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Assessing Citizen Use Behavior of Digital Land Services in Bangladesh: The Mediating Role of Public Trust and Satisfaction

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Abstract

This study assesses the factors affecting citizen behavior toward using Digital Land Services (DLS) in Bangladesh. The study is basically cross-sectional quantitative research using the survey method based on a structured questionnaire. The data collected from 448 primary users of DLS were considered for the analysis, where the Structural Equation Modeling (SEM), run by Smart-PLS and M-plus, was used for testing the research model containing several hypotheses. This study reveals that Service Quality (SQ) significantly impacts Public Trust (PUBT) and Satisfaction (SAT), and PUBT and SAT directly influence Use Behavior (USEB). The mediation analysis furthermore highlights that PUBT and SAT as important mediators between SQ and USEB. Total effects analysis underscores SQ, PUBT, and SAT as the most influential constructs in determining the USEB of DLS service recipients in Bangladesh. This study introduces a novel research model aimed at understanding citizen use behavior of DLS, which is one of the pioneering works to combine a service quality model with satisfaction and public trust. Moreover, it marks the first instance in the e-service domain to utilize public trust as a mediator alongside satisfaction.

1. Introduction

Land, the concept primarily defines the relationship between people and the environment, whereas land services management deals with resource sustainability concerns respectively (Reenberg, 2006). Where rights and access to land for all citizens are mostly vital for global investment, economic growth, and resilience, preventing land seizures, displacement vulnerability, and forced migration also fall under the common concern for countries around the world (World Bank, 2023). Increasing population, urbanization, and climate change with an increased number of natural disasters- are a few of many pressuring factors that pulled the concern of improving rights and access to land-property information (Chehrehbargh et al., 2024; Burns & Shojaei, 2023). In the present years, the concept and practices of E-governance have evolved and appeared as a paradigm shift in delivering land-property information, prioritizing transparency, reliability, and accountability across both developing and developed countries (Wandaogo, 2022; Khanra & Joseph, 2019; Mosse & Whitley, 2009). The digital transformation of land administration has mostly altered concerned services into swift, user-friendly, and capable of producing reliable outputs that ensure legal certainty within a contemporary land administration framework, mostly critical for achieving the Sustainable Development Goals (SDGs) as well (Kusmiarto et al., 2021). Nowadays, traditional land registries are increasingly shifting towards digital systems to enhance respective transparency and efficiency, minimizing repeated visits to land offices with unnecessary bureaucratic procedures and incompetent intermediaries (Arifuzzaman & Islam, 2024; Todorovski & Potel, 2019). The world is now experiencing a growing trend with about one-third of countries around the world, adopting digital land record systems (Rodima-Taylor, 2021). Research works also show that this digitization of land administration is simplifying the monitoring of land procedures, ensuring an updated service with reduced challenges by service seekers (Todorovski & Potel, 2019). India is now leading the game with digitized land records and computerized property registration offices (Thakur et al., 2020). Bangladesh, on the other side of the coin, covering an area of roughly 148,460 square kilometers, is

facing challenges in accommodating and managing its vast population where land is still being treated as an increasingly valuable source of fixed capital (Alam et al., 2022; Viana et al., 2022). However, the existing land use policy in Bangladesh struggles with major issues stemming from outdated and fragmented land records (Joysoyal et al., 2024). Even in this age of technological development, Bangladesh relies on an inefficient, traditional, paper-based land management system. The process of registering ownership, possession, or other land rights is mostly dependent on various physical records, such as deeds, purchases, registrations, and mutation documents, which require the participation of multiple ministries and departments in the process additionally (Rahman & Hossain, 2020). In practice, this is often treated as a cumbersome job as it is quite challenging to coordinate among various departments in a 3rd world developing country like- Bangladesh. This outdated system poses significant challenges for the government in managing and updating land registration records with practices such as limiting access to reliable land information and preventing real-time transaction record updates (Ameyaw & de Vries, 2020; Islam et al., 2020). The limited synchronization among departments often leads to diverse forms of fraud, reducing transparency among stakeholders in land transactions. Additionally, completing the Record of Rights (ROR) transfer takes several months, and identifying court cases or bank leases during the registration of ownership transfer is equally difficult (Alam et al., 2022). Acknowledging such a plethora of challenges as well as the potential of digitizing the land management system, the Government of Bangladesh (GoB) has taken a few initiatives followed by highlighting an urgent necessity for digitizing its land records, registration processes, paperwork, and associated data (Akter, 2022). The first land management service to undergo digitization was “E-Mutation,” launched in 2018, which allowed citizens to apply for mutations online, significantly reducing the time, cost, and number of visits required compared to traditional methods (Rabbani & Hossain, 2019). Upazila land offices in Bangladesh are leading these digital land services in Bangladesh to streamline land-related processes and improve citizen satisfaction. Highlighting the potential, the government has plans to expand the digital land services system to all Upazila land offices to enhance the quality of land services (Akter, 2023). However, in many instances, the general population remains uninformed about these advancements, limiting their ability to benefit from them indeed (The Daily Star, 2023).

The existing body of literature demonstrates a significant focus on digital land services globally. However, in the context of Bangladesh, most studies concentrate on traditional land service systems, with limited scholarly attention given to the digital land services provided by Upazila Land Offices (ULOs). Therefore, this research seeks to address this gap and enrich the academic discourse on digital land services in Bangladesh. Accordingly, the primary aim of this study is to evaluate user’s use behavior of digital land services provided by ULO. The study further aims to assess citizens’ satisfaction with digital land services, thereby providing insights into their effectiveness and implications for improving service delivery in the Bangladeshi context.

