

Analysis of Factors Influencing the National Payment Switch Adoption in Sierra Leone

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Abstract

This study examines the factors influencing the adoption of the National Payment Switch in Sierra Leone, focusing on trust, transaction costs, government support, and financial institution support as independent variables, and intention to use as the dependent variable. Drawing on six theoretical models, including unified theory of acceptance and use of technology and Technology-Organization-Environment, a mixed-methods approach was employed to analyze data from 623 participants across banks, fintech companies, and regulatory bodies. Partial least squares structural equation modeling, regression, and thematic analysis revealed transaction cost and trust as the strongest predictors of intention to use. Mediation analysis confirms that institutional credibility strengthens the effects of affordability and trust on adoption. At the same time, financial services and government support played complementary roles. Additionally, performance expectancy, facilitating conditions, organizational readiness, regulatory support, and technological infrastructure were key enablers that influence adoption. Conversely, security concerns, limited digital literacy, and infrastructural gaps emerged as significant barriers to progress, particularly in rural areas where awareness levels are significantly lower. The study recommends targeted awareness programs, capacity-building initiatives, public-private partnerships, and adaptive regulation that align with local realities. These findings offer actionable insights for policymakers and financial institutions, thereby contributing to the existing literature on digital payments and financial innovation in sub-Saharan Africa.

Categories: Banking and financial services, Service operation management, Digital business

Keywords: national payment switch system, intention to use, trust, cost of transaction, digital adoption, sierra leone, stakeholder ecosystem

Introduction

A National Payment Switch System (NPSS) is a centralized financial infrastructure that connects various financial institutions to facilitate seamless, real-time transactions, promoting interoperability, efficiency, and security (Ahmady, 2023) (Keya, 2021) (Naik et al., 2025). The adoption of NPSS is increasingly recognized as a transformative step in digital financial services, facilitating seamless, cost-effective, and secure transactions across financial institutions. Governments worldwide have adopted NPSS to promote financial inclusivity, regulate cashless transactions, and enhance economic efficiency. The interconnected nature of NPSS makes implementation complex, requiring substantial regulatory oversight, financial support, and user acceptance (Krishna et al., 2025) (Putrevu and Mertzanis, 2024). While several countries have successfully implemented NPSS, Sierra Leone remains at an early stage of adoption, with key barriers including low trust in digital payments, infrastructure challenges, and regulatory concerns affecting its implementation. The existing retail payment switches in Sierra Leone have faced various challenges and have not been as successful as the industry participants would like (Jonjo, 2023) (Kargbo and Gbolonyo, 2023) (Koroma, 2024). Also, Sierra Leone is considered a high-risk country with significant security concerns (Kamara et al., 2024) (Kamara, 2024) (Mansaray et al., 2024). Thus, these challenges may affect the implementation and adoption of the system.

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Several studies have explored the adoption of national payment infrastructures in different economic contexts. Research in China, Kenya, and South Africa suggests that government policies, financial institution support, trust, and transaction costs significantly influence the adoption of NPSS (Ahmady, 2023) (Behera and Kumra, 2024). Similarly, studies from India and Nigeria have highlighted that consumer perception, ease of use, and security concerns significantly influence the success of digital payment integration (Emmanuel, 2023) (Gupta et al., 2024).

However, existing studies tend to focus on single-user groups. For instance, (Ahmad Ramli, 2021) and (Sleiman et al., 2021) examined customer adoption behavior, while (Keya, 2021) and (Aurazo and Gasmi, 2024) focused solely on merchants and vendors. Additionally, many studies rely heavily on secondary data (Ahmady, 2023) (John and Onsomu, 2022), limiting empirical insights into real-world adoption barriers.

Despite the global shift towards digital payment systems, Sierra Leone lacks empirical research on the adoption of NPSS and user intention. The country's current payment systems face several challenges, including limited interbank transactions, fragmented payment infrastructures, inadequate information, and weak consumer trust (Kargbo and Gbolonyo, 2023) (Koroma, 2024). Furthermore, no comprehensive study has examined how government support, financial institutions, transaction costs, and digital literacy shape NPSS adoption in Sierra Leone's unique socio-economic context. This research addresses these gaps by examining a broader sample base (regulators, banks, customers, students, private sector players, NGOs, and business owners) and employing a mixed-methods approach to provide qualitative and quantitative insights. Thirdly, a comparative analysis has been conducted with China, India, Kenya, and South Africa to draw relevant lessons for Sierra Leone. Thus, the research aims to identify, model, and evaluate key enablers and barriers affecting NPSS adoption in Sierra Leone.

Furthermore, to fully understand NPSS adoption in Sierra Leone, this study investigates the proposed three research questions:

1. What factors influence citizens' willingness to adopt and use NPSS?
2. How do government policies and financial institutions facilitate or hinder NPSS adoption?
3. What are the significant challenges, and what strategies can enhance NPSS implementation?

The novelty of this study lies in its empirical approach, multi-stakeholder perspective, and comparative methodology, providing practical insights for policymakers, financial institutions, and technology providers. By addressing these gaps, this research contributes to the growing field of digital finance adoption in emerging economies, ensuring that NPSS implementation in Sierra Leone is effective, inclusive, and sustainable.

Literature review

NPSS Adoption in Sierra Leone

The NPSS plays a crucial role in the financial modernization process, facilitating secure, low-cost, and real-time inter-institutional transactions (Ahmady, 2023) (Keya, 2021) (Naik et al., 2025). Its launch in Sierra Leone is the first step towards financial equity and digital revolution. However, the nation has some difficulties. More than 90 percent of the population is in the informal sector, which has a low level of digital literacy and where cash remains the dominant means of payment (Transparency International, 2024) (Jofre-Bonet et al., 2023) (Barrie, 2024). Earlier systems, including the Sierra Leone Banks Automated Processing System installed in 1996, were based on a heavy cheque-based clearing and lacked interoperability.

Despite the growing demand for digital transactions, infrastructural shortcomings, inadequate levels of control, and low levels of trust significantly slow the pace. The literature on Sierra Leone's financial system has concentrated on e-commerce rather than payment infrastructure (Koroma, 2024) (Monson and Macauley, 2024). The research was conducted to analyze the direct adoption of NPSS, filling a significant gap, as factors such as trust, transaction costs, institutional readiness, and government support are also taken into consideration.

Comparative Insights From Other Countries

Other countries, especially in the regions of America, Europe, and Asia, have comparable experiences to offer in designing strategies, implementing them, and training their workforce, strategies that Sierra Leone may learn from. In developed economies, such as the United States and the United Kingdom, robust payment systems have been developed, including Fedwire and Faster Payments Service, demonstrating that regulation and interoperability can be synonymous with efficiency.

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The case with China is one of the strongest in Asia, where systems such as Alipay, WeChat Pay, UnionPay, Wanglian, and others are unified under central control, contributing to the reduction of cash dependency and further coverage in even rural regions (Zhao et al., 2024). The introduction of QR code payments and digital wallets in Uzbekistan is another example of how financial participation can be enhanced through innovative solutions (Mamadiyarov and Ahadjonov, 2024).

African experiences are pertinent. The example of M-Pesa in Kenya illustrates how affordable mobile phone transfers can facilitate inclusion and support small enterprises (Fu and Kingiri, 2020). The South African Multiple Options Settlement system in South Africa highlights the importance of robust regulatory oversight to ensure interbank stability (Ahmady, 2023) (Matsimbi, 2024) (Ocran and Abor, 2024) (Webb and Vanqa Mjijima, 2024). At the regional level, the Pan-African Payment and Settlement System harmonizes national systems to facilitate cross-border trade, with financial technology standing out as an integration facilitator within the African Continental Free Trade Area (Domingo and Teevan, 2022).

The lessons here indicate the need for Sierra Leone's NPSS to focus on affordability, interoperability, and trust, and to develop capacity in regulation and institutions to sustain adoption.

Key Factors in the Adoption of NPSS in Sierra Leone

Several interconnected factors contribute to the use of the NPSS in Sierra Leone. A significant impediment is the high costs of transactions (Karangwa et al., 2024). Digital fees, banking-related fees, and the expenses of regulations scare away both users and merchants from adopting the system (Monson and Momodu, 2024). The evidence gathered in various countries suggests that pricing structures, such as those in Singapore and Sweden, are crucial considerations in promoting uptake (Duong, 2024) (Sveriges Riksbank, 2023). On the contrary, in some regions of Africa, increased prices indicate how tight financial regulations tend to hamper participation unwillingly (Osabutey and Jackson, 2024) (Putrevu and Mertzanis, 2024) (Ahmad Ramli, 2021). Based on this, we proposed the following hypotheses: H1 argues that the cost of transaction influences the intention to use the NPSS, while H5a and H5b extend this by stating that the cost of transaction also influences government support and financial institution support. These propositions emphasize that lowering fees and improving pricing transparency can increase both state and institutional backing.

Similarly, the issue of trust is also a classical concern, as previous failures in retail payment systems and cases of fraud have lowered the level of trust in digital transactions (Monson and Momodu, 2024). To build trust, technical and security (Krishna et al., 2025) are not the only factors that should be present; transparency, reliability, and effective ways to address user concerns must also be in place (Monson and Momodu, 2024). In the absence of this, individuals and business firms would continue to resist the idea of adopting cash alternatives. In this regard, H2 proposes that trust significantly influences the intention to use the NPSS, while H6a and H6b suggest that trust also influences government support and financial institution support, respectively. These relationships highlight that a credible trust framework can stimulate both state and institutional engagement, which in turn reinforces adoption.

Furthermore, the combination of government support and policy is also critical (Naik et al., 2025) (Nwaozomudoh et al., 2021) (Monson and Momodu, 2024). In Sierra Leone, previous attempts to establish digital payment systems have been unsuccessful due to inadequate enforcement and insufficient incentives (Monson and Momodu, 2024). The comparative examples of India and Nigeria demonstrate that explicit regulations, as well as interoperability strategies, enhance implementation even in the face of some systemic issues (Naik et al., 2025) (Nwaozomudoh et al., 2021). On this basis, H3 states that government support influences the intention to use the NPSS. Likewise, H7a and H8a suggest that government support mediates the relationships between the cost of transaction and intention to use, as well as between trust and intention to use. This means that the state can act as a powerful lever in ensuring that trust and affordability translate into actual adoption.

