The role of service quality in automated health systems on customer satisfaction: Evidence from National Social Security Fund (NSSF) Ilala, Dar es Salaam, Tanzania

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ABSTRACT

Healthcare systems worldwide are increasingly adopting automation to enhance service delivery, yet the relationship between automated service quality and customer satisfaction remains underexplored in developing contexts. This study examined how assurance and reliability dimensions of automated processing procedures influence customer satisfaction among National Social Security Fund (NSSF) beneficiaries accessing Social Health Insurance Benefit (SHIB) services in Ilala, Dar es Salaam, Tanzania. Grounded in the Service Quality (SERVQUAL) model, the study employed a descriptive research design with a quantitative approach. From the target of 490 beneficiaries, a sample of 220 NSSF beneficiaries was selected using Yamane's formula and simple random sampling. Data were collected through structured questionnaires using a five-point Likert scale and analyzed using descriptive statistics and multiple regression analysis via SPSS version 23. Results revealed that both assurance ($\beta = 0.482$, $p < 0.001$) and reliability ($\beta = 0.317$, $p = 0.001$) significantly and positively influenced customer satisfaction, jointly accounting for 45% of the variance ($R^2 = 0.450$). Assurance, operationalized through security, confidentiality, and trust; demonstrated a stronger predictive effect than reliability which was undermined by occasional system downtimes and technical failures. These findings underscore the critical importance of robust assurance mechanisms and consistent system reliability in enhancing satisfaction with automated health insurance processes. The study recommends strengthening data protection protocols, improving system uptime through real-time monitoring and preventive maintenance, providing continuous training for healthcare agents, and conducting periodic system audits to sustain efficiency, trust and satisfaction. These insights contribute to theory by reinforcing the SERVQUAL model's applicability in health insurance automation contexts and offer practical strategies for improving automated healthcare systems in Tanzania and similar developing economies.

Keywords: Automated Health System, Customer Satisfaction, NSSF, Service Quality, SHIB

I. INTRODUCTION

The global healthcare landscape has undergone substantial transformation through digital innovation and automation, fundamentally reshaping medical infrastructure, service delivery mechanisms and patient experiences. The World Health Organization (WHO) emphasizes that digital health technologies represent essential tools for achieving universal health coverage and improving health outcomes, particularly in resource constrained settings (WHO, 2020). In developing countries such as Tanzania, the integration of automated health systems has become increasingly critical for addressing longstanding challenges related to healthcare accessibility, timeliness at the hospitals and quality of service provision that offered to beneficiaries. These technological interventions aim to reduce issues of administrative burdens, minimize human error that produces services and enhance the efficiency of healthcare delivery systems.

The National Social Security Fund (NSSF) established under the NSSF Act (Chapter 50, Revised Edition 2018) extending health insurance coverage to its members through the Social Health Insurance Benefit (SHIB) program by providing medical coverage for insured persons, their spouses and up to four dependents. NSSF has partnered with accredited medical providers nationwide and adopted automated health systems to ensure efficient delivery of medical benefits. According to Kwesigabo et al. (2019), these partnerships represent significant steps toward modernizing Tanzania's social security healthcare framework. Despite these technological advancements, concerns persist regarding the effectiveness of NSSF's automated health systems in meeting beneficiaries' expectations. Khamis and Nhamo (2021) argue that poorly managed systems can precipitate dissatisfaction among insured members. While automation was expected to reduce waiting times, improve processing efficiency and enhance satisfaction levels; customer satisfaction

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is influenced not only by system availability but also by perceptions of reliability, security, trustworthiness and service quality dimensions.

The SERVQUAL model developed by Parasuraman et al. (1988), identifies five core dimensions of service quality: assurance, reliability, empathy, responsiveness and tangibility that applied across diverse service sectors to predict customer satisfaction. Within healthcare contexts, assurance and reliability emerge as particularly salient dimensions. Assurance encompasses the knowledge, courtesy and ability of service providers to inspire trust and confidence, while reliability refers to the ability to perform promised services dependably and accurately. Recent empirical evidence highlights that confidentiality and data protection are central to building patient trust in automated systems (Esmaeilzadeh, 2019), while accuracy and transparency improve user confidence (Williamson & Prybutok, 2024). Furthermore, trust mediates the relationship between service quality and satisfaction, underscoring the critical importance of assurance in digital healthcare adoption (Akter et al., 2013). Specifically, beneficiaries in Ilala district have reported dissatisfaction stemming from long waiting times, limited availability of specialized healthcare services, and inconsistent quality of care across different accredited healthcare providers (United Republic of Tanzania, 2024).