2. Literature Review: Development of Hypotheses and Research Model

2.1 Antecedents of Service Quality:

Service quality reflects the perceived performance of services compared to recipient expectations, with perceived ease of use and usage patterns being key factors (Chohan & Hu, 2020). It plays a vital role in fostering public trust across sectors like law enforcement, healthcare, and education. High-quality services enhance trust by promoting responsiveness, professionalism, and transparency, as seen in studies on digital police services (Chaeruddin et al., 2024). In healthcare, inefficiencies erode trust, prompting many to seek treatment abroad (Yulianto, 2024). Research also shows that service quality and innovation boost satisfaction, strengthening public trust (Muzaki et al., 2023). Therefore, service quality is pivotal for building and sustaining trust in institutions. Thus, the hypothesis in this regard is as follows;

H1

Service Quality has a positive impact on the Public Trust

Service quality differs from citizen satisfaction, as it precedes and influences satisfaction in the assessment process, with quality leading to satisfaction (Parasuraman et al., 1988). Rita et al. (2019) emphasized that service quality shapes ultimate satisfaction and influences whether recipients remain loyal or seek alternatives. In e-government, studies have consistently shown a strong positive relationship between service quality and satisfaction (Biswas et al., 2024; Saha, 2022; Hoque, 2020). Aryanty et al. (2024) and Ghimire et al. (2024) found that dissatisfaction arises from lower-quality services, underscoring service quality's role in satisfaction. Reliability, a key dimension of service quality, ensures consistent and accurate service delivery, significantly enhancing satisfaction (Albar, 2024; Halika & Kharisma, 2024). In the context of ULO's digital land services, "service quality" refers to citizens' evaluation of these services, which directly impacts overall satisfaction. Consequently, the proposed hypotheses are as follows;

H2

Service quality has a direct positive impact on user's satisfaction

Service quality influences both satisfaction and customer loyalty, with improved quality driving higher satisfaction and use behavior, as seen in e-commerce (Hidayat et al., 2024; Halika & Kharisma, 2024; Nur Ullah & Biswas, 2024). It is a key factor in fostering loyalty (Fatiha et al., 2024), particularly in digital environments where website quality encourages return visits, engagement, and recommendations. This applies to both online and traditional services, as studies confirm that perceived service quality significantly impacts consumer behavior (Saputra et al., 2022). In e-government, research shows a direct link between service quality and use behavior (Yapinski et al., 2024; Latifah et al., 2023). Therefore, this study posits that high service quality is essential for sustaining consistent use behavior in e-government platforms. Thus, the hypothesis in this case is as follows;

H3

Service Quality has a direct positive impact on Use Behavior

2.2 Antecedents of Satisfaction:

Specific satisfaction refers to satisfaction with individual transactions by measuring the gap between expected and actual services, while accumulative satisfaction reflects overall satisfaction built over time since the initial transaction (Zhang, 2009). Some prior studies (Biswas et al., 2024; Alsuwaidi, 2023; Ferdous et al., 2022; Biswas & Roy, 2020) have found that specific satisfaction significantly influences accumulative satisfaction. Satisfaction with each service interaction donates to overall satisfaction with an organization and the cumulative effect determining the final satisfaction level. Citizens' evaluations are influenced by both the halo effect and recent experiences by emphasizing the dynamic interaction between specific and accumulative satisfaction. Satisfaction plays an important role for building sustainable and reciprocal relationships between government and citizens in digital services system (Sukma & Leelasantitham, 2022). It is also a key driver of use behavior on digital government platforms (Fatiha et al., 2024). DeLone and McLean (2003) found that there has a positive relationship between satisfaction and reuse intention and citizen loyalty. Recent studies identify satisfaction as a primary determinant of use behavior in service organizations (Biswas et al., 2024; Oematan et al., 2024; Yu et al., 2024; Jo, 2024). Similarly, Prior research on e-loyalty has shown that satisfaction shapes use intentions and enhance the long-term relationships with service providers (Jin & Ryu, 2024; Pramudita et al., 2023). The literature consistently highlights that satisfaction drives e-government service use and loyalty and both specific and accumulative satisfaction significantly contributing to citizen loyalty. Therefore, the hypothesis proposed in this context reflects as follows;

H4

User's Satisfaction has a direct positive impact on Use Behavior

2.3 Antecedents of Trust:

Citizen trust in government agencies is crucial for driving use behavior and satisfaction with e-government services. Trust develops through social interactions and experiences with government programs (Cai, 2023). Transparent, fair, and ethical conduct by agencies fosters confidence, enhancing satisfaction and continued engagement (Li & He, 2024; Qatawneh et al., 2024). ICT advancements enable governments to build trust by offering effective, citizen-centric e-services that boost satisfaction and promote consistent use (Taufiqurokhman et al., 2024; Li & Shang, 2020; and Alzahrani et al., 2018). For example, in Saudi Arabia, trust in the Ministry of Education enhances satisfaction with university admissions and increases engagement with e-services. Research also shows that trust directly influences satisfaction and reuse intentions in e-commerce (Zheng et al., 2017; Bilgihan, 2016) and e-government, fostering long-term relationships by sustaining satisfaction and use behavior (Tegethoff et al., 2019). Therefore, the proposed hypotheses are

H5

Public Trust has a direct positive impact on Use Behavior

2.4 Antecedents of Use Behavior:

Behavioral intention towards technology significantly impacts actual usage and long-term organizational performance (Hossain et al., 2023; Jiakui et al., 2023; and Li et al., 2022). Continuance intention is a key indicator of IS success model that reflects users' ongoing adoption behavior and helps to measure user loyalty as well as the success of IS implementation (Hossain et al., 2023; Wang et al., 2022). In the context of e-government, continuous use behavior of citizens is essential for maximizing service value and overall performance of the system (Qatawneh et al., 2024; Li & Shang, 2020). Many scholars argued that user engagement also influences behavioral intention toward e-services (Asagbra et al., 2018; Brock & Von, 2019). However, factors that influencing initial adoption may reduce continuance usage and also emphasizing that the importance of post-adoption behavior in ensuring long-term technology adoption and satisfaction (Oliver, 1980; and Bhattacherjee, 2001).

2.5 Model Development:

The measurement of service quality research started significantly in the 1980s. Haywood-Farmer (1988) introduced three key attributes: physical facilities and processes, people's behavior, and professional judgment in his Attribute Service Quality model. In 1994, Taylor and Cronin developed the SERVPERF model to measure performance based on the service quality matrices. In 1985, Parasuraman initially identified 97 attributes across 10 dimensions for service quality assessment, and later, in 1988 refined the model with seven dimensions. Further (Parasuraman et al., 1994) revised their model with a five-dimension SERVQUAL model. The SERVQUAL model is widely used to assess service quality by measuring the gap between expected and perceived service quality (Raza et al., 2020; Yadav & Rai, 2019). It has been applied in healthcare (Teshnizi et al., 2018; Abuosi & Atinga, 2013), education (Ali & Gulliver, 2017; Wang & Chiu, 2011), and banking (Negi, 2009; and Nyeck et al., 2002). Many recent studies (Biswas et al., 2024; Nur Ullah & Biswas, 2024; Pandey, 2024; Raza et al., 2020; and Yadav & Rai, 2019) suggested that the SERVQUAL model is also effective for evaluating digital e-government services. In this study, the five-dimensional SERVQUAL model is used to assess the service quality of digital land services provided by the ULO in Bangladesh. Citizen satisfaction is measured using Zhang's Two-Dimensional Satisfaction Model (SAT) (Zhang, 2009), while Public Trust (PUBT) is conceptualized based on Colesca (2009). Additionally, the Use Behavior (USEB) is examined following the framework of Biswas & Roy (2020). This study proposes an integrated model to examine the factors influencing use behavior toward government digital services. The model aims to explore the theoretical relationships among SQ, SAT, and PUBT and their combined impact on USEB regarding the digital land services of the ULO in Bangladesh. These relationships are illustrated in Fig. 1.