Additionally, there are financial institutions. Banks, microfinance institutions, fintech firms, and mobile operators play an essential role in creating awareness, training users, and ensuring interoperability. Nevertheless, the effectiveness of these is still limited by weak infrastructure and low financial literacy in Sierra Leone (Koroma, 2024). The evidence provided in Kenya and Nigeria demonstrates that collaboration between banks and Fintech can increase the use of Fintech when accompanied by investment in digital infrastructure (Domingo and Teevan, 2022) (Emmanuel, 2023) (Fu and Kingiri, 2020). In line with this, H4 suggests that financial institution support has a significant influence on the intention to use the NPSS. Additionally, we proposed that financial institutions' support mediates the relationships between the cost of transaction and intention to use, as well as between trust and intention to use. Hence, H7b and H8b are postulated. This underscores the fact that active institutional participation, coupled with partnerships, can be decisive in promoting digital payment adoption.

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Cumulatively, these aspects have highlighted that successful NPSS implementation requires a combination of trust-building measures, cost-saving initiatives, robust regulatory engagement, and active participation from financial entities. Below is a comprehensive summary of the hypothesis.

Summary of Hypotheses

H1: Transaction cost has a significant effect on intention to use the NPSS.

H2: Trust has a significant effect on intention to use the NPSS.

H3: Government support has a significant effect on intention to use the NPSS.

H4: Financial institution support has a significant effect on intention to use the NPSS.

H5a: Transaction cost has a significant effect on government support.

H5b: Transaction cost has a significant effect on financial institution support.

H6a: Trust has a significant effect on government support.

H6b: Trust has a significant effect on financial institution support.

H7a: Government support mediates the relationship between transaction cost and intention to use.

H7b: Financial institution support mediates the relationship between transaction cost and intention to use.

H8a: Government support mediates the relationship between trust and intention to use.

H8b: Financial institution support mediates the relationship between trust and intention to use.

Theoretical Framework

Theoretical models relevant to the adaptation of the NPSS in Sierra Leone are as follows. The Technology Acceptance Model (TAM) explains the relationship between adoption and perceived usefulness and how usefulness and ease of use relate. In that sense, the cost of transaction and the aspect of trust can be directly attributed to these drivers and influence the willingness of users to transact in digital currencies. Unified theory of acceptance and use of technology (UTAUT) provides additional insights by incorporating the impact of social expectations and facilitating conditions as key drivers, particularly in settings where institutional and community elements significantly influence decision-making.

The Diffusion of Innovation Theory (DOI) helps illustrate how awareness, perceived benefits, and observability influence the rate of innovation dissemination in a society. This is particularly relevant in Sierra Leone, where there is a low level of financial literacy and limited access to digital devices. Complementary models include the Perceived E-Readiness Model (PERM) and Perceived Organizational E-Readiness (POER), which focus on the preparedness of governments, institutions, and organizations to implement and adapt to new technologies. Additionally, the Institutional Readiness Theory (IRT) emphasizes the significance of comprehensive legal, regulatory, and technological frameworks in determining the likelihood of success for national programs like NPSS.

All these theories combine to form a multifaceted approach. Additionally, the Technology-Organization-Environment framework explains technology adoption by considering technological, organizational, and environmental factors. This study illustrates how institutional readiness and regulatory context impact the adoption of the National Payment Switch. Although TAM and UTAUT are used to explain individual user behavior, DOI describes the diffusion process, while PERM, POER, and IRT emphasize the preparation of institutions and their systems. This combination ensures that the adopted factors are both user-level and ecosystem-level in their explanation of NPSS adoption in Sierra Leone.

Conceptual Framework for NPSS Adoption

The adoption of the NPSS in Sierra Leone can be best explained using an integrated model, which combines the core determinants of user behavior and their influence on institutions. This model, as shown in Figure 1, proposes four key constructs: transaction cost, trust, government support, and the role of financial institutions, which influence the intention to adopt NPSS among users.

These two measures, transaction cost and trust, reflect the individual's focus on affordability, safety, and certainty in using digital transactions. Government buy-in is an indicator of the regulatory and policy framework that enables or hinders adoption. The role of financial institutions emphasizes the need for banks, fintech firms, and microfinance institutions to

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stimulate awareness, offer access, and maintain interoperability. Taken in combination, the constructs relate to the links between individual perceptions and systemic and institutional preparedness.

By incorporating these factors into a structural equation modeling-oriented design, the model not only explains how each determinant factor affects adoption but also indicates how the factors interact with one another. The government can ease transaction costs by facilitating policy changes, and financial institutions can earn customer trust by providing effective customer service. This conceptual framework thus offers an integrated view of perspective analysis regarding the adoption of NPSS in Sierra Leone. It therefore informs the empirical testing of the study.

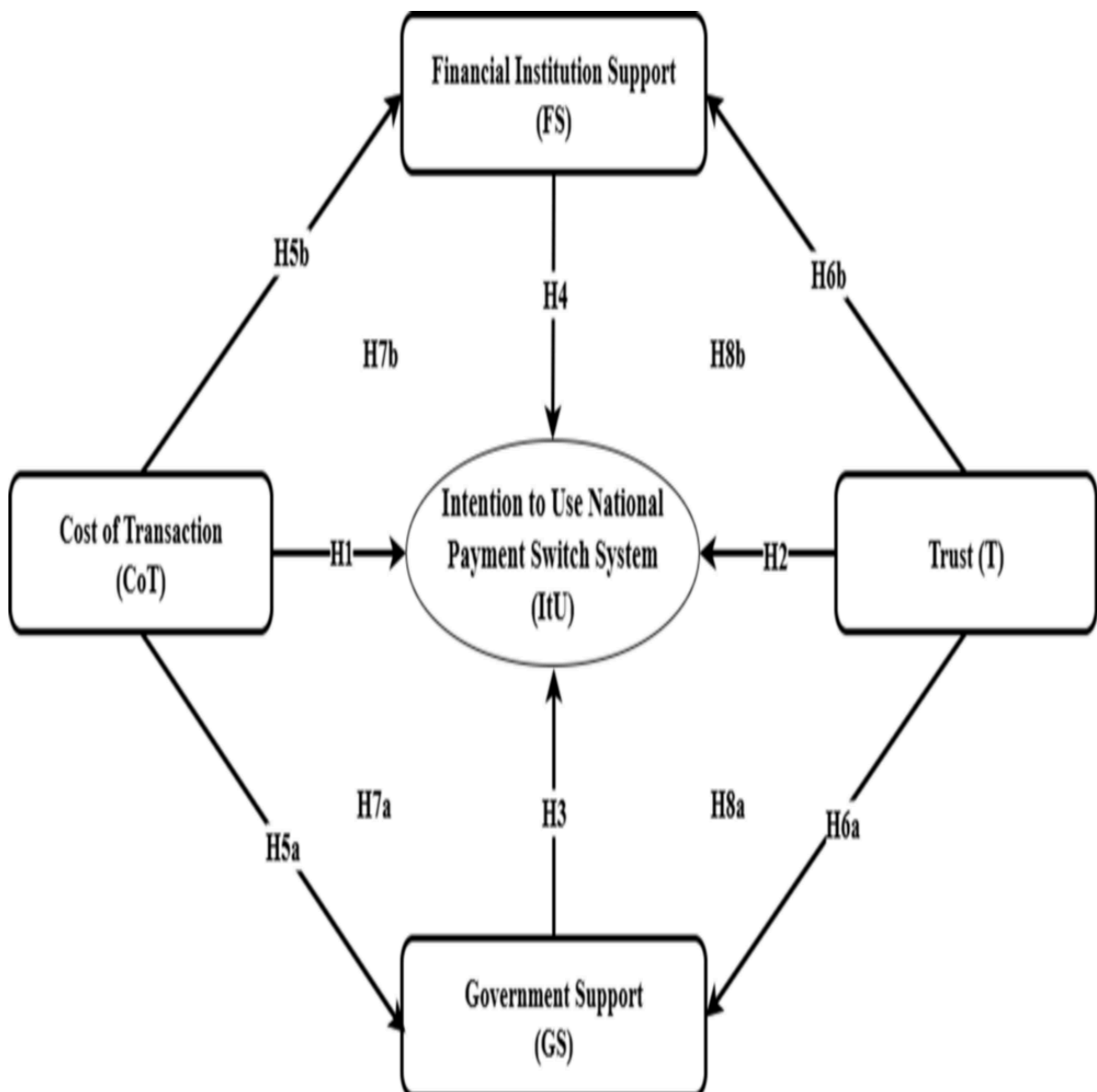


FIGURE 1: Conceptual Framework for Adoption of National Payment Switch System

Source: Author's own output

Research Method

Research design

The study is grounded in original empirical evidence generated through a mixed-methods research design. Quantitative data was collected using a structured, self-administered questionnaire distributed to users of digital financial services across five regions of Sierra Leone. The full questionnaire can be found in Appendices Table 12. The KoboCollect tool was used as the primary instrument for data collection in this research, serving as a standard survey system that enhances research operations across developing nations (Sesay, 2025). As a digital survey platform, it enhances accuracy and field efficiency.

The mixed-methods approach was adopted to test the proposed conceptual model and hypotheses derived from an integrated theoretical framework combining TAM, UTAUT, PERM, DOI, POER, and IRT. Quantitative analysis enabled statistical testing of the hypothesized relationships. At the same time, qualitative findings complemented these results by clarifying the institutional mechanisms through which transaction costs and trust shape adoption behavior, thereby strengthening the model's explanatory power.

A non-random, purposive sampling strategy was employed to ensure representation of key digital payment users and service providers, including stakeholders from banks, fintech firms, and regulatory institutions relevant to the NPSS.

Therefore, the mixed-methods design enabled data triangulation, with qualitative insights contextualizing and validating quantitative findings. Hence, the study relied predominantly on primary data, enhancing the originality and credibility of the analysis.

Population and sample size

The population and sample size comprised active users and institutional stakeholders involved in digital financial services in the context of the NPSS implementation across five regions of Sierra Leone. The inclusion criteria required previous experience using digital payment platforms. Of the 700 questionnaires administered, 623 valid responses were retained for analysis. Thus, the final sample included 121 non-profit sector workers, 140 students, 123 business owners (retail users, fintech, etc.), 116 private sector workers (fintech enterprises, banks, mobile companies, and financial services providers), and 123 public sector workers (regulatory bodies, banks, government ministries and departments). In parallel, qualitative insights from 20 key informant interviews (KIs) were conducted using a semi-structured guide to capture in-depth institutional and practitioner perspectives (see Appendices Table 13 for full questionnaire). Respondents were 53 percent female and 47 percent male, with most falling in the economically active age bracket. The obtained sample size is diverse and provides adequate statistical power for structural equation modelling, as well as ensuring extensive coverage of regions, demographically and sector-wise.

