & Todd, 1995)	Refers to a person's actual use of technology	AU1: Blockchain technology service is a pleasant experience. AU2: Truly, I would like to use blockchain technology to keep my data secure. AU3: I use blockchain technology on regular basis.

4.4 Data Collection

This study used an online survey using Google Forms as the primary method for collecting information. Parts A and B of the questionnaire were separated. Part A comprised the demographic information used to determine the descriptive characteristics of the sample. Based on previous studies, all measurement instruments were modified to enhance content validity. An English questionnaire was first created and then converted into Bengali by a qualified, experienced translator to obtain accurate responses from respondents. Those taking part are requested to provide their responses on five points on a five-point Likert scale: one is for "strongly disagree," and five is for "strongly agree." This scale was used to generate cognitive information. A preliminary pilot study was conducted with a sample size of 25 participants to ascertain the efficacy and suitability of the questionnaire. The study circulated 300 questionnaires, of which 280 were returned to 94% of the respondents. Ten unanswered questions were excluded from the analysis. Consequently, 270 surveys were conducted. All participants received data papers and forms for consent, which detailed the study objectives. The research employed Amos 23, SPSS Version 23, and a statistical approach based on SEM to analyze the research suppositions' relationships.

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4.5 Data Analysis

A thorough examination of each entry was performed as a primary measure. A secondary measure that followed involved verifying the interpretation of the mean, standard deviation, and frequency distribution are examples of descriptive statistics. The accuracy of the data entry process for the dataset was estimated to be 92%. It was observed that ten questionnaires had incomplete data in several parts of the measurement of the constructs. Out of the situations, ten questionnaires had incomplete responses to the entirety of the questionnaire. The first analysis excluded the aforementioned situation (Jena, 2022). Consequently, after removing ten instances, 270 viable samples were preserved in the database to facilitate the subsequent analysis of normalcy and outliers.

The total number of participants obtained for the study was 270. The data were examined using Amos 23 and SPSS 23.0. Structural Equation Modeling (SEM) was used in the current research to assess construct validity and dependability and to examine the proposed model and assumptions. Regression weight analysis assessed the connection between independent and dependent variables. This study focuses on different factors influencing individuals' perception of adopting blockchain technology. The aim was to identify any significant perceptual differences among those factors. Descriptive analysis can explain the characteristics of respondents and individuals' behavior toward satisfaction and actual use in research.

5. Findings

5.1 Respondent Characteristics

The demographic characteristics of the participants are shown in Table 2. Among the 270 participants, the majority were over 31-40 (87%). About 65.6% were male, 34.1% were female, and 0.4% preferred not to say who participated in the current study. In addition, 66.7% of the participants had Postgraduate and MPhil/PhD education levels. Of all the participants, 53 percent had 6 to more than ten years of work experience. Most firms were at least 4–9 years old (64.4%). Most firms had 100 to more than 200 users (70%). Moreover, the experience of using e-health technology was at least 4–9 years (72%), whereas the experience of using blockchain technology was 1–4 years (91.5%).

Table 2. Socio-demographic characteristics of the 270 respondents

Dimensions	Frequency	%
Gender		
Male	177	65.6
Female	93	34.4
Age		
25-30	33	12.2
31-40	237	87.8
Level of Education		
Graduate	90	33.3
Postgraduate and MPhil/PhD	180	66.7
Work experience (years)		
0-5	127	47.0
6-More than 10 years	143	53.0
Firm size (uses)		
Less than 100	79	29.3
100- More than 200	191	70.7

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Table 2. Socio-demographic characteristics of the 270 respondents (Continue)

Dimensions	Frequency	%
E-Health technology usage experience		
1-3 years	68	25.2
4-9 years	195	72.2
More than 9 years	7	2.6
Blockchain technology usage experience		
1-4 years	247	91.5
5-6 years	23	8.5
Firm age		
1-3 years	61	22.6
4-9 years	174	64.4
More than 9 years	35	13.0

5.2 Assessing Normality

In the initial phase, descriptive statistics were used, utilizing the mean scores of both dependent and independent variables. The results indicated that the kurtosis scores were below 3. This implies the generation of a reduced number of extreme outliers. Skewness is indicated by the skewness value in Table 3. Generally, if skewness is between -0.5 and 0.5, it is considered reasonably equal. It is considered highly skewed depending on whether the skewness is larger or smaller than one. This result shows that almost all skewness values are less than -1. Therefore, it was considered to be highly skewed.