A critical examination of existing literature reveals significant research gaps. Previous studies have explored various dimensions of customer satisfaction within the NSSF context in Tanzania; focusing on general challenges, influencing factors and satisfaction levels (Kidola, 2022). However, these studies have largely overlooked the specific effects of service quality dimensions particularly assurance and reliability on customer satisfaction within automated health service processing procedures. This gap is problematic because automated systems fundamentally alter the service delivery landscape, introducing new dynamics in how service quality is perceived and experienced by beneficiaries. Understanding these dynamics is essential for optimizing system design, improving user experiences and ensuring that technological investments translate into meaningful satisfaction improvements. This study addresses these gaps by investigating the role of assurance and reliability dimensions in shaping satisfaction with automated health systems at NSSF Ilala, Dar es Salaam, Tanzania.

1.1 Statement of the Problem

NSSF extending health coverage to its members by partnered with accredited medical providers and adopted health systems to ensure efficient delivery of medical benefits, reduce waiting times, improve processing efficiency and to ensure customer satisfaction. However, despite these significant advancement in digital healthcare services in Ilala, Dar es Salaam; concerns persist regarding the effectiveness of enhancing customer satisfaction. The study suggests that, the quality dimensions especially assurance and reliability play crucial role in shaping customer satisfaction within automated healthcare system (Parasuraman et al., 1988). Existing studies on social health service delivery have largely overlooked these specific dimensions. This study addresses this gap by examining how assurance and reliability of automated health service's processing procedures influence customer satisfaction at NSSF Ilala, Dar es Salaam in order to inform improvements in digital healthcare delivery and optimize beneficiaries' outcomes.

1.2 Research Objective

To examine the influence of assurance and reliability in automated health services' processing procedures on customer satisfaction

II. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Service Quality (SERVQUAL) Model

The Service Quality (SERVQUAL) Model developed by Parasuraman et al. (1988), remains one of the most influential and widely applied frameworks for evaluating service quality and customer satisfaction across diverse service sectors. The model emerged from seminal research seeking to explain the gap between customer expectations and their perceptions of actual service delivery. It posits that service quality is fundamentally determined by the discrepancy between these two constructs what customers expect versus what they perceive they receive. The SERVQUAL model operationalizes this concept across five distinct dimensions: tangibles (physical facilities, equipment, and appearance of personnel), reliability (ability to perform the promised service dependably and accurately), responsiveness (willingness to help customers and provide prompt service), assurance (knowledge and courtesy of employees and their ability to inspire trust and confidence) and empathy (caring, individualized attention provided to customers). The model provides a structured framework for identifying and addressing gaps between customer expectations and actual service performance that enabling organizations to pinpoint specific areas requiring improvement (Ladhari, 2009). This diagnostic capability makes SERVQUAL particularly valuable for service quality management and continuous improvement initiatives. However, the model also has recognized limitations as it may not fully capture the complexities

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of service quality in different cultural contexts or adequately account for all factors influencing customer satisfaction in specific service environments (Al-Assaf et al., 2024)

Despite these limitations, recent scholarship has reinforced the continued relevance of SERVQUAL in contemporary digital healthcare contexts. Smith and Johnson (2021) demonstrate that SERVQUAL effectively assesses how healthcare automation aligns with patient expectations, providing valuable insights for system design and implementation. Similarly, (Alharbi et al., 2024) emphasize the need for contextual adaptation when measuring service quality in evolving technological environments, suggesting that while the core dimensions remain relevant, their operationalization may require adjustment for digital service contexts. In automated health systems, assurance and reliability emerge as particularly critical dimensions. Assurance that encompassing trust, security, and confidentiality; becomes paramount when personal health information is processed through digital platforms. Reliability that involving system consistency, accuracy and stability; directly affects user confidence in automated processes.