3. Methodology of the Study

3.1 Research Method:

This study is a cross-sectional quantitative study based on primary and secondary data sources. The quantitative method helps to measure impacts, causes, and relationships where statistical significance among the constructs of latent variables is necessary to unveil (Palys, 1997). As this study tests predetermined hypothetical paths among the constructs, i.e., SQ, PUBT, SAT, and USEB, towards the digital land service of Upazila Land Office (ULO), the quantitative method is logical to apply. Biswas et al. (2024) and many researchers used cross-sectional quantitative methods to measure service quality, satisfaction, and use intention.

3.2 Study context:

The Government of Bangladesh introduced the digital land service system under the Digital Bangladesh Manifesto of 2008 (Akter, 2022). This initiative aims to digitize land records and documents using ICT tools, simplifying service management and enhancing accessibility for citizens (Islam et al., 2015). The transition from traditional paper-based land services to a modern e-land system has significantly increased demand among citizens (Hossain, 2015). According to The Business Standard (September 30, 2022), 3.5 lakh people accessed digital land services via the land service hotline in just eight months. This innovation in land management offers a compelling context for research. The study examines 20 upazila land offices (ULOs) across Bangladesh, representing various regions to ensure generalizability where five ULOs each from the northeastern, northwestern, southeastern, and southwestern parts of the country.

3.3 Measurement Instruments:

This study evaluates SQ, PUBT, SAT, and USEB related to the digital land services of ULO in Bangladesh. The five-dimensional SERVQUAL framework (Tangibility, Reliability, Responsiveness, Assurance, and Empathy) has been used to measure SQ. SAT was measured based on Biswas et al. (2024), USEB was measured using items from Biswas & Roy (2020), and PUBT was assessed using measures from Colesca (2009). All constructs were measured on a five-point Likert scale (1 = Very Disagree to 5 = Very Agree). Additionally, demographic characteristics such as age, gender, education, occupation, and income of the respondents were also collected.

3.4 Sampling and Sample Selection:

This study has been primarily used purposive sampling because it is cost-effective and time-efficient technique as well as more effective method when a limited and specific group of people can serve as primary data sources that are closely related to specific research objectives (Campbell et al., 2020; and Ovi et al., 2023). A convenient sampling technique is also used due to limited funding opportunities and participants' time scheduling constraints (Etikan et al., 2016). The sample was the users who had visited and got services from ULO's digital land services at least once. Based on Yamane's (1967) formula for populations exceeding 100,000 at a 95% confidence level, the recommended sample size is 400. Tabachnick and Fidell's (2007) rule-of-thumb suggests a minimum sample of 82 for four independent

variables. Memon et al. (2020) recommend a range of 160 to 300 for multivariate analysis methods like PLS-SEM and CB-SEM. Considering these guidelines, this study analyzed data from 448 respondents that fulfilled the minimum requirements.

3.5 Questionnaire development and Data Collection and Analysis:

A structured survey questionnaire was developed based on the research model constructed. Initially designed in English, it was translated into Bengali for better respondent comprehension. After piloting, the finalized questionnaire was used for data collection between February 20 and March 10, 2025. A total of 500 questionnaires were distributed, and 460 were returned. Following quality checks, 12 were excluded due to missing data, leaving 448 for analysis. Descriptive statistics were analyzed using IBM SPSS-25, while SmartPLS-4.0 was employed for Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM), a widely accepted method for testing and validating theoretical models.

3.6 Model Specification:

In order to confirm the relationships between latent variables and their respective observed indicators, this study first estimate the measurement model as follows;

$$SQ = \lambda_{SQ1}X_1 + \lambda_{SQ2}X_2 + \lambda_{SQ3}X_3 \ldots\ldots\ldots + \lambda_{SQ22}X_{22} + \epsilon_{SQ}$$

$$PUBT = \lambda_{PUBT1}Y_1 + \lambda_{PUBT2}Y_2 + \lambda_{PUBT3}Y_3 + \lambda_{PUBT4}Y_4 + \lambda_{PUBT5}Y_5 + \lambda_{PUBT6}Y_6 + \epsilon_{PUBT}$$

$$SAT = \lambda_{ACCS1}Z_1 + \lambda_{ACCS2}Z_2 + \lambda_{ACCS3}Z_3 + \lambda_{ACCS4}Z_4 + \lambda_{ACCS5}Z_5 + \epsilon_{ACCS}$$

$$USEB = \lambda_{USEB1}W_1 + \lambda_{USEB2}W_2 + \lambda_{USEB3}W_3 + \epsilon_{USEB}$$

Where, X_1, X_2, X_3.....X_{22} ; Y_1, Y_2, Y_3, Y_4, Y_5,Y_6 ; Z_1, Z_2, Z_3, Z_4, Z_5 ; Z_6, Z_7, Z_8 ; and W_1, W_2W_3 are the observed items of latent variable- SQ; PUBT; SAT and USEB respectively. λ_{SQ1}, λ_{SQ2}, λ_{SQ3}.... λ_{SQ22} ; λ_{PUBT1}, λ_{PUBT2}, λ_{PUBT3}, λ_{PUBT4}, λ_{PUBT5}, λ_{PUBT6} ; λ_{ACCS1}, λ_{ACCS2}, λ_{ACCS3}, λ_{ACCS4}, λ_{ACCS5} ; λ_{SPES1}, λ_{SPES2}, λ_{SPES3} ; and λ_{USEB1}, λ_{USEB2}, λ_{USEB3} are the factor loadings of all items of latent variable- SQ; PUBT; ACCS; SPES; and USEB respectively. ϵ_{SQ}, ϵ_{PUBT}, ϵ_{ACCS}, ϵ_{SPES}, and ϵ_{USEB} are the measurement error of latent variables- SQ; PUBT; ACCS; SPES; and USEB respectively. As part of the measurement model, this study calculates Composite Reliability (CR) and Convergent Validity through Average Variance Extracted (AVE) based on the following equations;