Table 3. Skewness and Kurtosis values for data normality test

Constructs	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
Information Quality	3.830	0.789	0.623	-1.424	0.148	1.403	0.295
System Quality	2.912	1.179	1.390	0.006	0.148	-1.465	0.295
Service Quality	3.821	0.877	0.769	-1.437	0.148	1.325	0.295
Task Characteristics	2.890	1.175	1.379	0.022	0.148	-1.443	0.295
Performance Expectancy	3.919	0.784	0.615	-1.619	0.148	2.288	0.295
Satisfaction	3.862	0.885	0.784	-1.595	0.148	1.758	0.295
Actual Use	3.784	0.983	0.966	-1.380	0.148	0.774	0.295

5.3 Common Method Bias (CMB)

As per Hew and Kadir (2017), an analysis of Harman's single factor was undertaken using 21 items of the scale and seven constructs (information quality, system quality, service quality, task characteristics, performance expectancy, satisfaction, and actual use). Gligor et al. (2020) suggested that no single component emerged as the initial construct, accounting for 37.67% of the variance, which is less than the cut-off value of 50%. The CMB problem was not present in the data collection, which may be stated in the conclusion.

5.4 Measurement Model: Validity and Reliability Tests

As demonstrated by the CFA results, the model showed good fit statistics, with a CFI of 0.984 and RMSEA, RMR, and GFI of 0.932, which all fell within the good fit range. The recommended values are supplied in brackets, as suggested by Hair et al. (2017) (RMSEA< 0.08, RMR< 0.05, GFI≥ 0.89, CFI> 0.90)—convergent and discriminant validity

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analyses of internal reliability allowed for the evaluation of the measurement model. Composite dependability and Cronbach's alpha were employed to evaluate internal reliability; a level of 0.70 indicated excellent internal consistency. The expected CR range (0.753–0.896) is shown in Table 4. Convergent validity may be assumed for constructs with an Average Variance Extracted (AVE) of a minimum of 0.50, and a similar assumption can be made if the item loading is significantly higher than 0.50. Table 4 also indicates that the estimated AVE range between 0.505 and 0.742 exceeds the permitted ranges. Therefore, this study satisfies the convergent validity requirements.

Table 4. Convergent validity and internal consistency reliability

Constructs	Items			CR	AVE	CA
System quality	SQ1	SQ1	SQ1	0.890	0.729	0.888
Information quality	IQ1	IQ1	IQ1	0.753	0.505	0.742
Service quality	SVQ1	SVQ1	SVQ1	0.820	0.603	0.815
Task characteristics	TC1	TC1	TC1	0.896	0.742	0.896
Performance expectancy	PE1	PE1	PE1	0.799	0.572	0.793
Satisfaction	SAT1	SAT1	SAT1	0.869	0.622	0.832
Actual use	AU1	AU1	AU1	0.869	0.688	0.868
Model Fitness: RMSEA = 0.034; RMR = 0.043; GFI = 0.932; CFI = 0.984						

Note: IQ: information quality, SQ: system quality, SVQ: service quality, TC: task characteristics, PP: performance expectation, SAT: satisfaction, AU: actual use.

We assessed discriminant validity using the Fornell-Larcker criterion (Fornell & Larcker, 1981). Our analysis revealed that each construct's square root of the AVE surpasses the correlation with other constructs (Table 5). Discriminant validity provides further support for this measurement model.

Table 5. Discriminant validity assessment results based on the Fornell-Larcker criterion

Constructs	IQ	SQ	SVQ	TC	SAT	PP	AU
Information Quality	0.710						
System Quality	0.249**	0.854					
Service Quality	0.618***	0.193**	0.777				
Task Characteristics	0.229**	0.770***	0.311***	0.861			
Satisfaction	0.652***	0.266***	0.637***	0.418***	0.789		
Performance Expectancy	0.608***	0.216**	0.654***	0.375***	0.758***	0.756	
Actual Use	0.571***	0.350***	0.565***	0.402***	0.797***	0.615***	0.829

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

The GoF indicators confirm the model's predictive capacity. GoF calculates the geometrical median of the average interaction and average R^2 of the internal latent constructs. These results show that the GoF indices are typically 0.10 (small), 0.25 (mid), and 0.36 (large), and fall between 0 and 1. Unlike AMOS, SPSS does not offer a global goodness-of-fit index, which is $\surd$ [(average communality) × (average R2)] = √ (0.637 × 0.67) = 0.653 is the goodness of fit. As a result, the analysis above shows that our suggested model's worldwide GoF value is 0.653, which is more than the stated cutoff point of 0.36 (Mohammadkazemi & Pouriz, 2023).