In the context of this study, which evaluates the role of assurance and reliability in automated health systems on customer satisfaction among NSSF beneficiaries in Ilala region, the SERVQUAL model provides a highly relevant theoretical framework. It allows for detailed analysis of how these specific dimensions of automated health systems align with beneficiaries' expectations and perceptions. By applying SERVQUAL, the study can systematically identify gaps in service delivery, assess the effectiveness of SHIB processing procedures and provider performance, and offer evidence-based, actionable insights to enhance customer satisfaction (Smith & Johnson, 2021). The model's focus on perceptual measures aligns well with the study's objective of understanding beneficiary experiences with automated systems, making it an appropriate theoretical lens for this investigation.

2.2 Empirical Review

2.2.1 Influence of Assurance and Reliability in Automated Processing Procedures on Customer Satisfaction

Empirical evidence increasingly demonstrates that assurance (encompassing trust, security and confidentiality) and reliability (involving consistency, accuracy and system stability) constitute central determinants of customer satisfaction in digital health contexts. However, findings vary across contexts and methodological approaches, revealing nuanced relationships between these service quality dimensions and satisfaction outcomes.

Ahmed et al. (2021) investigated the impact of Islamic Shariah compliance on customer satisfaction in Islamic banking services, focusing on service quality's mediating role. Using data from 384 respondents analyzed through SEM, findings revealed that service quality significantly mediated the relationship between Shariah compliance and customer satisfaction. While conducted in a banking rather than healthcare context, this study provides valuable insights into how assurance-related dimensions (trust, confidence in institutional integrity) operate in service sectors involving sensitive personal information and financial transactions. The banking-healthcare parallel is instructive because both sectors require high levels of trust and confidentiality, suggesting that assurance mechanisms proven effective in banking contexts may transfer to healthcare insurance applications.

Dagger et al. (2007) proposed a hierarchical approach to conceptualizing perceived service quality, suggesting that service quality operates at multiple levels including interaction quality, physical environment quality, and outcome quality. Their theoretical framework, while developed before widespread healthcare automation, provides valuable conceptual foundations for understanding how different service quality dimensions may operate with differential importance depending on service context. Applied to automated health insurance, their framework suggests that outcome quality (accuracy; reliability of processing results) and interaction quality (trust; assurance in system interactions) may constitute primary determinants of satisfaction, while physical environment quality becomes less relevant in digital contexts.

Ladhari (2009) conducted a comprehensive review of twenty years of SERVQUAL research, examining the model's applications across diverse service contexts and cultures. The review identified 429 articles using SERVQUAL, revealing widespread adoption but also highlighting contextual variations in dimension importance. Ladhari noted that reliability consistently emerged as the most critical dimension across service contexts, though its relative importance varied. Assurance's importance appeared particularly elevated in contexts involving risk, uncertainty, or sensitive information – characteristics that strongly apply to healthcare and health insurance services. This meta – analytic perspective supports the current study's focus on assurance and reliability as particularly salient dimensions in automated health insurance contexts.

Fenny et al. (2021) assessed social health insurance schemes across multiple African countries, examining outcomes and impacts on healthcare access and satisfaction. Their comprehensive review of health insurance implementations in Ghana, Kenya, Nigeria and Tanzania revealed common challenges including administrative inefficiencies, delayed claims processing, and inadequate communication with beneficiaries. The study emphasized that successful health insurance schemes require robust administrative systems characterized by reliability (consistent and timely processing) and assurance (transparent communication and trust-building). Importantly, their findings

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demonstrated that automated systems, when properly implemented; can address many administrative challenges while simultaneously requiring careful attention to data security and system stability to maintain beneficiary trust.

Mgaya and Gwahula (2024) examined the effect of service quality on customer satisfaction at St. Joseph Referral Hospital-Peramiho in Tanzania using Structural Equation Modeling (SEM) with 123 respondents. Their findings revealed that tangibility, reliability, responsiveness, assurance and empathy all had significant effects on customer satisfaction. Specifically, reliability demonstrated a strong positive association with customer satisfaction, with factor loadings exceeding 0.900 for reliability items. The study emphasized that healthcare services' unique nature requires consistent, dependable service delivery to maintain patient satisfaction. These findings from a Tanzanian healthcare context provide important baseline evidence for understanding service quality dynamics in East African healthcare settings.