CR= $\frac{\left[\sum_{i=1}^{n}\lambda_i^2\right]}{\left[\sum_{i=1}^{n}\lambda_i^2\right]+\left[\sum_{i=1}^{n}\delta_i\right]}$

AVE= $\frac{\left[\sum_{i=1}^{n}\lambda_i^2\right]}{n}$

Where *n* is the number of items, λ_i is the standardized factor loading for item *i*, and δ_i is the measurement error for item *i*. And then this study calculated the structural model that shows hypothetical relationships among the constructs i.e. SQ; PUBT; ACCS; SPES; and USEB. The equitation is;

$$USEB = \beta_0 + \beta_1 SQ + \beta_2 PT + \beta_3 AS + \epsilon_{UB}$$

$$PUBT = \beta_0 + \beta_4 SQ + \epsilon_{PT}$$

$$SPES = \beta_0 + \beta_5 SQ + \beta_6 PT + \epsilon_{SS}$$

Where, β_0 is the intercept or constant term in each equation, representing the baseline value when all independent variables (predictors) are zero? $\beta_1, \beta_2, \beta_3 \ldots\ldots\ldots\ldots \beta_{10}$, are the path coefficients. ϵ is the error term. Then, the model calculates direct, indirect and total effects on the UB. In this case, the value of $\beta_1, \beta_2, \beta_3, \beta_4 \text{are}$the direct effects of SQ, PUBT, ACCS, and SPES on USEB respectively. Alongside, the value of β_5 is the direct effect of SQ on PUBT; and the value of $\beta_6, \beta_7, \beta_8$ are the direct effects of SQ, PUBT, SPES on ACCS respectively. And the value of β_9, β_{10} are the direct effects of SQ, PUBT on SPES respectively. The model then calculates indirect and total effects of SQ on USEB based on the following equations;

SQ -> PUBT -> USEB = $(\beta_4 . \beta_2)$

SQ -> SAT -> USEB = $(\beta_5 . \beta_3)$

Total Indirect Effects of SQ -> USEB = $(\beta_4 . \beta_2) + (\beta_5 . \beta_3)$

Total effect of SQ -> USEB= $\beta_1 + (\beta_4 . \beta_2) + (\beta_5 . \beta_3)$

3.7 Ethical Statement:

This research was conducted following the highest ethical standards to ensure integrity, transparency, and academic honesty. Ethical approval (Ref: 23.0.902.858.07.786.24/30) was obtained from the Research Ethical Committee (REC) of Bangladesh University of Professionals (BUP), Dhaka, and all necessary permissions were secured before data collection. Informed consent was obtained from all participants, ensuring their voluntary participation and confidentiality. The authors declare that there are no conflicts of interest related to this study. All data presented in this article are accurate and have not been manipulated or fabricated. The authors confirm their adherence to ethical research and publishing practices, ensuring that all contributions were properly acknowledged and that the study maintains academic integrity.

4. Results

4.1 Demographic Information:

The demographic and behavioral characteristics of the study's respondents (users of DLS) are summarized in Table 1. Most of the users are middle-aged, with 27.7% aged 31-40 and 41-50 years, while

younger (<20 years) and older (>60 years) users comprise only 2.2% and 5.1%, respectively. The majority of them are male (73.2%), and 49.1% hold at least a Bachelor's degree, though 4.2% lack formal education. Among all of the respondents, the businesspeople (25.9%) represent the largest occupational group, followed by private employees (20.5%) and students (12.3%). The monthly incomes of the respondents primarily range from 30,001-40,000 BDT (33.7%) and 20,001-30,000 BDT (22.1%), with fewer users earning <10,000 BDT (5.6%) and >50,000 BDT (8.9%). The user's awareness of DLS is largely driven by personal interactions (38.4%), followed by ULO officials (21.9%), with additional contributions from public representatives (16.3%), advertisements (13.6%), and websites (9.8%). Regarding usage, 17.6% are first-time users, while 40.5% have used the service for 6 months to 2 years, and only 8.9% are long-term users (>3 years). This data reveals that digital land services in Bangladesh are primarily utilized by educated, middle-aged males with moderate-to-high incomes and varied experience levels.

Table 1: Demographic Data (N=448)

Variables	*Categories*	*Frequency*	*Percentage*
Age	<20 years	10	2.2
	21-30	96	21.4
	31-40	124	27.7
	41-50	124	27.7
	51-60	71	15.8
	>60 Years	23	5.1
Gender	*Male*	328	73.2
	Female	120	26.8
Education	*No education*	19	4.2
	Primary	44	9.8
	High school	81	18.1
	College	84	18.8
	Bachelor	128	28.6
	Masters or above	92	20.5
Occupation	Teacher	39	8.7
	Farmer	50	11.2
	Private employee	92	20.5
	Housewife	38	8.5
	Students	55	12.3
	Business man	116	25.9
	Retired	42	9.4
	No job	16	3.6
Income (Monthly)	<10000	25	5.6
	10001 -20000	49	10.9
	20001-30000	99	22.1
	30001-40000	151	33.7
	40001-50000	84	18.8
	>50000	40	8.9

Knowing ULO Digital Services	People	172	38.4
	Advertisement	61	13.6
	ULO officials	98	21.9
	Public Representative	73	16.3
	Website	44	9.8
Tenure of Using	This is the first time	79	17.6
	Less than 6 months	65	14.5
	6 -12 months	97	21.7
	1-2	84	18.8
	2-3	83	18.5
	>3 years	40	8.9

Source: Field Survey (2025)

4.2 Measurement Model

In order to evaluate the measurement model, this study calculated the validity and reliability of the four-factor model (i.e., SQ, PUBT, SAT, and USEB). Conformity Factor Analysis (CFA), was conducted for factor loadings of the items of four constructs and their covariance. Construct reliability was confirmed through Cronbach's Alpha and Composite Reliability (CR). Convergent and divergent (Discriminant) validity was also checked through Average Variance Extracted (AVE), the Fornell-Larcker Criterion, and the Heterotrait-Monotrait (HTMT) Ratio. Table no 2 presents the construct validity and reliability of the data used in this study. The factor loadings of all items have shown a significant contribution in explaining respective constructs since they exceed the critical value of 0.50 (Hair et al., 2020). In the case of reliability, all constructs show acceptable reliability, with Cronbach's Alpha and CR values exceeding the threshold of 0.70 (Hair et al., 2020) that indicate strong internal consistency and confirming the strong reliability of the model. In convergent validity, the value of AVE of all constructs exceeded the critical value of 0.50 (Fornell & Larcker, 1981). Furthermore, this study confirmed discriminant validity using the Fornell-Larcker Criterion and the Heterotrait-Monotrait (HTMT) ratio that the constructs are distinct from one another. According to the Fornell-Larcker Criterion, the square root of the AVE (diagonal values) for each construct exceeds the correlations with other constructs (off-diagonal values), shown in Table no 3. According to HTMT ratio, all construct's pair values are within the threshold value of 0.85 shown in table 4, indicating strong discriminant validity (Fornell & Larcker, 1981 and Henseler et al., 2015). Together, these results confirm that the constructs are sufficiently independent. Hence, the measurement model is reliable and valid for further analysis.