Twenty KIs were strategically conducted across three institutional levels of the NPSS ecosystem. The policy level ($n = 7$), comprising representatives from the Central Bank, the Ministry of Finance, the Ministry of Communication, Technology, and Innovation, and the National Telecommunication Agency (NatCA), provided important information on regulatory systems and mechanisms. The commercial banks and fintech providers, forming the market stratum ($n=8$), provided insights into institutional preparedness, interoperability, and adoption dynamics. The stratum of technology and infrastructure ($n = 5$), which involved mobile money operators and NPSS technical experts, provided useful observations on system reliability, integration processes, and trust mechanisms. This stratified sampling provided a complete ecosystem-wide representation and strengthened triangulation of the quantitative approach's findings.

Measurement instrument

The questionnaire consisted of multi-item reflective scales operationalized to capture the study constructs within the proposed structural model. Trust (T), Cost of Transactions (CoT), Government Support (GS), and Financial Institution Support (FS) were each measured using five items, while Intention to Use (ItU) was measured using four items. All items were assessed using a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The use of multiple indicators per construct enhances internal consistency reliability and supports robust latent variable estimation within the partial least squares structural equation modeling (PLS-SEM) framework. Examples of measurement items for each construct include:

CoT: The transaction fees for the NPSS will be affordable.

T: The NPSS will be a trustworthy platform for payment services.

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GS: The government commitment is crucial to ensuring the success of the switch system.

FS: Financial institutions' collaboration will ensure a smooth adoption of the system.

Data analysis and model evaluation

We looked at data analysis, data quality, reliability, and statistical justification. Data analysis involved descriptive statistics, PLS-SEM, and thematic analysis to ensure both statistical rigor and contextual depth. A total of 623 valid responses were retained for analysis, exceeding the minimum sample size requirements for PLS-SEM. According to (Hair and Alamer, 2022) and (Hair et al., 2024), for PLS-SEM, the minimum sample size should be at least ten times the maximum number of predictors leading to a single endogenous construct. The research requires a minimum of 40 valid responses because its path model uses four predictor variables. Hence, the research sample of 623 participants meets and exceeds the minimum requirements, yielding robust and analytically reliable results within the defined study context.

Descriptive analyses were conducted using SPSS Version 27, while structural model estimation was performed using SmartPLS Version 4 (Ringle et al., 2024). Normality tests were conducted to capture deviations from normality using skewness, kurtosis, and a significant Cramér-von Mises test ($p < 0.001$). The tests for normality indicated that the data distribution failed to meet the assumption of normality. Also, skewness (1.68) and excess kurtosis (7.24) were greater than recommended levels for skewness +1 and -1 and kurtosis 3 and -3, respectively (Ghaleb and Yaşlıoğlu, 2024) (Iacobucci et al., 2025) (Mishra et al., 2019). Given the violation of normality assumptions, a distribution-free estimation approach (PLS-SEM with bootstrapping) was employed.

Additionally, the Cramer-von Mises test was significant ($p < 0.001$), indicating that the data were not normally distributed. Accordingly, PLS-SEM with bootstrapping was employed due to its resistance to violations of multivariate normality, robustness to non-normal data, suitability for complex models, effectiveness in testing-mediated and indirect effects and works well with medium sample sizes (Hair et al. 2024). It also supports latent variable analysis with reflective and formative indicators, making it suitable for examining mediated and indirect effects, such as the influence of institutional support on the intention to use NPSS (Sesay, 2025).

Measurement model evaluation included reliability tests (Cronbach's alpha and composite reliability), convergent validity (factor loadings and average variance extracted [AVE]), and discriminant validity (Fornell-Larcker Criterion and heterotrait-monotrait ratio [HTMT]). Variance inflation factor (VIF) values were used to assess multicollinearity. Structural model analysis tested the direct and mediated hypotheses using 5,000 bootstrap subsamples, while predictive validity was evaluated using PLSpredict.

Ethical measures were taken to minimize response bias, including the use of anonymized participation. To avoid survey fatigue, clear instructions and a streamlined question flow were employed. Common method bias was assessed using both Harman's one-factor test and the full collinearity VIF approach. Results showed that no single factor explained more than 50% of the variance, and all construct VIFs were below 3.3 (see Tables 5-6), confirming that common method bias was not a concern.

Model specification

Model 1:

$$Y(\text{ItU}) = \beta_0 + \beta_1\text{CoT} + \beta_2T + \beta_3\text{GS} + \beta_4\text{FS} + \epsilon$$

where, ItU = Intention to Use NPSS; CoT = Cost of Transaction; T = Trust; GS = Government Support; FS = Financial Institution Support, and ϵ = Error term

Model 2 (including moderation):

$$Y(\text{ItU}) = \beta_0 + \beta_1\text{CoT} + \beta_2T + \beta_3\text{GS} + \beta_4\text{FS} + \beta_5(\text{CoT} \times \text{GS}) + \beta_6(\text{CoT} \times \text{FS}) + \beta_7(T \times \text{GS}) + \beta_8(T \times \text{FS}) + \epsilon$$

Based on theoretical foundations and prior empirical evidence, the study therefore examined direct and moderated relationships influencing NPSS adoption within the Sierra Leonean digital financial services ecosystem.

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Results And Discussion

Demographic characteristics of respondents

This analysis links demographic and contextual insights to constructs such as ItU, GS, FS, CoT, and Trust.

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Category	N	%
Age		
18-24	101	16.20%
25-35	292	46.90%
36-45	159	25.50%
46+	71	11.40%
Gender		
Female	328	52.60%
Male	295	47.40%
Sector		
Business owners	123	19.70%
Non-Profit Sector Workers	121	19.40%
Private Sector Workers	116	18.60%
Public Sector Workers	123	19.70%
Students	140	22.50%
NPSS Level of Awareness		
No	398	63.90%
Yes	225	36.10%
Level of Education		
No Schooling	11	1.80%
WASC/GCE Certificate	75	12.00%
College Certificate	103	16.50%
National Diploma	77	12.40%
Higher National Diploma	99	15.90%
Bachelor's Degree	194	31.10%
Master's Degree	60	9.60%

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PhD	4	0.60%
Location		
Eastern	109	17.50%
North-East	90	14.40%
North-West	108	17.30%
Southern	102	16.40%
Western Area Rural	102	16.40%
Western Area Urban	112	18.00%

TABLE 1: Demographic Characteristics of Respondents

Source: Author's data output

From Table 1, young people between 25 and 35 represent my sample since they are well-suited for adopting new technologies. The percentage of mobile phone users in this population sector (43.8%) presents expanding possibilities for digital financial platforms to enter the market (Tarawali, 2020). A slight female dominance is evident among respondents, with 52.6% of the population falling within this group. Students and public sector workers comprise the predominant participant types, and public sector support influences evaluations of GS and Trust.

A significant information gap exists due to the low (36.1%) awareness rate regarding the NPSS, which threatens the adoption intentions of future national payment systems.

A higher percentage of people (52.7%) within the Western Urban Area demonstrate awareness of the national payment system, but only 14.8% of the North-West area show this awareness. This urban-rural divide highlights infrastructural and educational inequality, directly affecting CoT and ItU. These disparities reinforce the importance of regional equity for national adoption success. The correlation between education level and awareness of NPSS is strong, as more highly educated individuals show greater trust in fintech systems and a higher intention to use them. Educational equality is essential, as people without access to formal education often lack knowledge about NPSS, thereby highlighting vital gaps in digital and financial education. Higher education correlates with higher ItU and Trust.

Geographic differences can hinder consumers' access to financial institutions, which in turn affects their perceptions of FS and CoT. The implementation of educational and infrastructural initiatives needs to target awareness disparities in NPSS, as these are the primary barriers that prevent users from utilizing these systems effectively. The campaign will achieve more equitable national acceptance of NPSS by making lower-awareness areas its primary focus.

Gender and Infrastructure Context

Our findings indicate clear gender differences in awareness of the NPSS. Although females constitute a slightly larger proportion of the sample (53%), a higher share of male respondents reported awareness of NPSS (55%) compared with female respondents (45%). Conversely, lack of awareness is more pronounced among females, who account for 57% of respondents reporting no awareness, compared to 43% among males. Overall, the findings suggest that NPSS awareness is unevenly distributed by gender, with males demonstrating relatively higher exposure to the system, highlighting a potential gender gap in information access and digital financial awareness.

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Thus, the descriptive analysis of the respondents indicates a modest gender-based disparity in the use of the NPSS. The sample consisted of slightly underrepresented female respondents, a trend consistent with broader financial inclusion trends in low- and middle-income economies. Women respondents experienced less exposure to advanced digital payment services and relied more on assisted or intermediate financial transactions, suggesting differentiated interaction patterns with the NPSS. Even though these patterns do not treat gender as an explanatory variable, they suggest that gendered access to digital resources, financial autonomy, and technology-mediated services may indirectly affect adoption patterns.

Additionally, the challenges faced by the respondents across the various institutional categories were infrastructure-related, including intermittent network connections and unstable electricity supply. The respondents who reported these problems more often worked not in large urban centers and were linked to delays in transactions and system downtime rather than an outright refusal to use NPSS. Therefore, the issue of infrastructure constraints seems to have a greater impact on the continuity and reliability of use than on first-time adoption choices.

Measurement model assessment

Confirmatory Factor Analysis

Confirmatory factor analysis confirms the reliability and adequacy of the measurement model, thereby verifying the relationship between observed indicators and latent constructs. The model demonstrates strong indicator reliability, convergent validity, and discriminant validity, with Cronbach's alpha and composite reliability values above 0.70. These results support the robustness of the measurement model and justify its use in subsequent PLS-SEM path analysis. Below is a detailed analysis of confirmatory factor analysis.

Factor Loadings (Standardized Estimates)

Table 2 summarizes the factor loadings for five constructs: CoT, FS, GS, ItU, and Trust. Factor loadings represent the extent to which each item measures its corresponding construct. According to (Hair et al. 2021), acceptable factor loadings should be ≥ 0.70 . All indicators meet or exceed this threshold, confirming the reliability of each construct. Minor variations in FS and GS suggest opportunities to strengthen item clarity and relevance. The analysis supports strong indicator reliability for CoT, ItU, and Trust. While acceptable, government and financial institution support constructs may benefit from targeted improvements to enhance user perception and motivation for adoption.