Mboera et al. (2021) investigated the digital transformation of healthcare systems in Tanzania, identifying both opportunities and challenges in implementing automated health technologies. Their comprehensive review highlighted that while digital health initiatives offer potential for improved efficiency and accessibility, significant challenges exist including infrastructure limitations, technical capacity gaps, and user acceptance issues. The study emphasized that successful digital health implementation requires addressing both technical reliability concerns and building user trust through transparent, secure systems. These findings provide crucial context for understanding the specific challenges facing automated health insurance systems in Tanzania, where infrastructure and capacity constraints may affect both reliability and assurance dimensions.

Collectively, these empirical studies reveal three critical research gaps that the current study addresses. First, while assurance and reliability have been explored extensively in various digital health contexts internationally, limited empirical evidence exists specifically examining their influence within automated health insurance systems in Tanzania. The available Tanzanian studies (Mboera et al., 2021; Mgaya & Gwahula, 2024) focus on hospital – level systems or general digital health transformation rather than social health insurance automation.

Second, much existing literature has concentrated on general digital healthcare perceptions or hospital information systems, overlooking structured social health insurance schemes that involve complex interactions among fund administrators, accredited medical providers, and beneficiaries. These systems present unique service quality challenges distinct from direct healthcare delivery contexts. Third, while the SERVQUAL model has been applied across diverse service sectors, its application to automated health insurance in African contexts remains limited, leaving questions about dimensional importance and contextual adaptations unresolved.

This study therefore addresses these gaps by applying the SERVQUAL model to examine the specific influence of assurance and reliability dimensions on customer satisfaction with automated processing procedures in SHIB under the NSSF in Ilala, Dar es Salaam. In doing so, it contributes to deeper understanding of how automation affects efficiency, trust, and satisfaction in national health insurance systems while offering practical, evidence-based recommendations for strengthening automated health service delivery in Tanzania. The study extends existing knowledge by focusing on a previously underexplored context (national health insurance automation) and by explicitly examining the comparative influences of assurance versus reliability dimensions within this specific context.

III. METHODOLOGY

This study adopted a descriptive research design with a quantitative approach to examine the influence of service quality dimensions on customer satisfaction among NSSF beneficiaries. The descriptive research design was selected because it enables systematic description of characteristics of a population or phenomenon being studied, allowing researchers to assess current status of variables and their relationships without manipulation. This design involved collecting data at a single point in time to assess current levels of service quality perceptions and customer satisfaction, examining their relationships while maintaining objectivity. The quantitative approach emphasized the use of objective measurements, numerical data, and statistical analysis to test hypothesized relationships between variables (Creswell & Creswell, 2018).

The target population comprised social health insurance beneficiaries registered with NSSF and accessing services through the SHIB program in Ilala district, Dar es Salaam. According to NSSF regional records, approximately 490 active beneficiaries regularly utilized SHIB services in Ilala district during the study period. This population was selected because beneficiaries represent the primary users of automated processing systems and therefore possess direct experiential knowledge of service quality dimensions under investigation. Their perspectives are essential for understanding how automated systems perform in practice and how service quality influences satisfaction outcomes.

Sample size determination employed Yamane's (1967) formula, which is appropriate for finite populations in quantitative studies. The formula is expressed as:

$$n = N / (1 + Ne^2)$$

Where:

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n = Sample size
N =Population size of 490,
e = Margin of error (0.05)

Hence:

$n = 490 / (1+ 490 \times 0.05^2)$

n = 220

Therefore, the sample size for quantitative data collection was 220 NSSF beneficiaries. This sample size provides adequate statistical power for detecting meaningful relationships while remaining practically feasible for data collection within resource and time constraints.

Simple random sampling was employed to select the 220 beneficiaries from the sampling frame of 490 active SHIB users. This probability sampling technique ensures that each beneficiary in the population has an equal and independent chance of being selected, thereby minimizing selection bias and enhancing the representativeness of the sample (Ryman, 2021).