Table 2: Construct reliability and validity

Constructs	*Items*	*Loadings*	*Cronbach's Alpha*	*CR*	*AVE*
	SAT1	0.853	0.850	0.899	0.690
Satisfaction	SAT2	0.821			
	SAT3	0.843			
	SAT4	0.804			
	PUBT1	0.805	0.879	0.908	0.623
	PUBT2	0.816			
Public Trust	PUBT3	0.772			
	PUBT4	0.787			
	PUBT5	0.763			
	PUBT6	0.793			
	SQAS1	0.855			
Assurance	SQAS2	0.828	0.831	0.887	0.663
	SQAS3	0.787			
	SQAS4	0.786			
	SQEM1	0.956			
	SQEM2	0.930			
Empathy	SQEM3	0.942	0.959	0.970	0.890
	SQEM4	0.945			
	SQRL1	0.834			
	SQRL2	0.842			
Reliability	SQRL3	0.812			
	SQRL4	0.835	0.885	0.916	0.684
	SQRL5	0.813			
	SQRS1	0.887			
Responsiveness	SQRS2	0.879			
	SQRS3	0.898	0.934	0.950	0.791
	SQRS4	0.874			
	SQRS5	0.908			

	SQTA1	0.857			
	SQTA2	0.842	0.856	0.902	0.698
Tangible	SQTA3	0.804			
	SQTA4	0.838			
	USEB1	0.829			
Use Behavior	USEB2	0.758	0.748	0.855	0.664

Source: Field Survey (2025)

Note: CR= Composite Reliability, AVE= Average Variance Extracted

Table 3: Discriminant validity- Fornell and Larcker Criterion

	SAT	PUBT	SQAS	SQEM	SQRL	SQRS	SQTA	USEB
SAT	**0.830**							
PUBT	0.492	**0.789**						
SQAS	0.274	0.332	**0.814**					
SQEM	0.230	0.390	0.017	**0.943**				
SQRL	0.490	0.351	0.236	0.012	**0.827**			
SQRS	0.319	0.268	0.056	0.090	0.170	**0.889**		
SQTA	0.285	0.353	0.337	0.033	0.360	0.148	**0.835**	
USEB	0.407	0.468	0.334	0.260	0.255	0.286	0.274	**0.815**

Source: Field Survey (2025)

Table 4: Discriminant validity-Heterotrait- monotrait ratio (HTMT) matrix

	SAT	PUBT	SQAS	SQEM	SQRL	SQRS	SQTA	USEB
SAT								
PUBT	0.567							
SQAS	0.323	0.383						
SQEM	0.254	0.422	0.052					
SQRL	0.566	0.393	0.273	0.035				
SQRS	0.357	0.293	0.066	0.095	0.187			
SQTA	0.335	0.401	0.401	0.048	0.413	0.168		
USEB	0.507	0.570	0.413	0.303	0.309	0.335	0.342	

Source: Field Survey (2025)

However, this study used service quality constructs that requires higher order constructs (HOC) validity as service quality measured as the higher order construct in this study based on fiver lower order construct-responsiveness, reliability, tangible, assurance and empathy. In order to establish higher-order construct validity, outer weights, outer loading, and VIF were calculated. Furthermore, outer loading was found to be greater than .50 for each of the lower-order constructs (Sarstedt et al., 2019). VIF values were assessed to check multicollinearity and found to be at a very minimal level, which is acceptable (Hair et al., 2016). Since all criteria were met, the HOC validity was established.

Table 5: Higher order construct validity results

HOC	*LOC*	*Outer weight*	*T-statistics*	*P values*	*Outer loading*	*VIF*
SQ	SQAS	0.351	6.508	0.000	0.547	1.148
	SQEM	0.471	10.128	0.000	0.519	1.009
	SQRL	0.431	7.982	0.000	0.650	1.188
	SQRS	0.346	6.927	0.000	0.510	1.047
	SQTA	0.199	3.326	0.001	0.539	1.257

Source: Field Survey (2025)

4.3 Structural Model Analysis:

As this study used Structural Equation Modeling (SEM), and the measurement model was found reliable and valid, this study tested the structural model for analyzing the statistical significance of path relationships among the constructs of the research model shown in Figure 1. The results of the direct path relationships presented in Table 6 and Figure 2 indicate that all constructs have substantial positive

effects on use behavior as assumed in the hypotheses and research of the model. SQ significantly influences SAT (β = 0.583, t = 16.566, p = 0.000); PUBT (β = 0.614, t = 17.440, p = 0.000); and USEB (β = 0.285, t = 4.452, p = 0.000) respectively, accepting the H1, H2, H5. SAT also exhibits a significant positive effect on USEB (β = 0.126, t = 2.210, p = 0.027), assuming in the H3. The study also shows a strong positive impact of PUBT on USEB (β = 0.234, t = 3.844, p = 0.000) supporting the H4.

Table 6: Hypotheses Testing Results (Direct Effects)

Hypothesis path	*β*	*SE*	*T statistics*	*P values*
PUBT -> USEB	0.234	0.061	3.844	0.000
SAT -> USEB	0.126	0.057	2.210	0.027
SQ -> PUBT	0.614	0.035	17.440	0.000
SQ -> SAT	0.583	0.035	16.566	0.000
SQ -> USEB	0.285	0.064	4.452	0.000

Source: Field Survey (2025)

In this study, calculated potential indirect effects shown in Table 6 reveal the significant mediating effects of SAT and PUBT on the relationship of SQ and USEB. SQ also significantly influences USEB indirectly through SAT (β = 0.073, t = 2.176, p = 0.030) and PUBT (β = 0.143, t = 3.740, p = 0.000), highlighting the mediating roles of satisfaction and trust, therefore, accepting the H6 and H7. It is noted that as SQ has a direct effect on the USEB in presence of mediators like PUBT and SAT, there is a partial but significant mediating effects of public trust and satisfaction in shaping the relationship between service quality and citizen use behavior considering the context of DLS in Bangladesh.