5.5 Structural Model: Regression Weights Analysis

The internal components' R-square values and structural path coefficients were examined using the widely known statistical program Amos 23 to verify and confirm

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the proposed model's explanation capacity. The bootstrap method evaluated the hypotheses at a significance threshold of 0.05 (p < 0.05). The results of testing the hypotheses and structural equation modeling (SEM) are presented in Table 6.

Table 6. Hypothesis test results using SEM analysis

Hypotheses	Path	Estimate	S.E.	C.R.	P-value	Label
H1	Task characteristics→ Satisfaction	0.150	0.076	1.980	0.048	Supported
H2	Performance expectancy → Satisfaction	0.443	0.095	4.683	***	Supported
H3	Information quality → Satisfaction	0.324	0.103	3.135	0.002	Supported
H4	System quality → Satisfaction	-0.032	0.076	-0.418	0.676	Not Supported
H5	Service quality → Satisfaction	0.149	0.088	1.703	0.089	Supported
H6	Satisfaction → Actual use	0.897	0.076	11.859	***	Supported
Model Fitness: RMSEA = 0.035; RMR = 0.050; GFI= 0.931; CFI = 0.982						

Note: *p < 0.05; **p < 0.01; ***p < 0.001

The findings showed that the model was well-fitted, with an RMR of 0.050, GFI of 0.931, and CFI of 0.982. According to Everitt and Dunn (2001), model fitness is represented by these values (RMSEA<0.08, RMR<0.05, GFI ≥ 0.89, CFI>0.90). The statistical findings indicated that the relationships between performance expectancy and satisfaction (t=4.683, β=0.443, p<.05), task characteristics and satisfaction (t=1.980, β=0.150, p>0.05), information quality and satisfaction (t=3.135, β=0.324, p<0.05), service quality and satisfaction (t=1.703, β= 0.149, p>0.05), and satisfaction and actual use (t=11.859, β=0.897, p<0.05) were analytically fulfilled at the 5% significance level. Therefore, H1, H2, H3, H5, and H6 were statistically supported. Still, oddly enough, system quality and satisfaction (t=-0.418, β= -0.032, and p>0.05) were insignificant at the threshold of 0.05 (p<0.05). So, H4 was rejected.

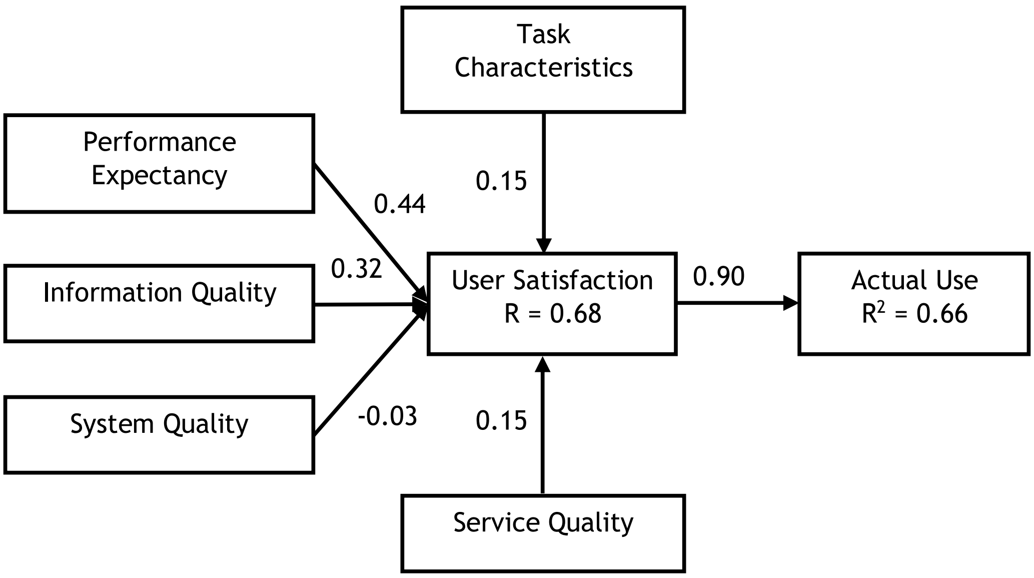

Figure 2. Summary of structural equation model results

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6. Discussion

6.1 The Effect of Task Characteristics on Satisfaction

The strong association between task characteristics and satisfaction (H1) suggests that task characteristics significantly impact users' decisions to use blockchain technology. The results of previous studies by Almasarweh (2023) support our findings. Regarding technology adoption, the link between these two elements is well-established and proven (Almasarweh et al., 2023). Consequently, this study's findings are consistent with previous research on blockchain adoption (Gan et al., 2017; Thiruchelvam et al., 2018). However, any new technology may create barriers for users owing to its distinct features. Blockchain technology users will be more satisfied when they obtain the desired service from task features. Blockchain services support users' needs and enable them to complete their learning, and they may develop favorable attitudes toward them. Tasks are widely acknowledged as crucial components that influence the acceptability of behavior (Evwiekpaefe et al., 2018). From this perspective, this element influences the adoption of blockchain technology.