The sampling procedure involved obtaining the list of active beneficiaries from NSSF Ilala office, assigning each beneficiary a unique identification number, and using computer-generated random numbers to select participants. This approach strengthens the external validity of findings by ensuring the sample accurately reflects characteristics of the broader beneficiary population.

Data were collected through structured questionnaires designed specifically for this study. The questionnaire employed a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to measure respondents' perceptions of service quality dimensions and satisfaction levels. Likert scales are widely used in service quality research because they allow collection of standardized data measuring attitudes, perceptions, and opinions while minimizing researcher bias and variation in data collection, leading to more objective and comparable results (DeVellis, 2017). The questionnaire comprised four main sections: demographic characteristics (gender, age, marital status and education level), assurance-related items (security, confidentiality, trust and accuracy), reliability-related items (consistency, error frequency, cross-platform functionality), and customer satisfaction items (overall satisfaction, service quality perception and recommendation likelihood).

Instrument validity was established through multiple approaches. Content validity was achieved by having three experts in health management and service quality research thoroughly review questionnaire items. These experts assessed whether items adequately represented the constructs being measured and provided feedback for refinement. Their input confirmed that items effectively captured key dimensions of assurance, reliability, and customer satisfaction. Face validity was established by pre-testing the survey instrument with 22 participants (10% of the sample size), following recommendations by DeVellis (2017). This pilot test verified that items were clear, understandable, and relevant to respondents' experiences with automated SHIB services. Feedback from pilot participants led to minor wording adjustments to enhance clarity and cultural appropriateness.

Instrument reliability was assessed using Cronbach's alpha coefficient, with a threshold set at $\alpha > 0.70$ as recommended for social science research (Nunnally & Bernstein, 1994). This statistical measure evaluates internal consistency of survey items, ensuring that items within each scale consistently measure the same underlying construct. Pilot test results yielded Cronbach's alpha values of 0.86 for assurance items, 0.82 for reliability items, and 0.88 for customer satisfaction items, all exceeding the 0.70 threshold and indicating satisfactory reliability. These reliability coefficients provide confidence that the measurement instrument consistently captures the intended constructs across different respondents.

Data analysis employed both descriptive and inferential statistical techniques using the Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics including frequencies, percentages, means, and standard deviations were calculated to summarize demographic characteristics and describe levels of assurance, reliability, and customer satisfaction among respondents. These descriptive analyses provide foundational understanding of the sample composition and variable distributions. Inferential statistics, specifically multiple regression analysis, were employed to test hypothesized relationships between independent variables (assurance and reliability) and the dependent variable (customer satisfaction). Multiple regression analysis is appropriate because it allows simultaneous examination of multiple predictors' effects on an outcome variable while controlling for other factors, providing coefficients that indicate the strength and direction of relationships (Field, 2013).

Prior to regression analysis, diagnostic tests were conducted to verify that data met statistical assumptions. These included tests for normality (Kolmogorov-Smirnov test), linearity (scatterplots), multicollinearity (Variance Inflation Factor), and homoscedasticity (residual plots). All assumptions were satisfactorily met, supporting the appropriateness of regression analysis for hypothesis testing.

The study upheld rigorous ethical standards throughout all research phases. Research clearance was obtained from the College of Business Education research ethics committee and permission was secured from NSSF headquarters and Ilala regional office to access beneficiaries and conduct the study. Informed consent was obtained from all

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participants before data collection, with clear explanations provided regarding study purposes, voluntary participation, right to withdraw, and data confidentiality. Participants' identities and personal information were kept strictly confidential, with no names or identifying information disclosed in data presentation or reporting. Data were stored securely and accessed only by research team members. These ethical practices ensure protection of participants' rights and well-being while maintaining research integrity and credibility.

IV. FINDINGS & DISCUSSION

4.1 Demographic Characteristics of Respondents

This section presents demographic characteristics of the 220 NSSF beneficiaries who participated in this study. Understanding demographic composition provides important context for interpreting findings and assessing the representativeness of the sample relative to the broader beneficiary population. Demographic variables examined include gender, marital status, age and education level, all of which may influence perceptions of service quality and satisfaction with automated health systems. The demographic profile of the 220 NSSF beneficiaries reveals a representative sample of active social health insurance users in Ilala, Dar es Salaam.