Table 7: Mediation Results (Indirect Effects)

Indirect Path	*β*	*SE*	*T value*	*P value*	*Percentile bootstraps 95% confidence interval*	
					Lower	*Upper*
SQ → SAT →USEB	0.073	0.034	2.176	0.030	0.017	0.128
SQ →PUBT →USEB	0.143	0.038	3.740	0.000	0.081	0.208

Source: Field Survey (2025)

Table 7 presents the total effects analysis of SQ on USEB. The indirect effect of SQ on USEB through mediators (β = 0.217, t = 4.684, p = 0.000) indicates a meaningful mediating influence. And the total effect, which includes both direct and indirect impacts (β = 0.501, t = 12.788, p = 0.000), reinforces the

strong overall effect of SQ on USEB. The results suggest that while a significant portion of the relationship is mediated, SQ still has a substantial total effect on USEB.

Table 8: Total Effects (Direct + Indirect)

Path Direction	*β*	*SE*	*T statistics*	*P values*
SQ -> USEB (Through Mediators)	0.217	0.046	4.684	0.000
SQ -> USEB (Total Effects)	0.501	0.039	12.788	0.000

Source: Field Survey (2025)

5. Discussion

This study investigates the determinants of use behavior among users of digital land services in Bangladesh, focusing on key constructs such as SQ, PUBT, SAT, and USEB and their interrelationships. The results provide significant insights into the theoretical and practical implications of digital service adoption, revealing both strengths and gaps in the measurement and structural models. The study demonstrates strong reliability and validity of the measurement model. The Cronbach's alpha values for all constructs exceeded the 0.70 threshold, confirming internal consistency, while Composite Reliability (CR) values supported the construct's reliability. Average Variance Extracted (AVE) values also met the minimum standard of 0.50, ensuring convergent validity. Furthermore, the Fornell-Larcker criterion and HTMT ratio confirmed discriminant validity, with constructs clearly distinguished from one another. These results affirm the robustness of the model and the reliability of the instruments used in this study. The structural model sheds light on the pathways influencing USEB. SQ emerges as the most pivotal construct, exerting both direct and indirect effects. Its direct effect on USEB is statistically significant, exposing similarity to the existing studies of Nur Ullah & Biswas (2024), Latifah et l (2023), and Saputra et al (2022), reinforcing the idea that better service quality encourages users to continue using digital services. SQ also significantly influences PUBT and SAT, admitting the existing studies of Chaeruddin et al. (2024), Yulianto (2024), Biswas et al. (2024), Albar (2024), Ghimire et al. (2024), Muzaki et al., (2023); and Hoque, (2020), highlighting its foundational role in shaping users' perceptions and attitudes toward digital land services. The effect of SQ on PUBT is highly significant, which highlights that higher service quality leads to increased public trust. The efficiency, reliability, and accessibility of digital land services play a crucial role in shaping citizens' trust in government service delivery. A strong positive relationship is observed between SQ and SAT, which suggests that service quality is a major determinant of user satisfaction. When digital land services perform well in terms of responsiveness, reliability, and accessibility, users tend to be more satisfied with their experiences. PUBT also plays a critical role, directly affecting USEB, which supports the existing studies of Li & He (2024), Qatawneh et al. (2024), Taufiqurokhman et al. (2024), Cai (2023), and Tegethoff et al., (2019). This finding indicates that public trust in the digital land service strongly influences users' engagement and continued use. Higher trust in service provider's fosters confidence and reliance on the system. SAT also plays a critical role in determining user behavior in using digital land services. This study found that the relationship between

SAT and USEB positively matches with the existing studies of Biswas et al. (2024) and Alsuwaidi (2023) but weaker than PUBT'sPUBT's effect, which indicates that user satisfaction significantly contributes to continued use but is a relatively weaker predictor compared to trust. While satisfaction enhances user engagement, trust appears to be a stronger determinant of behavioral outcomes.

Furthermore, the mediation analysis in this study also explores the indirect effects of service quality (SQ) on use behavior (USEB) through satisfaction (SAT) and public trust (PUBT). The results provide deeper insights into the underlying mechanisms driving user engagement with digital land services. The path between SQ and USEB through SAT has a significant indirect effect (β = 0.073, p = 0.030), indicating that satisfaction partially mediates the relationship between service quality and use behavior. However, the relatively small coefficient suggests that while service quality enhances satisfaction, its impact on use behavior through this route is modest. This supports the direct effect, where satisfaction had a weaker influence on use behavior compared to public trust. However, the path between SQ and USEB through PUBT shows a stronger mediation effect (β = 0.143, p = 0.000), with a 95% confidence interval (0.081, 0.208) confirming its significance. This suggests that public trust is significant mediator between service quality and use behavior. Users are more likely to engage with digital land services when they perceive high service quality and strengthens their trust in the system. This emphasizes the idea that trust plays a dominant role in determining user behavior. The findings of this study found that that service quality (SQ) is the most influential factor in driving user engagement with digital land services directly and indirectly. Public trust (PUBT) and satisfaction (SAT) significantly mediate the relationship between SQ and use behavior (USEB). The results of direct effects show that public trust has a greater impact on use behavior than satisfaction. The mediation analysis further confirms that the indirect effect of SQ on USEB via PUBT is stronger than through SAT. These results emphasize the need for trust-building strategies alongside service quality improvements to enhance public confidence and engagement with digital government services in Bangladesh.