Construct	Item	Factor Loading
Cost of Transaction (CoT)	CoT1	0.852
	CoT2	0.742
	CoT3	0.86
	CoT4	0.75
	CoT5	0.824
Financial Institution Support (FS)	FS1	0.848
	FS2	0.744
	FS3	0.805
	FS4	0.728
	FS5	0.749
Government Support (GS)	GS1	0.815
	GS2	0.725
	GS3	0.838
	GS4	0.756
	GS5	0.746
Intention to Use (ItU)	ItU1	0.86
	ItU2	0.755
	ItU3	0.843
	ItU4	0.78
Trust (T)	T1	0.822
	T2	0.751
	T3	0.81
	T4	0.776
	T5	0.717

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TABLE 2: Factor Loadings*Analysis of Construct Reliability and Validity Results*

Construct Reliability and Validity					HTMT				Fornell-Larcker Criterion				
Construct	α	ρ_a	ρ_c	AVE	CoT	FS	GS	ItU	CoT	FS	GS	ItU	T
CoT	0.865	0.871	0.903	0.651					0.807				
FS	0.834	0.841	0.883	0.602	0.866				0.741	0.776			
GS	0.835	0.842	0.884	0.604	0.864	0.868			0.741	0.729	0.777		
ItU	0.826	0.834	0.885	0.658	0.873	0.868	0.856		0.745	0.724	0.717	0.811	
T	0.834	0.839	0.883	0.602	0.809	0.895	0.908	0.858	0.691	0.750	0.761	0.717	0.776

TABLE 3: Analysis of Construct Reliability and Validity Results

Source: Author's data output

AVE, Average Variance Extracted; HTMT, Heterotrait–Monotrait; CoT, Cost of Transaction; FS, Financial Institution Support; GS, Government Support; ItU, Intention to Use; T, Trust

The current model was assessed to evaluate the reliability and validity of constructs related to adopting the NPSS. These constructs include ItU, GS, FS, CoT, and Trust. The analysis employs multiple validity measures, including Cronbach's alpha, composite reliability (ρ_c), average variance extracted (AVE), the Fornell-Larcker criterion, and the heterotrait-monotrait ratio (HTMT). A summary of these metrics is found in Table 3.

Construct Reliability: All constructs report α values above the acceptable threshold of 0.70, ranging from 0.826 (ItU) to 0.865 (CoT), indicating strong internal consistency. Additionally, for composite reliability (ρ_c), each construct exceeds the recommended threshold of 0.70, ranging from 0.883 to 0.903. This signifies that the items within each construct reliably measure their latent variable. These results are consistent with those of (Kim et al., 2024), who found that α and CR values above 0.70 are sufficient in the context of financial technology adoption research.

Convergent validity: The study employed the AVE to assess the level of convergent validity of the construct items. All constructs have AVE values above 0.50, from 0.602 (FS, GS, Trust) to 0.658 (ItU), demonstrating acceptable convergent validity. These findings suggest that each construct explains over 50% of the variance in its respective indicators. Similar AVE values were noted in (Kim et al., 2024), who confirmed the appropriateness of these thresholds in empirical banking models.

Discriminant validity was also assessed using Fornell-Larcker criterion and HTMT ratios. For the Fornell-Larcker criterion, for each construct, the square root of AVE exceeds its correlations with other constructs. For example, CoT shows a square root of AVE at 0.807, which is greater than its correlation with FS (0.741), GS (0.741), and ItU (0.745). This affirms discriminant validity. In the HTMT ratios, all values fall below the conservative threshold of 0.90, except for GS-T, which is marginally high at 0.908. While this still falls within the acceptable range suggested by (Henseler et al. 2015), it indicates a possible conceptual overlap between these two constructs. Similar HTMT thresholds were reported in (Sheykhan et al., 2024) for digital finance models.

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Comparatively, (Kim et al., 2024) examined digital banking and technology adoption constructs, reporting α values between 0.74 and 0.95, CR values between 0.70 and 0.96, and AVEs ranging from 0.62 to 0.82. These ranges are highly comparable to those of the current model, confirming its psychometric soundness. Hair and colleagues emphasized the importance of $AVE > 0.50$ and $CR > 0.70$ in validating structural models for consumer financial behavior, further corroborating the present findings (Hair et al., 2024). (Hair and Alamer, 2022) and (Hair et al., 2024) highlighted HTMT thresholds of 0.85-0.90 for robust discriminant validity in PLS-SEM modeling. The slightly elevated HTMT between GS and Trust (0.908) should prompt caution, though it remains within acceptable limits (Sarstedt et al., 2023).

The model confirms high construct reliability and validity for the NPSS, aligning with recent studies. However, caution is advised regarding the HTMT value between GS and Trust, as further research is required.

Model Fit Indices

	Saturated Model	Estimated Model
SRMR	0.062	0.063
d_uls	1.155	1.190
d_g	0.519	0.525
Chi-square	1,874.653	1,884.531
NFI	0.801	0.800

TABLE 4: Model Fit Indices
NFI, Normed Fit Index; SRMR, Standardized Root Mean Square Residual

Table 4 presents model fit indices for both the saturated and estimated models, which are essential for evaluating goodness-of-fit in SEM. These indices help determine how well the hypothesized model reproduces the observed data structure.

The model fit assessment shows a strong alignment between the estimated model for NPSS adoption in Sierra Leone and the observed data, confirming that the hypothesized structural paths effectively replicate the dataset's covariance structure (Sarstedt et al., 2021). The d_uls values, ranging from 1.155 for the saturated model to 1.190 for the estimated model, confirm the model's adequacy, indicating minimal deviation between the observed and model-implied matrices, which enhances confidence in the model's specification (Henseler et al., 2015).

Similarly, the geodesic distance values of 0.519 and 0.525 indicate minimal differences between the two models, suggesting their robustness and resemblance to theoretical relationships. The chi-square values for the saturated and estimated models are high, indicating stability in large samples despite potential model rejection due to sample size sensitivity.

Finally, the normed fit index values of 0.801 and 0.800 slightly exceed the acceptable threshold, confirming that the model fits within an acceptable range for a developing digital financial system, such as the adoption of NPSS in Sierra Leone (Kim et al., 2024).

Structural model assessment

Collinearity Test

VIF values assess multicollinearity in structural equation models. Multicollinearity occurs when independent variables are highly correlated, potentially distorting regression coefficients. A VIF value below 5 is generally acceptable, while values above 3.3 warrant closer scrutiny (Hair et al., 2021).

The study found that all items in the outer model have VIF values below 5, ranging from 1.522 to 2.661, which is ideal, as shown in Table 5, indicating no multicollinearity issues. The highest VIFs were found among cost of transaction and government support items, but still within safe limits. This confirms the validity of the outer measurement model, supporting the stability and interpretability of structural paths in Sierra Leone.

Items	VIF
CoT1	2.661
CoT2	1.794
CoT3	2.670
CoT4	1.645
CoT5	2.123
FS1	2.344
FS2	1.741
FS3	2.082
FS4	1.668
FS5	1.621
GS1	2.061
GS2	1.609
GS3	2.482
GS4	1.698
GS5	1.886
ItU1	2.164
ItU2	1.547
ItU3	2.151
ItU4	1.652
T1	2.045
T2	1.727
T3	2.029
T4	1.733
T5	1.522

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TABLE 5: Outer Model VIF Analysis

Source: Author's data output
VIF, Variance Inflation Factor; CoT, Cost of Transaction; FS, Financial Institution Support; GS, Government Support; ItU, Intention to Use; T, Trust

Inner Model VIF Analysis

In Table 6, the inner model VIF values range from 1.913 to 3.128, indicating low multicollinearity and a robust model. The lowest values occur in multiple paths, while the highest values suggest multiple predictors share explanatory power. These findings support the validity of the inner model and justify hypothesis testing and path coefficient analysis. Each construct provides unique information.

Path	VIF
CoT → FS	1.913
CoT → GS	1.913
CoT → ItU	2.785
FS → ItU	3.036
GS → ItU	3.128
T → FS	1.913
T → GS	1.913
T → ItU	2.988

TABLE 6: Inner Model VIF Analysis

Source: Author's data output
VIF, Variance Inflation Factor; CoT, Cost of Transaction; FS, Financial Institution Support; GS, Government Support; ItU, Intention to Use; T, Trust

Hypothesis Testing

The hypothesis testing results comprehensively evaluate the direct and indirect relationships between key constructs influencing the ItU of the NPSS model in Sierra Leone. In Table 7, all hypotheses (H1-H8b) are statistically supported with p-values < 0.005, demonstrating robust and significant model pathways. Below is a critical breakdown of these relationships:

Hypothesis	Path	β	t-statistics	p-values	5.0%	95.0%	Result
H1	CoT $\rightarrow$ ItU	0.323	6.645	0.000	0.239	0.400	Supported
H2	T $\rightarrow$ ItU	0.217	3.482	0.000	0.112	0.316	Supported
H3	GS $\rightarrow$ ItU	0.167	3.241	0.001	0.081	0.252	Supported
H4	FS $\rightarrow$ ItU	0.200	3.199	0.001	0.098	0.303	Supported
H5a	CoT $\rightarrow$ GS	0.411	9.476	0.000	0.341	0.482	Supported
H5b	CoT $\rightarrow$ FS	0.428	7.568	0.000	0.335	0.518	Supported
H6a	T $\rightarrow$ GS	0.477	9.712	0.000	0.395	0.556	Supported
H6b	T $\rightarrow$ FS	0.454	8.012	0.000	0.360	0.546	Supported
H7a	CoT $\rightarrow$ GS $\rightarrow$ ItU	0.069	3.129	0.001	0.032	0.106	Supported
H7b	CoT $\rightarrow$ FS $\rightarrow$ ItU	0.086	3.186	0.001	0.042	0.131	Supported
H8a	T $\rightarrow$ GS $\rightarrow$ ItU	0.080	2.974	0.001	0.037	0.127	Supported
H8b	T $\rightarrow$ FS $\rightarrow$ ItU	0.091	2.784	0.003	0.041	0.149	Supported

TABLE 7: Hypothesis Testing

Source: Author's data output

CoT, Cost of Transaction; FS, Financial Institution Support; GS, Government Support; ItU, Intention to Use; T, Trust

Direct Effects on Intention to Use (H1-H4)

Hypothesis 1 postulated that transaction costs directly impact consumer intention to use or adopt new technology, particularly in Sierra Leone. The result ($\beta = 0.323$, $t = 6.645$, $p < 0.001$) indicates a significant and positive relationship; the CoT has the most substantial direct influence on NPSS adoption, reinforcing the idea that perceived affordability and efficiency are major drivers of user behavior. The finding aligns with (Karangwa et al, 2024) in terms of the similar significance of transaction cost impacts on digital payment uptake. The study revealed that high costs hinder the adoption of payment systems. Therefore, to increase user adoption, stakeholders should reconsider lower-cost incentives (Duong, 2024) (Kumar and Unnisa, 2024). Therefore, our findings support H1, as cost directly impacts intention to adopt new technology.