6.2 The Effect of Performance Expectancy on Satisfaction

This research indicates that the adoption of blockchain technology is significantly influenced by performance expectancy on satisfaction (H2) because healthcare users can be satisfied by the expected performance of blockchain technology. These empirical results align with traditional theories proposed by Venkatesh et al. (2012). This result, in line with Latif and Zakaria (2020) shows that performance expectancy can significantly affect blockchain technology. Rahman et al. (2024) discovered that consumers' intentions to use blockchain technology are not influenced by their performance expectations. This might result from people's insufficient understanding of the blockchain technology. However, the results are comparable to those of Khazaei (2020), who discovered that the use of blockchain technology in the Malaysian SME sector is positively and significantly influenced by performance expectancy. This study substantially advances the knowledge of the significance of performance expectancy in the blockchain technology adoption process in Bangladesh's e-health industry because sharing personal health information can be sensitive and embarrassing. For this reason, blockchain users believe this technology helps them perform daily activities and enhances work performance.

6.3 The Effect of Information Quality on Satisfaction

Furthermore, there is a substantial correlation between information quality and satisfaction (H3) with implementing blockchain technology. These results align with traditional theories of the IS success model. However, one study showed that information quality does not always affect satisfaction (Al-bloush et al., 2021). Because of inaccurate information, a lack of trustworthiness, irrelevant information, and unavailable information creates dissatisfaction among users. Nevertheless, According to Shahzad et al. (2021), higher education institutions' use of e-learning is significantly affected by information quality. Prisscilya and Napitupulu (2023) found that the reliability of information influences a user's decision to use blockchain technology to purchase cryptocurrency assets through Tokocrypto. This may be because people depend more on technology at every stage. The likelihood of using social media and technology has increased. Users are more knowledgeable about technology; thus, they are more influenced by what their peers think about using it and word-of-mouth. Thus, information quality influences the adoption of blockchain technology.

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6.4 The Effect of System Quality on Satisfaction

Surprisingly, system quality had an insignificant influence on satisfaction (H4), contradicting traditional concepts. According to DeLone and McLean (2003), users adopt any technology when a system fulfills individual demands and meets user satisfaction through usability, reliability, and adaptability. Bangladeshi users in the healthcare sector may not find it easy to use blockchain technology due to its complex features. Thus, this variable may not influence Bangladeshi people in the healthcare service sector. From this perspective, our findings are comparable to those of the research conducted by Hafizh and Aswar (2020), who examined the effect of system quality on company efficiency. In contrast, another study discovered that system quality positively affects user satisfaction with the online Bitcoin exchange platform (Lee & Sung, 2023). Therefore, system quality does not influence the adoption of blockchain technology.

6.5 The Effect of Service Quality on Satisfaction

Additionally, the findings show a strong correlation between service quality and satisfaction (H5). The results of previous studies by DeLone and McLean (2003) support our findings. Nowadays, people are more concerned about their health than they were before. Therefore, they are incredibly focused on the quality of healthcare services in Bangladesh, including transparency, dependability, promptness, certainty, and sensitivity offered by DeLone and McLean. Blockchain technology systems have trustworthy services, response times, and effectiveness, significantly and promptly influencing users' intention to adopt blockchain technology. These results are similar to those of (Alazab et al., 2021; Hafizh & Aswar, 2020; Naidoo, 2023). Thus, this element influences the adoption of blockchain technology.

6.6 The Effect of Satisfaction on Actual Use

Interestingly, this study found that satisfaction had the greatest influence on actual use (H6) ($\beta = 0.897$). This implies that user intentions are the most important factor impacting how blockchain technology is used. The users are satisfied with the system and like to use it without confusion. Because of their positive experience, they feel motivated to share their thoughts with others, which creates more interest in others to try further usage. Actual usage reflects when users satisfy their expectations by using blockchain technology. This result was consistent with the hypothesis that high satisfaction affects the level of actual use. These findings come from the research carried out by Diputra and Yasa (2021). Individuals pleased with the technology will be incentivized to use it more frequently, resist it, or refer others to it, all of which are signs of its actual use (Aburayya et al., 2020). According to Alazab et al. (2021) the calculation of the coefficient value (R2) for SAT is 68%, and the actual use is 66%, which is regarded as strong (higher than the reference value of 0.50). Thus, the study's findings acknowledged the IS success model and TTF and UTAUT's explanatory solid power for predicting users' intention to adopt blockchain technology.