6. Research Implications

6.1 Theoretical Implications:

This study has a substantial theoretical implication for the e-governance service delivery and management field of study because it offers a deeper new understanding and dynamics of citizen use behavior through service quality, trust, and satisfaction by analyzing both direct and indirect effects. The empirical results of this study challenge the traditional e-service adoption models by adding trust as a crucial mediator alongside satisfaction, providing new insight into the debate on the use behavior of digital services. The previous research argued that service quality is a key driver of citizen use behavior, not only in digital services but also in traditional public services. However, this study redesigns and extends these existing theoretical frameworks by adding trust as a mediator with satisfaction. In contrast, the higher mediating effect of trust over satisfaction indicates that service quality enhances trust more effectively than satisfaction, which in turn drives citizen use behavior. This new insight suggests the SERVQUAL, the Technology Acceptance Model (TAM), and the Unified Theory of

Acceptance and Use of Technology (UTAUT) by emphasizing service quality as a fundamental precursor to trust rather than just a determinant of satisfaction. Besides, the Expectation-Confirmation Theory (ECT) claims satisfaction is an important factor in user behavior. Still, this study disagrees that public trust plays a stronger mediating role in shaping the citizen use intention. This study raises a question on the limited direct influence of satisfaction on citizen use behavior, suggesting that satisfaction alone is insufficient to drive sustained engagement in digital services, especially in public-sector settings where trust in institutions plays a crucial role. This study urges a shift from a satisfaction-centric approach to a trust-focused model in e-governance research. By extending e-governance theories with new mediators like trust, this study provides a holistic perspective on digital public service engagement, emphasizing the importance of trust-building strategies alongside technological advancements.

6.2 Practical implications:

This study has also a practical implication as it provides some significant insights for policymakers, digital service providers, and public administrators striving to enhance user engagement with e-government services, particularly in digital land services in Bangladesh. By demonstrating the theoretical model tested positive, where SQ through SERVQUAL, SAT, and PUBT works as the key drivers of USEB, this research provides actionable strategies to improve the effectiveness of digital land services in Bangladesh. Given that SQ directly influences trust, satisfaction, and use behavior, digital service providers should focus on enhancing system efficiency by reducing processing times, minimizing errors, and ensuring reliable service delivery, user-friendly design, and accessibility to cater to diverse demographics, including those with low digital literacy; and proactive customer support to resolve issues promptly and improve the overall user experience. Since public trust plays a stronger role than satisfaction, policymakers must prioritize trust-building initiatives such as enhancing transparency in digital services through clear policies, open data, and accountability mechanisms; strengthening data security and privacy protections to reassure users that their information is safe, and implementing feedback mechanisms to address concerns and demonstrate responsiveness. As satisfaction alone does not strongly predict continued use behavior, therefore, authority should focus on a trust-focused citizen engagement strategy. Policymakers should adopt context-specific strategies such as localizing digital literacy programs to bridge knowledge gaps in rural and underserved communities, introducing public-private partnerships to leverage expertise in digital service delivery while maintaining government oversight, and formulating policy frameworks that align with institutional trust theories, ensuring that government-led digital initiatives foster long-term engagement.

7. Limitations

While this study offers some crucial arguments in the debate on determinants of use behavior for digital land services in Bangladesh, it has several limitations. Firstly, it is a cross-sectional survey research capturing user perceptions at a single point in time, which limits the ability to establish causal relationships among the constructs. Thus, a longitudinal research method could be done for deeper understanding on how these relationships are developed. Secondly, this study is based on self-reported

responses, which may introduce biases; users may have overestimated or underestimated their level of trust, satisfaction, or use behavior, affecting the accuracy of the findings. Thirdly, this study's context limits its wider applicability, meaning the findings may not be directly applicable to other digital government services or contexts, particularly in countries with different socio-economic, political, or technological landscapes. Fourthly, while the study considers key determinants of the use behavior of digital land service, other factors such as digital literacy, internet accessibility, legal frameworks, and government policies were not explicitly analyzed. Other psychological or behavioral factors, such as perceived ease of use, perceived risk, or prior digital experience, may also play crucial roles. These factors could significantly influence users' use behavior with digital land services and should be explored in future studies. Fifthly, the users of digital land services across Bangladesh are unlimited, so, the sample size considered in this study may limit the generalizability of the findings of this study. Therefore, research with a large sample could be conducted in future. Lastly, although the survey ensures reliability and validity through Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE), certain latent constructs might still be subject to measurement limitations. Future studies could refine the scales or employ mixed-method approaches, such as qualitative interviews, to capture more nuanced user experiences.

8. Conclusion

This study investigated the role of service quality, satisfaction, and trust in determining the use behavior of digital land services in Bangladesh. The results of this study confirm that SQ serves as the most influential factor, exerting both direct and indirect effects on USEB through PUBT and SAT. It reinforces prior studies that demonstrate the strong link between high-quality digital services and user retention. Additionally, it has been tested that SQ significantly impacts PUBT and SAT, which argues that the efficiency, reliability, and accessibility of digital services play a crucial role in shaping user perceptions and attitudes toward digital land services. This study unveiled an interesting insight that while both PUBT and SAT mediate the relationship between SQ and USEB, trust (PUBT) emerges as the stronger mediator than the SAT, which illustrates that trust-building measures should be prioritized to enhance citizens' reliance on digital land services. It also suggests that while users appreciate high service quality and express satisfaction, their continued use behavior is more significantly driven by their confidence in the system. This study is an important piece of research for its unique contribution in both theoretical and practical domains. Theoretically, this study proposes an extended e-governance model by including trust as a mediator alongside satisfaction. Practically, the study findings offer crucial implications for policymakers and digital service providers. More efforts should focus on improving service quality while simultaneously enhancing user engagement and sustaining the adoption of digital land services, implementing trust-building initiatives. Besides, transparency, data security, and responsive service mechanisms can improve public trust and encourage continued usage. Future research can further explore these relationships in different digital governance contexts and examine additional moderating factors such as demographic variables, digital literacy, and regulatory frameworks. By addressing these

aspects, policymakers and service providers can refine their strategies to ensure higher user engagement and satisfaction with digital land services in Bangladesh and beyond.

Declarations

Compliance with Ethical Standards

Conflict of Interest: The author(s) declared no potential conflicts of interest.

Informed consent: Informed consent was secured from each participant, ensuring voluntary participation and the protection of confidentiality.

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Ethical approval: This study was conducted in strict adherence to established ethical guidelines to uphold academic integrity, transparency, and research credibility. Ethical clearance (Ref: 23.0.902.858.07.786.24/30) was granted by the Research Ethical Committee (REC) of Bangladesh University of Professionals (BUP), Dhaka, prior to the commencement of data collection.

Data availability: Data can be shared upon request from the corresponding author.

Authors' contributions

Mohammad Nur Ullah contributed to the conceptualization, methodology, supervision, validation, and review and editing of the manuscript. Md. Shariful Islam contributed to the investigation, resources, and review and editing of the manuscript. Nahida Shaulin contributed to the supervision, and editing of the manuscript. All authors read and approved the final manuscript. Anas Al Masud contributed to project administration, data collection and review. Bikram Biswas contributed to the conceptualization, formal analysis, investigation, and data curation.