Hypothesis 2 suggests that trust significantly influences user intention ($\beta = 0.217$; $t = 3.482$, $p = 0.000$), consistent with prior fintech adoption studies that highlight trust as a prerequisite for engaging with unfamiliar financial technologies (Al Oraini et al., 2024) (Qatawneh and Makhoulf, 2025) (Sleiman et al., 2021). Hence, the result supports the hypothesis that trust significantly affects users' intention.

H3 and H4 posited that government and financial institution support have a direct impact on user intention. The result reveal that (GS $\rightarrow$ ItU, $\beta = 0.167$; 3.482 and $p = 0.000$; FS $\rightarrow$ ItU, $\beta = 0.200$; 3.199 and $p = 0.000$). While their effects are slightly weaker than CoT and Trust, they are still meaningful, indicating that external institutional credibility fosters internal user confidence.

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These findings align with those of (Naik et al., 2025) and (Karangwa et al., 2024), who found that supportive institutions drive increased adoption of payment systems. Thus, H3 and H4 are supported.

Direct Effects on Institutional Support (H5a-H6b)

Hypothesis H5a and H5b suggest that CoT is a significant determinant of both government ($\beta = 0.411$; $t = 9.476$, $p = 0.000$) and financial institution support ($\beta = 0.428$; $t = 7.568$, $p = 0.000$). This suggests that cost perceptions shape how users view institutional engagement. If services are too costly, institutional efforts may be deemed ineffective (Duong, 2024) (Kumar and Unnisa, 2024). Collectively, the empirical data provide a strong argument for the suggested institutional pathways. Hypotheses H5a and H5b are accepted, as the effect of transaction costs on government and financial institution support is significant and positive

H6a and H6b postulated that trust in the system is a powerful predictor of how users perceive government and financial institution support ($\beta = 0.477$, $t = 9.712$, $p < 0.001$, and $\beta = 0.454$, $t = 8.012$, $p < 0.001$, respectively). This supports the notion that trust-based perceptions extend beyond personal usage to include evaluations of broader institutional credibility (Sleiman et al., 2021). Hence, hypotheses H6a and H6b are accepted, proving that trust is a robust determinant of perceived institutional support.

Indirect (Mediated) Effects on Intention to Use (H7a-H8b)

H7a and H7b both suggest indirect paths that are statistically significant with $\beta = 0.069$, $t = 3.129$, $p = 0.001$, and $\beta = 0.086$, $t = 3.186$, $p = 0.001$, respectively, implying that institutional support partially mediates the relationship between transaction cost and user intention (Dawood et al., 2022) (Masri et al., 2021). The results indicate that cost affects not only direct intention but also perceived institutional credibility, influencing user behavior. In mediation analysis, the indirect effects are statistically significant, indicating that institutional support plays an essential intermediary role in the adoption process. Based on this, Hypotheses H7a and H7b are accepted, suggesting that government and financial institution support partially mediate the relationship between transaction costs and intention to use.

H8a and H8b. Similarly, trust influences user intention indirectly through perceptions of GS and FS ($\beta = 0.080$, $t = 2.974$, $p = 0.001$, and $\beta = 0.091$, $t = 2.784$, $p = 0.003$, respectively). These indirect effects reinforce the model's layered structure, where trust directly influences ItU and improves institutional support, boosting adoption (Tan et al., 2025). Therefore, Hypotheses H8a and H8b are accepted, indicating that trust affects intention to use both immediately and indirectly through improved perceptions of institutional support.

The model provides strong empirical support for direct and mediated effects influencing NPSS adoption. CoT and Trust emerge as foundational factors, directly predicting user intention and enhancing perceptions of government and financial support. The statistical significance and strength of mediated pathways underscore the importance of incorporating trust and affordability into institutional frameworks to drive adoption in developing financial ecosystems, such as those in Sierra Leone.

Mediation Analysis

Mediation analysis examines whether a third variable mediates the relationship between an independent variable and a dependent variable. In the context of this study on NPSS adoption in Sierra Leone, the mediation paths examine how GS and FS channel the effects of CoT and Trust on ItU. Summaries of the mediation effect are found in Table 8. The results revealed that all mediated paths were statistically and positively significant, with p-values less than 0.005.

No.	Path	β	t-statistics	p-values	Result
1	CoT $\rightarrow$ GS $\rightarrow$ ItU	0.069	3.129	0.001	Accepted
2	CoT $\rightarrow$ FS $\rightarrow$ ItU	0.086	3.186	0.001	Accepted
3	T $\rightarrow$ GS $\rightarrow$ ItU	0.080	2.974	0.001	Accepted
4	T $\rightarrow$ FS $\rightarrow$ ItU	0.091	2.784	0.003	Accepted

TABLE 8: Mediation Analysis

Source: Author's data output

CoT $\rightarrow$ GS $\rightarrow$ ItU: This statistically significant mediation path indicates that the CoT indirectly influences the ItU via GS. Users perceive that lower transaction costs make government involvement more effective and responsive, boosting their intention to adopt NPSS. This suggests that enhancing affordability directly impacts user perception and fosters confidence in government-backed systems (Naik et al., 2025).

CoT $\rightarrow$ FS $\rightarrow$ ItU: Similarly, this pathway confirms that FS mediates the relationship between CoT and ItU. Lower transaction costs reflect better institutional efficiency and service delivery, encouraging users to trust banks and engage with digital payment systems (Duong, 2024). FS's slightly larger effect size than the GS mediation implies that financial institutions may play a more immediate or visible role in service accessibility.

T $\rightarrow$ GS $\rightarrow$ ItU: Trust in the system also positively impacts user adoption indirectly through GS. This suggests that when users trust the NPSS framework, they are more likely to view government interventions as credible and effective, thereby enhancing their intention to use it. This result aligns with (Sleiman et al., 2021), who found that institutional trust reinforces positive public perception in digital transformation efforts.

T $\rightarrow$ FS $\rightarrow$ ItU: This pathway exhibits the most potent mediation effect, showing that trust in the NPSS system substantially boosts perceived support from financial institutions, significantly enhancing intention to use. It highlights the critical role of trust in establishing a reliable banking environment for digital financial systems, particularly in economies with a history of weak trust in formal institutions.

In summary, all four mediation paths are statistically significant, underscoring the importance of indirect effects in shaping user behavior. Trust and transaction costs directly influence NPSS adoption, as well as through enhanced perceptions of institutional support. These findings suggest that building credible, affordable, visible support structures through government and financial institutions is essential for scaling national digital payment systems in Sierra Leone.

Prediction Relevance and Effect Size

The PLSpredict MV (manifest variable) and LV (latent variable) summaries provide insight into the predictive power and out-of-sample performance of the PLS-SEM for the construct ItU. These metrics enable the comparison of the PLS-SEM model with benchmark models, such as linear regression (LM) and naive mean-based prediction (indicator average [IA]).

Q²predict Values

Q²predict values indicate the model's ability to predict new observations. According to (Monson and Macauley, 2024), values greater than 0 suggest predictive relevance, and values greater than 0.35 indicate medium to strong predictive power. For the manifest variables (ItU1-ItU4), values range from 0.360 to 0.545, confirming moderate to strong predictive relevance. At the latent level, ItU has a Q²predict of 0.653, highlighting the model's very high predictive capability.

Root Mean Square Error and Mean Absolute Error

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The PLS-SEM RMSE values (0.653-0.699) are either lower or comparable to the LM RMSE values (0.645-0.700). This result suggests that PLS-SEM performs as well as, or slightly better than, linear regression in terms of prediction accuracy. MAE values also support this, with PLS-SEM MAE consistently outperforming or equaling the LM benchmark, particularly for ItU1 and ItU4.

Comparison With Naive Benchmarks (IA Models)

IA_RMSE and IA_MAE values are consistently higher across all indicators (e.g., IA_MAE for ItU1 is 0.777 vs. 0.501 for PLS-SEM), indicating that PLS-SEM outperforms the naive benchmark (see Table 9). This demonstrates that the model provides substantial incremental predictive value over simplistic approaches, further validating its utility for policy and strategic decision-making in NPSS implementation.

Latent Variable Summary

The PLS-SEM model's robustness and generalizability are confirmed by acceptable predictive ranges (RMSE = 0.593 and MAE = 0.377) at the latent construct level (see Table 10). The model's high predictive relevance ($Q^2_{predict}$ values exceeding 0.35) for the NPSS adoption construct "Intention to Use" is confirmed, making it suitable for guiding national payment adoption strategies in Sierra Leone.

PLSpredict MV summary							
	$Q^2_{predict}$	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE	IA_RMSE	IA_MAE
ItU1	0.545	0.653	0.501	0.645	0.467	0.968	0.777
ItU2	0.360	0.673	0.497	0.671	0.497	0.841	0.496
ItU3	0.435	0.699	0.561	0.700	0.555	0.930	0.778
ItU4	0.367	0.690	0.533	0.675	0.515	0.868	0.543

TABLE 9: Summary of Prediction Relevance (MV)

Source: Author's data output
IA, Indicator Average (naïve benchmark model); ItU, Intention to Use; LM, Linear Regression; MAE, Mean Absolute Error; MV, Manifest Variable; PLS-SEM, Partial Least Squares Structural Equation Modeling; RMSE, Root Mean Square Error

PLSpredict LV summary (PLS-SEM)			
	$Q^2_{predict}$	RMSE	MAE
ItU	0.653	0.593	0.377

TABLE 10: Summary of Prediction Relevance (LV)

Source: Author's data output
ItU, Intention to Use; MAE, Mean Absolute Error; PLS-SEM, Partial Least Squares Structural Equation Modeling; RMSE, Root Mean Square Error; LV Latent Variable

Quality Criteria: R-square and F-square Analysis

The R-square and F-square values are vital quality criteria for assessing the explanatory power and effect sizes in PLS-SEM. Together, they determine how well the model explains the variance in the endogenous variables and the relative importance of predictor constructs. The results of the quality criteria are summarized in Table 11.

R-square (R^2) values for FS (0.657), GS (0.668), and ItU (0.661) indicate substantial explanatory power. These values suggest the model explains 66-67% of the variance in these constructs. Adjusted R^2 values close to 1 confirm the minimal risk of overfitting.