6.7 Managerial Implications

This study has important management implications for users' intentions to adopt blockchain technology by governments, corporations, and other shareholders. In light of these primary findings, policymakers and stakeholders can gain valuable insights into the factors influencing users to adopt blockchain technology. Implementing this strategy encourages user satisfaction and actual use. Blockchain user institutions such

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as Diagnostic centers, clinics, hospitals, and emergency labs can benefit by using these findings in their policy to influence patients through performance expectancy (PE), which has the greatest weighted influence on satisfaction, information quality (IQ), task characteristics (TC), and service quality (SVQ) in the e-health sector. The current investigation noted that system quality (SQ) did not favorably impact user satisfaction. Thus, future research should evaluate the critical role that SQ plays in shedding light on the views of various groups. The significance of this study extends to both blockchain technology designers and general users, as it elucidates the methods by which the confidentiality and security of individuals can be safeguarded amidst the increasing adoption and use of this innovation in the medical field. This study is anticipated to provide an opportunity for additional investigation into the potential uses of blockchain in the medical field and other commercial sectors.

6.8 Theoretical Contributions

Theoretically, this study enriches the literature on blockchain technology by determining which factors influence blockchain technology adoption in the e-health sector of Bangladesh. In addition, the findings show that information quality, service quality, task characteristics, and performance expectancy positively affect satisfaction and actual use. These variables greatly influence Bangladeshi users' use of this technology in the e-health sector. Surprisingly, system quality did not favorably impact satisfaction and actual use. The results of this investigation will benefit scholars in identifying the specific domains within the healthcare system where there is a strong demand and feasibility for implementing blockchain technology.

6.9 Limitations

The investigation carried out in this study was subject to certain constraints. Because of the cross-sectional research approach used in the study, it was not possible to determine whether the opinions collected during the survey data-gathering process would be true in the future. Another constraint of this study pertains to the findings specifically focusing on using the term 'blockchain in e-health' rather than encompassing a broader range of technologies associated with the healthcare sector. There is also a lack of scholarly literature in peer-reviewed academic journals in Bangladesh. Moreover, the structure is limited to a specific industry within a particular country. Additionally, the evaluation of the framework primarily relied on quantitative methods, which raises concerns regarding the absence of a qualitative analysis to validate its accuracy and reliability.

7. Conclusions

This study employs various factors to examine the intention to adopt Blockchain technology in the e-health sector. The results show that task characteristics, performance expectancy, information quality, and service quality are vital in influencing users' decisions to use this technology in e-health. Performance expectancy had the greatest weighted influence on satisfaction. Healthcare users may find satisfaction in the expected results of blockchain technology. However, system quality was not statistically significant in terms of user satisfaction. Blockchain technology might be challenging for Bangladeshi people due to its complexity. This study aims to provide deep insight into the complexity of personal preferences through thorough analysis and thoughtful examination of the factors and their effects on user satisfaction. This study successfully confirmed the utilization of blockchain technology in Bangladesh, a country with limited research conducted in this particular domain. Nonetheless, all these findings emphasize the adaptability and transparency

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among manufacturers, distributors, and healthcare organizations for verifying the qualifications of medical professionals.

8. Recommendation

Based on the presented results, it is expected to be able to identify which elements can be adapted to influence individuals to employ blockchain technology in the field of medicine. Firstly, longitudinal studies should be used in the future to track user behavior over time and provide insights into evolving trends. Secondly, future research is expected to conduct a mixed-method study where the outputs of quantitative analyses can be validated following a qualitative interview with specialists. Thirdly, scholars may focus on many dimensions of blockchain technology and examine its potential to provide novel opportunities within different realms. Fourthly, this study was limited to Bangladesh and examined only certain variables related to blockchain technology adoption. Future research could be conducted in major countries within the least developed countries to gain a more comprehensive understanding. Further research is needed to determine the underlying factors that drive individuals to adopt blockchain technology.

Citation information
Cite this article as: Begum, F., Khan, R., Mandal, J., Kaium, A., Rahman, S., Zahan, I. (2024). Unveiling end-users' satisfaction and actual use of blockchain in e-health: empirical evidence from Bangladesh. *Journal of Consumer Sciences, 9*(2), 163-184. https://doi.org/10.29244/jcs.9.2.163-184

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