4.1.1 Gender of Respondent

Gender distribution was nearly balanced; with females slightly outnumbering males (50.9% vs. 49.1%) as shown in Table 1, ensuring inclusivity of perspectives and minimizing potential gender bias in service quality evaluations. Research suggests that gender may influence healthcare service expectations and satisfaction evaluations (Ahmed et al., 2021); hence making balanced representation methodologically important.

Table 1

Gender of Respondents

Gender	Frequency	Percent %
Male	108	49.1
Female	112	59.9
Total	**220**	**100.0**

4.1.2 Marital Status of Respondent

From table 2 below, it shows that the majority of respondents were married (81.4%), suggesting they likely manage healthcare needs for multiple family members, which increases their interaction frequency with automated SHIB systems and enhances the depth of their experiential insights. Married individuals, particularly those with dependents covered under SHIB, may have heightened awareness of and engagement with health insurance processes and service quality.

Table 2

Marital Status of Respondents

Marital Status	Frequency	Percent %
Single	36	16.4
Married	179	81.4
Divorced	4	1.8
Widow	1112	0.5
Total	**220**	**100.0**

4.1.3 Age of Respondent

Age distribution concentrated in economically active groups, with the largest proportion aged 36-45 years (47.3%), followed by 26-35 years (36.4%) and 46-55 years (16.4%) as shown in Table 3. This working-age demographic represents core NSSF contributors who regularly engage with automated health insurance services and possess sufficient digital literacy to navigate technological systems effectively. These age groups are particularly relevant because they are likely to be digital technology users with experience navigating automated systems; making their evaluations of automated health insurance services especially informative.

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Table 3
Age of Respondents

Age of Respondents	Frequency	Percent %
26 – 35	80	36.4
36 – 45	104	47.3
46 – 55	36	16.4
Total	**220**	**100.0**

4.1.4 Age of Respondent

In Table 4 it shows that, educational attainment was notably high, with over three-quarters holding university degrees (76.4%), while 16.4% completed secondary education and 7.3% attended college. This educational profile indicates that most respondents possessed substantial educational backgrounds, likely conferring adequate literacy, technological competence, and capacity to navigate automated systems (DeVellis, 2017). Higher education levels may correlate with higher service quality expectations and more sophisticated evaluations of system performance. The predominance of university-educated respondents suggests the sample comprises individuals capable of providing nuanced, informed assessments of service quality dimensions. However, this educational skew also constitutes a potential limitation, as the sample may underrepresent less educated beneficiaries who might experience different challenges or hold different perceptions regarding automated systems.

Table 4
Education Level of Respondents

Level of Education	Frequency	Percent %
Secondary	36	16.4
College	16	7.3
University	168	76.4
Total	**220**	**100.0**

4.2 Descriptive Analysis: Influence of Assurance and Reliability on Customer Satisfaction

Table 5 presents comprehensive descriptive statistics for all items measuring assurance, reliability and their perceived influence on customer satisfaction. Note: SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly Disagree.

Table 5
Descriptive Statistics for Assurance and Reliability Dimensions

Statement	SA (%)	A (%)	N (%)	D (%)	SD (%)	Mean	SD
The automated system ensures security and confidentiality of my data	30.9	56.4	10.9	0.0	1.8	4.15	0.75
The automated service processes are accurate	23.6	63.6	9.1	3.6	0.0	4.07	0.68
Automated systems are consistent and rarely experience technical failures	10.9	52.7	25.5	9.1	1.8	3.62	0.86
Automated system functions reliably across different times and platforms	23.6	58.2	12.7	3.6	1.8	3.98	0.82
I trust the quality and outcome of the automated processing procedure	34.5	47.3	10.9	3.6	3.6	4.05	0.96
Overall Mean						**3.97**	

Data collected were analyzed using descriptive statistics including mean scores and standard deviations, providing insights into respondents' perceptions of assurance and reliability dimensions within NSSF's automated healthcare systems. To facilitate interpretation, mean values were mapped to descriptive categories using the following scale: 1.00-1.80 = Strongly Disagree; 1.81-2.60 = Disagree; 2.61-3.40 = Neutral; 3.41-4.20 = Agree; 4.21-5.00 = Strongly Agree. This interpretation framework allows clear understanding of whether respondents generally agree or disagree with statements regarding service quality dimensions.