According to Cohen's (1988) f^2 thresholds (0.02 = small, 0.15 = medium, 0.35 = large), Trust has significant effects on GS (0.358) and FS (0.315), while CoT significantly influences FS (0.279) and GS (0.266). Direct impacts on ItU are more modest but meaningful. The model thus exhibits both strong explanatory and predictive capacity, with key contributions from Trust and CoT in determining institutional support and adoption intention.

Construct/Path	R-square	R-square Adjusted	F-square
FS	0.657	0.656	CoT → FS = 0.279; T → FS = 0.315
GS	0.668	0.666	CoT → GS = 0.266; T → GS = 0.358
ItU	0.661	0.659	CoT → ItU = 0.110; FS → ItU = 0.039; GS → ItU = 0.026; T → ItU = 0.046

TABLE 11: Summary of R-square and F-square Analysis

Source: Author's data output
CoT, Cost of Transaction; FS, Financial Institution Support; GS, Government Support; ItU, Intention to Use; T, Trust

Structural Equation Model

The model shows strong predictive relationships among NPSS adoption factors in Sierra Leone. CoT and Trust significantly influence GS and FS, which affect ItU. All paths are significant, and R^2 values above 0.66 indicate substantial explanatory power (see Figure 2).

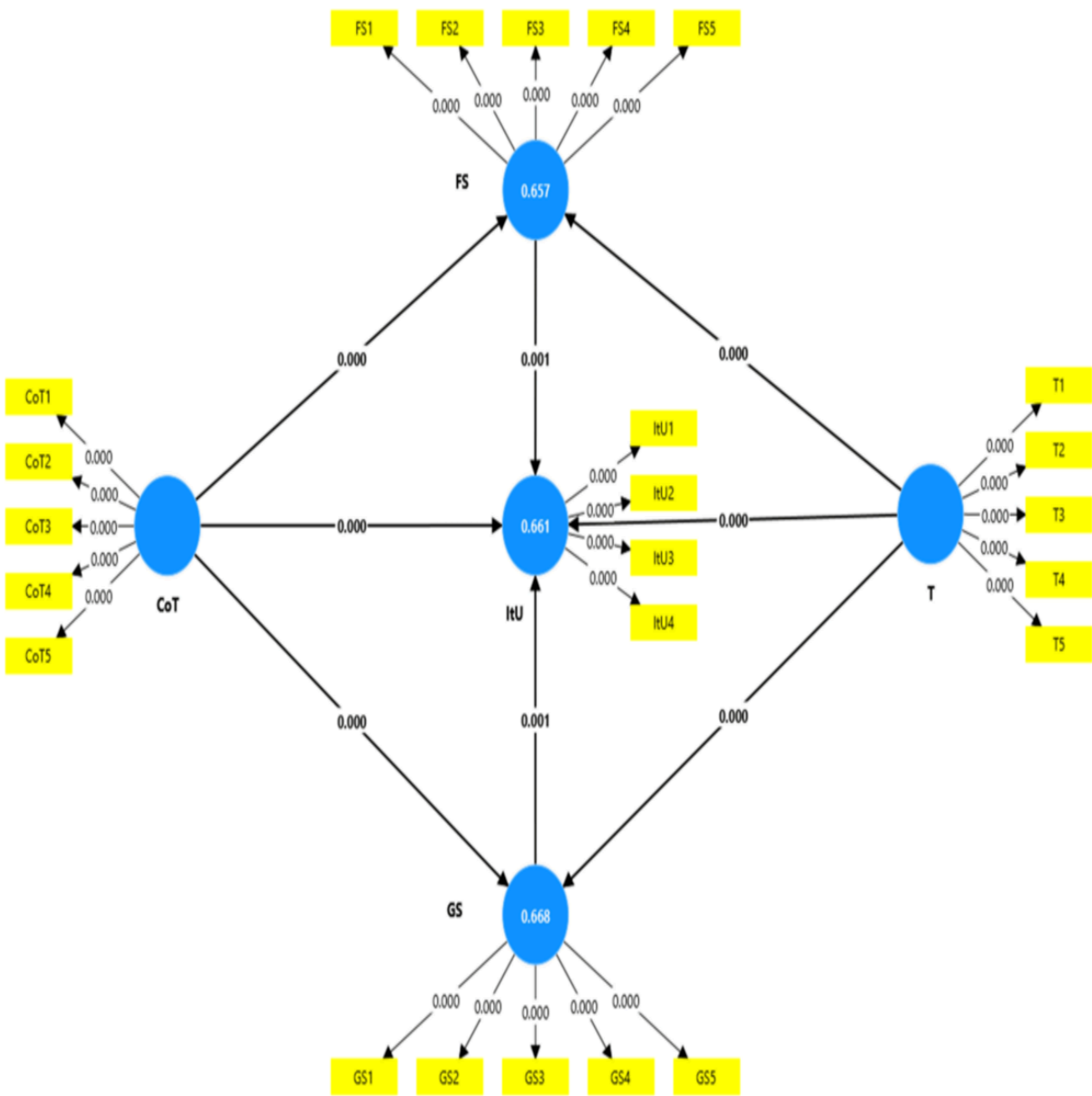


FIGURE 2: Final Structural Equation Model for NPSS Adoption

Author's data output using SmartPLS 4 (Ringle et al., 2024)
NPSS, National Payment Switch System; CoT, Cost of Transaction; FS, Financial Institution Support; GS, Government Support; ItU, Intention to Use; T, Trust

Regression Model specification

$$ItU = 0.323 \cdot CoT + 0.196 \cdot FS + 0.166 \cdot GS + 0.223 \cdot T + \epsilon$$

The regression results in Table 7 revealed that transaction cost and trust are the top predictors of ItU, as users are more focused on transaction costs. While financial services and government help drive outcomes, they are less potent than cost and trust. The model predicts that when transaction costs and trust are not considered, efficiency and government aid are not improved,

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and the intention to use the system will be near zero. This implies that improving the processes, making the system more trusted, accessible, and transparent, as well as enhancing the efficiency and recognition of financial services, should be policymakers' primary goal.

Stakeholder Perspectives on NPSS Adoption

Insights from the 20 KIs revealed a complex interplay of institutional, technological, and socio-economic factors shaping the adoption of the NPSS in Sierra Leone. The findings align with prior digital payment adoption literature, particularly within developing economies, where institutional credibility, cost efficiency, and infrastructural readiness are found to have a strong influence on uptake (Ammah et al., 2025) (Ehret and Olaniyan, 2023).

Also, regulatory actors, such as the Bank of Sierra Leone and NatCA, play a crucial role in NPSS governance, ensuring security, transparency, and interoperability standards, while also addressing public sensitization and cybersecurity, which were key challenges highlighted. Similarly, representatives from financial institutions, including banks, microfinance institutions, and fintechs, highlighted the transformative potential of NPSS in facilitating interoperability and expediting settlements, emphasizing trust, affordability, and the need for capacity building and user education. In addition, the technology providers, including switch operators, IT service providers, and telecom firms, highlight infrastructure reliability and cybersecurity resilience as key factors in adoption, with rural connectivity gaps being the most significant barrier. Furthermore, the end-users report low awareness of NPSS, with information mainly spread through informal networks. Concerns about transaction costs, security, and digital literacy are the most dominant. Thus, awareness campaigns are recommended, especially in rural areas.

We further identified five key themes, including trust, cost, government oversight, institutional readiness, technological infrastructure constraints, and the financial inclusion potential of National Payment System Schemes as a driver of digital transformation. These findings enabled the study to achieve greater contextual nuance in the quantitative results, clarifying how the dynamics of institutions affect user adoption of the National Payment Switch.

Institutional Credibility as a Prerequisite for Adoption: One of the trigger factors of adoption was institutional credibility. Participants emphasized that users view the NPSS as a continuation of governmental and financial institutions rather than as independent technology. Consistent messaging about policy, strict enforcement of regulations, and visible institutional commitment were considered necessary to instill confidence, thereby strengthening the empirically determined mediating role of institutional support in the structural model.

Transaction Cost as a Signal of Institutional Commitment: The institutional intent was often interpreted in respect to transaction costs and affordability. The interviewees noted that precise, uniform pricing frameworks reinforce a sense of fairness and inclusivity, while high or inconsistent charges undermine the perception of institutional self-interest. This is in line with the strong quantitative evidence that transaction costs have a significant impact on governmental and financial institution support.

Trust Transfer from Institutions to Technology: The system will gain more credibility by assuming the role of the key institution in the ecosystem. According to many respondents, users rely on the institution's reputation when assessing the NPSS, especially when they have low levels of technical literacy regarding payment infrastructure. This explains the finding that trust has both direct and indirect influences on the usage intention, mediated by institutional support processes.

Coordination Gaps Between Stakeholders: Even though institutional backing was primarily favorable, apparent coordination gaps among regulators, banks, and fintech operators proved a limiting factor for adoption. Lapse in unity and uneven application reduced the effectiveness of supportive measures, thereby contextualizing the relatively low effect sizes associated with institutional variables.

Lastly, the infrastructure constraints were recognized as external facilitators. Reliability of networks and stability of electricity were seen to affect continued usage rather than adoption, which supported the overall decision of the study to consider infrastructure as a contextual variable rather than a core construct.

Overall, our findings from the qualitative analysis complement the quantitative results by expounding the institutional pathways through which cost and trust influence adoption, thereby strengthening the explanatory power of the proposed model.

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Based on the insights from the KIs, we propose a framework with a multi-layered stakeholder ecosystem for NPSS, comprising regulators, financial institutions, technology providers, and end-users. It emphasizes the need for sustained alignment across regulatory, institutional, and community levels (see Figure 3). The collaboration will ensure a seamless platform for individuals and businesses.

Thus, the adoption of NPSS in Sierra Leone depends on technological provision, institutional credibility, affordability, and inclusive policy frameworks, providing policymakers and providers with valuable empirical insights.