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Supplementary Information

Q^2 result

	Q^2predict	RMSE	MAE
PUBT	0.366	0.801	0.598
SAT	0.328	0.824	0.654
USEB	0.241	0.876	0.653

R^2

	R-square	R-square adjusted
PUBT	0.377	0.375
SAT	0.340	0.338
USEB	0.304	0.299

Model fit indices

	Estimated model
χ2 /df	1.244
RMSEA	0.023
GFI	0.924
AGFI	0.910
SRMR	0.031
NFI	0.934
TLI	0.985
CFI	0.986

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.908
Bartlett's Test of Sphericity	Approx. Chi-Square	9728.821
	df	595
	Sig.	<.001

Harman’s single-factor test was applied across all ten constructs, following the recommendation of Podsakoff et al. (2003). The eight constructs were combined into one factor. The results concluded that a single factor explained 26.22% of the total variance, which was below the commonly recommended threshold of 50%. (Podsakoff et al., 2003), indicating that no evidence of CMB was presented in this study.

Figures

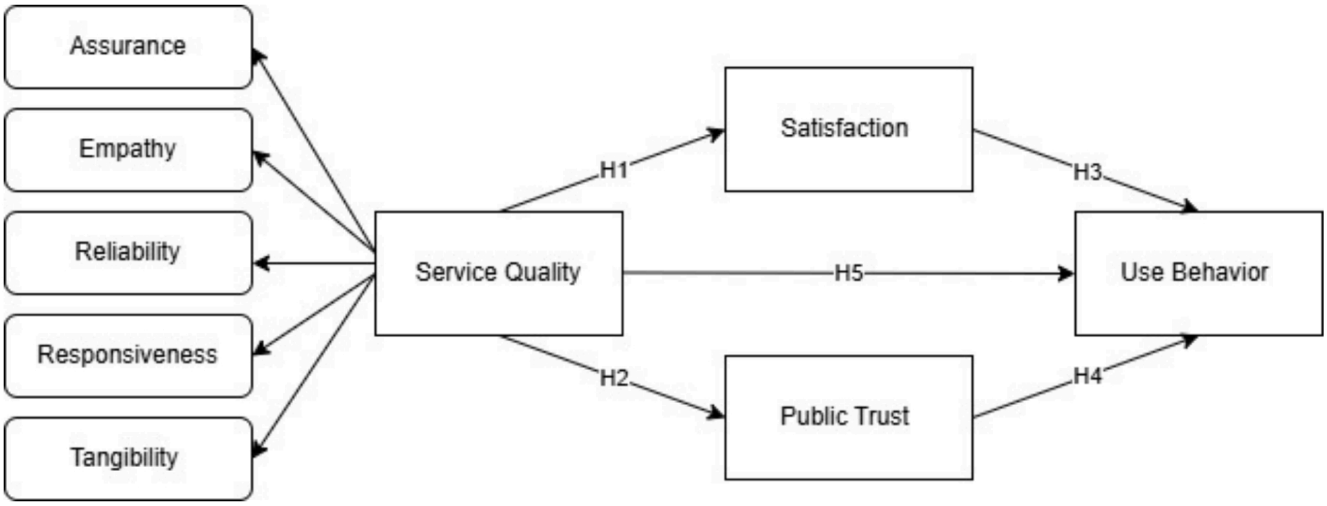


Figure 1

Research Model

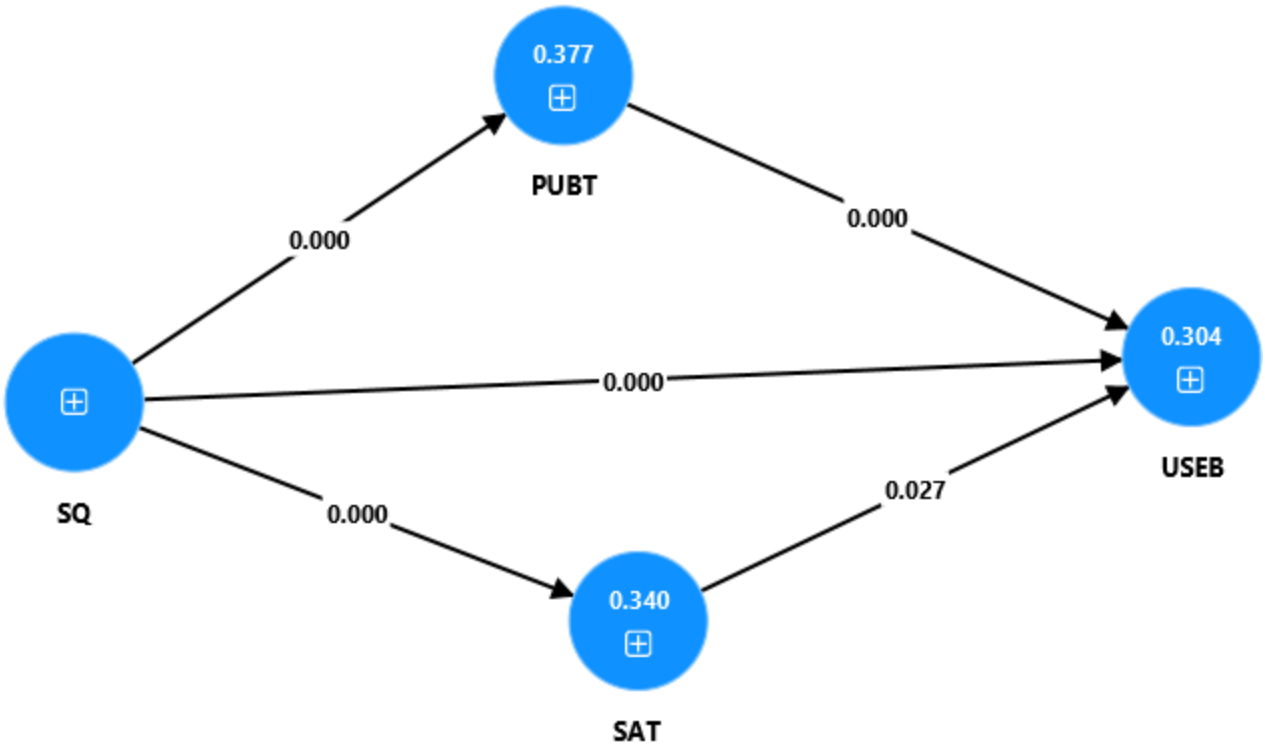


Figure 2

Structural Model