The descriptive findings presented in Table 5 reveal several important patterns regarding how beneficiaries perceive assurance and reliability dimensions of automated processing procedures at NSSF. First, regarding assurance-related perceptions, a substantial majority of respondents expressed strong agreement that the automated system ensures security and confidentiality of their data (mean = 4.15, SD = 0.75). Specifically, 87.3% of respondents either agreed or strongly agreed with this statement, indicating widespread confidence in data protection mechanisms. This finding is encouraging as it suggests that NSSF's automated systems have successfully established foundational trust; regarding information security which constitutes a critical prerequisite for trust in digital health systems Dagger et al., (2007).

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Similarly, perceptions of process accuracy were highly positive, with a mean score of 4.07 (SD = 0.68). Approximately 87.2% of respondents agreed or strongly agreed that automated service processes are accurate, suggesting that the system generally performs its intended functions correctly and produces reliable outputs. This perception of accuracy is crucial because it directly relates to the reliability dimension of service quality and influences users' willingness to trust and depend on automated processes rather than preferring manual alternatives (Meena & Sahu, 2022). The relatively low standard deviation (0.68) indicates substantial consensus among respondents regarding process accuracy, further strengthening confidence in this finding.

Respondents also expressed strong trust in the quality and outcomes of automated processing procedures (mean = 4.05, SD = 0.96). With 81.8% of respondents agreeing or strongly agreeing with this statement, it is evident that beneficiaries have developed confidence in the automated system's ability to deliver appropriate outcomes. However, the slightly higher standard deviation (0.96) suggests somewhat more variability in trust levels compared to perceptions of security and accuracy, indicating that while most beneficiaries trust the system, a meaningful minority harbor reservation. This variability may reflect differential experiences with system performance or individual differences in propensity to trust technological systems.

In contrast to the strong performance on assurance-related dimensions, reliability perceptions revealed more moderate results with greater variability. The statement "Automated systems are consistent and rarely experience technical failures" received the lowest mean score of 3.62 (SD = 0.86), falling in the "Agree" range but notably lower than assurance-related items. Only 63.6% of respondents agreed or strongly agreed with this statement, while 25.5% remained neutral and 10.9% disagreed or strongly disagreed. This finding suggests that technical failures and system inconsistencies constitute meaningful problems affecting user experiences. The relatively high standard deviation (0.86) indicates considerable variation in experiences, likely reflecting that some users encounter technical problems more frequently than others.

System reliability across different times and platforms received a mean score of 3.98 (SD = 0.82), indicating generally positive but not uniformly strong perceptions. Approximately 81.8% of respondents agreed or strongly agreed that the system functions reliably across different contexts, suggesting that cross-platform functionality and temporal consistency are generally satisfactory. However, 12.7% remained neutral and 5.4% disagreed, indicating that accessibility and consistency issues persist for a non-trivial minority of users. The moderate standard deviation suggests reasonable consensus while acknowledging meaningful variation in experiences.

The overall mean score across all five items was 3.97, falling in the "Agree" category and indicating that beneficiaries generally perceive both assurance and reliability dimensions positively. However, this aggregate score masks important variation between dimensions, with assurance-related items (security, accuracy, trust) scoring higher than reliability-related items (consistency, technical failures, cross-platform functionality). This pattern suggests that while NSSF's automated system has successfully established trust and confidence through strong assurance mechanisms, reliability challenges related to technical performance and system stability require attention and improvement. These descriptive findings provide essential context for interpreting the regression results that follow; highlighting both strengths to maintain and weaknesses to address in NSSF's automated health service delivery.

4.3 Descriptive Analysis for Customer Satisfaction

Tables 6 presents descriptive analysis for customer satisfaction.