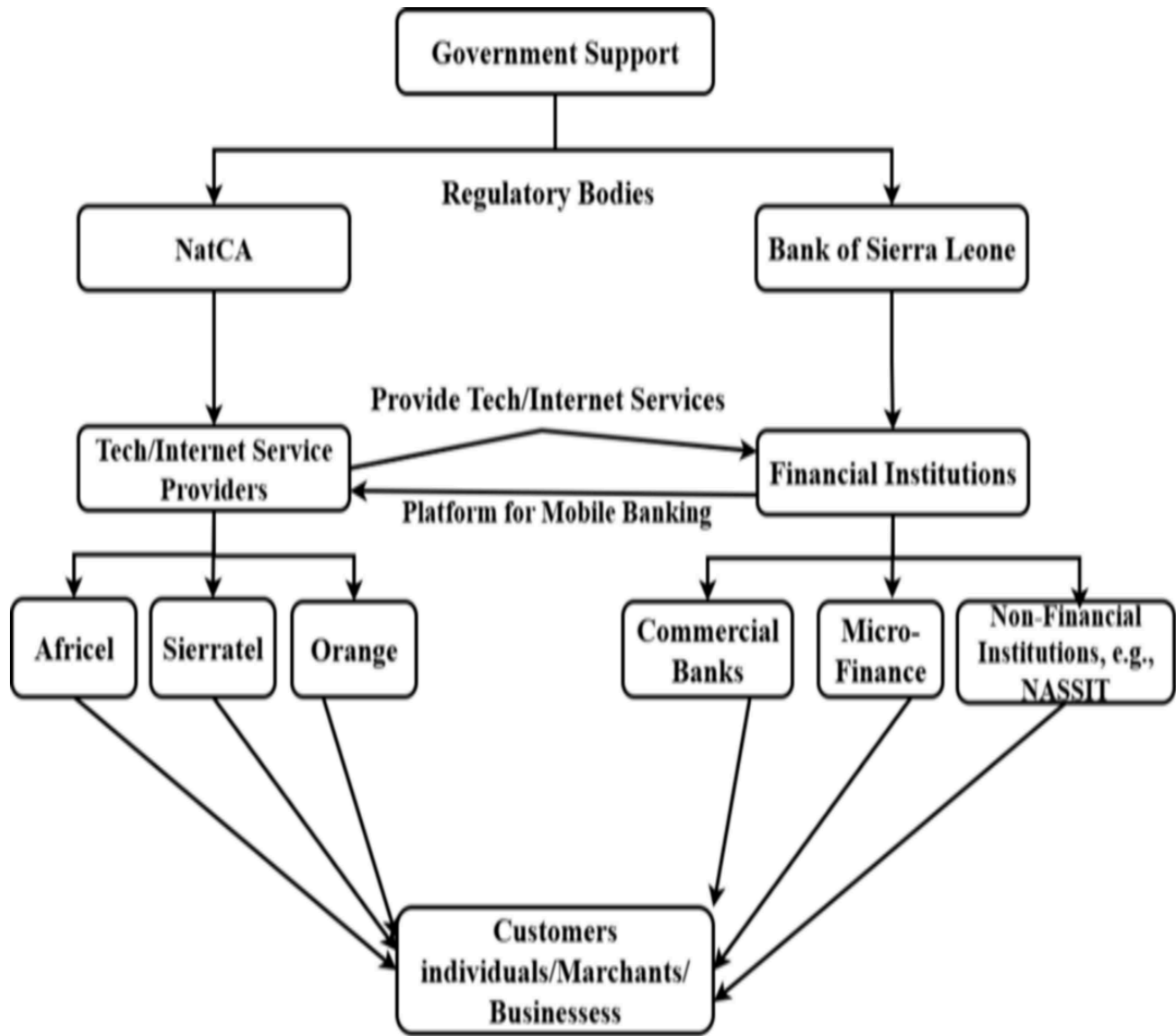


FIGURE 3: National Payment Switch System Ecosystem

Source: Author's own output

Discussion

This paper conceptualizes and tests a model that facilitates the implementation of the NPSS in Sierra Leone, incorporating the elements of CoT, Trust, GS, and FS. These results indicate that CoT and Trust have the most substantial direct effect on the ItU with a large percentage of explanatory power. Mediation analysis reveals that these effects are strengthened by

institutional support, with the pathway between Trust, FS, and ItU emerging as the most significant indirect effect. Collectively, the model performs well in terms of predictive validity ($Q^2 > 0.35$) and robustness relative to the benchmarks of linear regression, demonstrating its practical value.

These findings extend the existing literature in several ways. First, following the TAM and UTAUT, factors related to technology adoption include affordability and trust (Davis, 1989). Our findings also align with those of (Ammah et al., 2025), (Byambaa et al., 2025), and (Jafri et al., 2024), as they found that trust has a significant influence on user acceptance and intention to use new technology. Additionally, this research suggests an institutional mediation effect, indicating that situational perceptions of trust and transaction costs are highly influential in evaluating government and financial institutions among users, which aligns with the findings of (Ammah et al., 2025). Our findings complement the institutional theory and observed payment ecosystems. Second, the results support the trust-spillover-effect mechanism, as trust in the system increases trust in institutional agents. This aligns with previous studies, which have also indicated that the credibility, institutional reliability, and collaboration among digital finance platforms and government agencies are crucial for the adoption of digital finance in emerging economies (Ehret and Olaniyan, 2023) (Kemal and Shah, 2024) (Ng et al., 2024) (Sheng and Fauzi, 2023). Third, our research also examined access to NPSS adoption, which similarly indicates unequal access to adoption rates between urban and rural areas. These inequalities have a significant impact on the rate at which users accept and adopt new technology. We also observed that 52 percent of respondents in urban settings were aware of the adoption process, compared to 14 percent in rural areas, which is consistent with other literature on the digital divide in Sub-Saharan Africa (Ndoya and Asongu, 2024). This highlights the urgency of addressing region-specific interventions to facilitate inclusive adoption.

The demographic analysis also confirms previous research on the relationship between financial and digital literacy with adoption. Tertiary level of education is associated with a higher level of trust and intention, whereas the formal education level was poorly informed about NPSS. This validates that literacy and awareness campaigns play a critical role in filling the gaps related to adoption. This finding has also been replicated in various studies on digital adoption (Arakpogun et al., 2023) (Ndoya and Asongu, 2024) (Vurayai, 2024). Moreover, the perception of transaction costs is at the core of the perceived value, which aligns with the cost-benefit deliberations in innovation diffusion theory (Rogers, 2003).

Gender and Infrastructure Considerations in NPSS Adoption

Also, there are few contextual considerations to keep in mind when interpreting our findings. Nevertheless, the KIs provided clear institutional insights into the trust's anatomy, transaction costs, and coordination problems; they were primarily used to supplement and contextualize the quantitative findings rather than to develop explanatory variables. Similarly, gender disparities and variations in infrastructure, though recognized as indicators of digital financial inclusion, were not incorporated as fundamental variables in the model of analysis. The insights on gender were thus presented descriptively to define the characteristics of the respondent profile, and the infrastructure constraints were viewed as background conditions that determine the operating environment of the National Payment Switch and were thus not tested inferentially.

From our findings, female respondents were slightly underrepresented, reflecting broader structural barriers in access to formal financial services and digital technologies. Prior studies suggest that disparities in digital literacy, income stability, and access to mobile devices may influence adoption outcomes in similar settings. Infrastructure challenges, including network reliability and electricity stability, were also identified as background constraints affecting sustained system use rather than initial adoption. While these factors were not included as core constructs in the analytical model, they provide important context for understanding adoption dynamics and highlight areas for future research and policy intervention.

The noted gender differences provide valuable contextual information on NPSS adoption beyond the core institutional and economic factors discussed in the model. The low representation of female users and their relatively low use of digital payment systems probably indicate organizational limitations, including unequal access to mobile devices, low digital literacy, economic insecurity, and social and cultural standards that affect financial decision-making. These limitations can indirectly shape perceptions of trust and cost sensitivity, thereby determining adoption trajectories when gender is not explicitly modelled. The results support the existing literature by showing that women in developing economies often face multiple obstacles to digital financial inclusion, suggesting that institutional support systems should adopt gender-sensitive approaches to achieve equitable adoption outcomes.

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The infrastructural constraints also serve as enabling or constraining contexts, rather than the leading forces of adoption. Although users might be tempted to use the NPSS based on perceived cost-effectiveness, trust, and institutional support, in the long term, sustained utilization and user confidence can be affected by the ongoing failure of infrastructure due to unreliable connectivity and power supply. This finding makes sense of the fact that infrastructure has been considered a contextual issue in the current research, and it is important to co-invest in digital and energy infrastructure to go hand in hand with institutional reforms. The present model needs to be further elaborated in future studies that examine the use of gender and infrastructure as moderating factors in interactions with institutional support and trust in creating long-term adoption.

Furthermore, the results may also be interpreted in the context of DOI (Rogers, 2003), which posits that people adopt new technologies based on cost-benefit considerations. Within the context of our case, tertiary-educated users are in a better position to realize the comparative benefits of NPSS, including convenience, efficiency, and trust, and reduce the perceived costs. The less educated, on the other hand, have more cognitive and financial barriers to adoption, including low awareness and risk aversion, which is another barrier to adoption. Similar findings are also reported by (Vurayai, 2024), who believes that under-resourced universities in Sub-Saharan Africa struggle to address central issues, including the lack of digital literacy and high data costs, which further supports the idea that perceived barriers are one of the biggest obstacles to adoption. (Asongu et al., 2024) similarly demonstrate that access to technology is mediated by adult literacy. This finding supports the idea that literacy campaigns can reduce perceived adoption costs and create trust. These insights confirm that awareness efforts are not only necessary but also critical in shifting the cost-benefit equation in favour of adoption.

By combining these insights, the study contributes to an NPSS adoption framework (Figure 7) and a stakeholder ecosystem (Figure 3), which enriches the existing theoretical background (TAM, UTAUT, DOI, and institutional trust literatures) without duplicating these theoretical contributions. Additionally, it provides empirical data drawn from Sierra Leone. The results suggest that policy interventions should prioritize cost reduction, trust-building, and regional access in policy formulation and implementation. Institutional actors, especially the government and financial institutions, should play a proactive role in addressing users' concerns, rather than merely facilitating them.

Policy Implications for Stakeholders

The results highlight several actionable measures to accelerate the adoption of NPSS in Sierra Leone:

First, minimize transaction costs: As CoT has the most significant effect on ItU, consideration should focus on reducing transaction costs and creating a clear understanding of the cost savings that are in place. This is similar to the DOI, where affordability becomes a factor (Rogers, 2003).

Second, build and sustain trust: Trust has a direct impact on adoption as well as an indirect positive impact on fighting perceptions of government and financial institution support. As in previous research on institutional credibility, these must include transparent governance, predictable service delivery, and consumer protection structures. Trust also fosters a sense of reliability within institutions. Insistence on campaigns that strengthen system security and transparency can have a multiplicative effect on other institutional touchpoints.

Third, enhance institutional intervention: There is a mediation effect between GS and FS, underlining the fact that the influence of institutions is not inherent but an active force during adoption. Government and financial institutions must coordinate their policies and outreach efforts to catalyze user engagement.

Fourth, bridge the urban-rural divide: Adoption (gaps 52.7% awareness in urban areas vs. 14.8% in rural areas) points to the need for targeted outreach, infrastructure development, and education campaigns that focus on rural areas. This aligns with the findings on digital inclusion in Sub-Saharan Africa (Osabutey and Jackson, 2024).

Fifth, increase financial and digital literacy: People with a higher level of education were more likely to have higher adoption intentions, whereas those who are not formally educated were largely unaware of NPSS. The significant factors contributing to equitable acquisition are financial literacy programs, community outreach, and adult education.

Finally, leverage the collaboration of non-financial institutions: The inclusion of organizations like NASSIT and mobile service providers into NPSS can enhance the ecosystem and normalize usage through regular transactions, as seen in ecosystem-based approaches to digital finance (Ng et al., 2024).

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Limitations of the study

Despite its contributions, this study has several limitations. First, the cross-sectional design restricts causal interpretations, as it captures user behavior at a single point in time. Second, while purposive sampling ensured institutional representation, it may limit the generalizability of the findings to the broader population. Third, the study focused on self-reported perceptions, which can be affected by respondent subjectivity and social desirability bias. Fourth, the research was conducted in a single national context, Sierra Leone, which may not reflect the complexities of NPSS adoption in other developing countries. Finally, although gender and infrastructure factors are recognized as key elements in digital financial inclusion, they were not incorporated as core constructs in the analytical model. Consequently, these factors were described at a contextual level rather than subjected to inferential analysis. Future research may extend the model to explicitly examine demographic and infrastructural moderators of National Payment Switch adoption

Conclusions

This empirical study was a comprehensive exploration of the determinants that informed the implementation of NPSS in Sierra Leone, conducted using a combined socio-technical and institutional theoretical framework. These findings categorically demonstrated the dominance of transaction costs as the ultimate direct predictor of user intention to adopt, thereby underscoring affordability as the most influential factor in adoption. At the same time, trust had a substantively positive impact on usage intention, which in turn strongly affected perceptions of government and financial institution support. In addition, both types of institutional support had substantial direct effects on adoption, to some extent moderating the relationships among transaction costs, trust, and adoption intention; this highlights the focal role of institutional credibility in transforming user perceptions into tangible adoption intentions. Its structural model demonstrated strong predictive validity and explanatory power, indicating its methodological efficacy in explaining NPSS adoption behaviour. Overall, these results suggest that the intersection of affordability, trust, and institutional support within the payment ecosystem shapes the implementation of the NPSS in Sierra Leone

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Appendices

Questionnaire for National Payment Switch System in Sierra Leone		
	Dear Participants: This survey aims to explore the factors that influence National Payment Switch adoption in Sierra Leone. Participation is voluntary, responses are confidential, and data will be used solely for academic purposes. The survey takes about 10 minutes, and participants can withdraw at any time. By agreeing to proceed, participants confirm their voluntary consent, anonymity, and understanding of the study's purpose. For questions or concerns, please contact us at sesaymoussa87@gmail.com	
Note	Why the National Payment Switch System? This system will allow customers to perform transactions across different banks without needing multiple bank accounts or cards. It also promotes financial inclusion and innovative solutions that simplify the banking system.	
	Biodata	
	Question	Options
Q1	Age (please select one)	18-24, 25-35, 36-45, 46+
Q2	Gender (please select one)	Male, Female
Q3	Educational Level (please select one)	No Schooling, WASC/GCE Certificate, College Certificate, National Diploma (ND), Higher National Diploma (HND), Bachelor's Degree, Master's Degree, PhD
Q4	Location/Province (please select one)	Western Area, Urban Western Area, Rural North-West, North-East, Eastern, Southern
Q5	Sector (please select one) (Note: Non-profit sector includes NGOs, donor agencies, etc.)	Public Sector Workers, Non-Profit Sector Workers, Students, Business owners, Private Sector Workers (Banks, hotels, schools, etc.)
Q6	Are you aware of the National Payment Switch System Adoption by the Bank of Sierra Leone? (please select one)	Yes, No
Q7	If yes, where did you hear about the system? (This a multiple-choice question; you can select more than one.)	Radio, Television, Newspaper, Outreach Campaign (Community sensitization), Facebook, WhatsApp, Twitter, Others

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SECTION B: INFLUENCING FACTORS OF NATIONAL PAYMENT SWITCH ADOPTION						
Code	TRUST Carefully read the following statements and state your level of agreement or disagreement. Note that Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1	Options				
		1	2	3	4	5
T1	The National Payment Switch System will be secure for financial transactions					
T2	I trust that the system will operate transparently once implemented					
T3	I expect the Switch System to protect users' financial and personal information					
T4	I have confidence in the banks implementing the National Payment Switch System					
T5	The National Payment Switch System will be a trustworthy platform for payment services					
T6	The National Payment Switch System will be secure for financial transactions					
Code	GOVERNMENT SUPPORT Carefully read the following statements and state your level of agreement or disagreement. Note that Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1	Options				
		1	2	3	4	5
GS1	The government's commitment is crucial to ensuring the success of the Switch System					
GS2	Government policies will play an essential role in encouraging the system's adoption					
GS3	I trust the government will adequately promote national Payment Switch System awareness					
GS4	I expect the government to provide resources or support to help users adopt the system					
GS5	The government's involvement gives me confidence in the reliability of the National Payment Switch System					
Code	FINANCIAL SUPPORT Carefully read the following statements and state your level of agreement or disagreement. Note that Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1	Options				
		1	2	3	4	5
FS1	Financial institutions in Sierra Leone will actively promote the National Payment Switch System					
FS2	My bank will provide information on how to use the system when it is launched					

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FS3	Financial institutions' support to help users integrate the System with their accounts is crucial					
FS4	Financial institutions should encourage clear communication about the system					
FS5	Financial institutions' collaboration will ensure a smooth adoption of the system					
Code	COST OF TRANSACTION: Carefully read the following statements and state your level of agreement or disagreement. Note that Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1	Options				
		1	2	3	4	5
CoT1	The transaction fees for the National Payment Switch System will be affordable					
CoT2	The system's cost will be lower than other payment methods					
CoT3	The system will provide good value for the cost of its services					
CoT4	The system's pricing structure will be transparent and easily understood					
CoT5	The cost of transactions will not prevent users from using the system					
	SECTION C:					
Code	INTENTION TO USE: Carefully read the following statements and state your level of agreement or disagreement. Note that Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1	Options				
		1	2	3	4	5
ItU1	The National Payment Switch System will meet user expectations for reliable payment services					
ItU2	The system will provide a satisfactory experience for first-time users					
ItU3	The system will deliver fast and efficient transactions					
ItU4	The system will provide solutions for inter-bank payments in Sierra Leone					
END	Thank you for your support! The End					

TABLE 12: Questionnaire for Factors Influencing the National Payment Switch System in Sierra Leone

Source: Author's own work

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Key Informant Interview (KII) Guide
Study Title: Analysis of Factors Influencing the National Payment Switch Adoption in Sierra Leone
A. Introduction Script Good [morning/afternoon], and thank you for agreeing to participate in this interview. My name is [Interviewer's Name], and I am conducting a study on the factors influencing the adoption of the National Payment Switch System (NPSS) in Sierra Leone. The purpose of this interview is to gather insights from key stakeholders like yourself to better understand opportunities, challenges, and recommendations for effective NPSS adoption. Your perspective will help shape policy recommendations and strengthen the financial ecosystem.
B. Consent Statement Your participation is voluntary, and you may choose to stop the interview at any time. The discussion will remain confidential, and no information will be linked to you personally in any report. The interview will take approximately 20–35 minutes. With your permission, I may take notes or record the discussion for accuracy. Do you consent to proceed? Yes/No
C. Stakeholder-Specific Interview Questions
1. Regulators (Bank of Sierra Leone, NATCOM, Ministries) Can you describe your institution's role in the NPSS ecosystem? What safeguards are being implemented to ensure security and transparency in NPSS transactions? How effective are current government policies and regulations in supporting NPSS adoption? What challenges do you foresee in monitoring compliance across institutions? In your opinion, how will NPSS promote financial inclusion, particularly in rural Sierra Leone? What additional support or reforms are needed for NPSS sustainability?
2. Financial Institutions (Banks, Microfinance, Fintechs, Mobile Money Operators) How is your institution preparing to integrate with NPSS? What role will you play in building Customer trust and awareness? How do you expect NPSS to impact transaction costs for both institutions and customers? What infrastructural or operational challenges do you anticipate? How might NPSS create opportunities for new financial products or services? What support do you expect from the government and regulators?
3. Technology Providers (IT Companies, Telecoms) What technical role does your organization play in NPSS? How will interoperability between banks, mobile money, and fintechs be ensured? What strategies are in place to guarantee system reliability and cybersecurity? What infrastructural challenges (e.g., connectivity, rural coverage) may affect NPSS adoption? How should technology providers collaborate with regulators and financial institutions for success?
4. End-Users (Business Owners, Workers, Students, Rural Populations) Have you heard of NPSS? If yes, from which source? What are your expectations from such a system? Do you trust banks and mobile operators to safeguard your information? How important is the affordability of transaction fees in influencing your adoption decision? What challenges do you currently face when making digital payments or transfers? What would make you confident enough to adopt NPSS (e.g., training, government endorsement, reduced costs)? Which communication channels (radio, TV, outreach campaigns, social media) are best for sensitization in your community?
D. Closing Thank you very much for your valuable time and insights. Your contribution will help policymakers, regulators, and financial institutions develop more effective strategies for the successful adoption of NPSS in Sierra Leone.

TABLE 13: Key Informant Interview (KII) Guide

Author's own work (2025)

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Mohamed Mousa Sesay , Aminata Klah

Acquisition, analysis, or interpretation of data: Mohamed Mousa Sesay

Drafting of the manuscript: Mohamed Mousa Sesay , Aminata Klah

Critical review of the manuscript for important intellectual content: Mohamed Mousa Sesay

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Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. Yunnan University of Finance and Economics issued approval (YUFE/RES/AD/2024/NPSS-017). This research received ethical approval from the Yunnan University of Finance and Economics Ethical Approval Committee, confirming compliance with institutional guidelines and ethical standards, ensuring participant consent, confidentiality, and protection throughout the research process. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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