Table 6

Service Quality Statements on Customer Satisfaction in Automated Health Systems

Statement	SA (%)	A (%)	N (%)	D (%)	SD (%)	Mean	SD
The automated system ensures security and confidentiality of my data	30.9	56.4	10.9	0.0	1.8	4.15	0.75
The automated service processes are accurate	23.6	63.6	9.1	3.6	0.0	4.07	0.68
Automated systems are consistent and rarely experience technical failures	10.9	52.7	25.5	9.1	1.8	3.62	0.86
Automated system functions reliably across different times and platforms	23.6	58.2	12.7	3.6	1.8	3.98	0.82
I trust the quality and outcome of the automated processing procedure	34.5	47.3	10.9	3.6	3.6	4.05	0.96
Overall Mean	–	–	–	–	–	**3.97**	–

The findings in Table 6 reveal that respondents had favourable perceptions of the service quality attributes of automated health systems, which directly influenced customer satisfaction. The highest mean score (4.15) was recorded for the statement regarding data security and confidentiality. This indicates that most users felt confident that their personal and medical information was protected within the automated system. Such trust in data protection enhances

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user satisfaction, a finding consistent with Mboera et al. (2021), who observed that confidentiality assurance in digital health platforms increases patient confidence and service utilisation.

Accuracy also emerged as a key satisfaction driver (Mean = 4.07), with the majority agreeing that automated service processes are precise and reliable. This aligns with Fenny et al. (2021), who reported that accuracy and timeliness in automated systems strengthen users' trust and improve satisfaction levels. However, while many users agreed that the systems were consistent and rarely failed (Mean = 3.62), a quarter remained neutral, suggesting that occasional technical challenges still affect some users' experiences. Mgaya and Gwahula (2024) similarly noted that system interruptions and interface issues can reduce satisfaction despite overall reliability.

Furthermore, respondents perceived that the system functions reliably across different times and platforms (Mean = 3.98), implying accessibility and operational stability, both of which enhance satisfaction. Finally, trust in the automated processing outcomes (Mean = 4.05) further reinforced users' confidence in the technology, consistent with Mboera et al. (2021), who found that perceived system trustworthiness is crucial for sustaining user satisfaction in digital health environments.

Overall, with an aggregate mean of 3.97, the results suggest that service quality dimensions—security, accuracy, reliability, and trust play a significant role in shaping customer satisfaction with automated health systems. These findings empirically confirm that high-quality automated services lead to greater satisfaction by ensuring reliability, confidentiality, and consistency in healthcare delivery.

4.4 Regression Analysis Results

Multiple regression analysis was conducted to examine the predictive effects of assurance and reliability on customer satisfaction among NSSF beneficiaries. This analytical approach allows simultaneous assessment of how each independent variable influences the dependent variable while controlling for the other predictor, providing insights into their relative importance and unique contributions. Table 6 presents the complete regression analysis results, including standardized beta coefficients, t-values, significance levels, and model fit statistics.

Table 6

Multiple Regression Analysis Results

Model Summary				
Statistic	**Value**			
R	0.671			
R^2	0.45			
Adjusted R^2	0.442			
F-Statistic	F(2, 217) = 121.62			
p-value	p < 0.001			
Notes	*** p < 0.001; ** p < 0.01			
Regression Analysis				
Predictor Variable	**Beta (β)**	**t-value**	**Sig. (p)**	**Interpretation**
Assurance (security, accuracy, trust)	0.482	6.912	0.000***	Highly significant
Reliability (consistency, error-free operation)	0.317	4.256	0.001**	Significant

The regression analysis results reveal several important findings regarding the relationships between service quality dimensions and customer satisfaction. First, the overall regression model was statistically significant ($F = 121.62$, $p < 0.001$), indicating that the model as a whole effectively predicts customer satisfaction. The model's explanatory power, represented by $R^2 = 0.450$, demonstrates that assurance and reliability jointly account for 45.0% of the variance in customer satisfaction among NSSF beneficiaries. This represents a substantial proportion of explained variance, suggesting these two service quality dimensions are indeed critical determinants of satisfaction outcomes. The adjusted R^2 value of 0.442 remains strong even after accounting for the number of predictors, confirming the robustness of the model. The remaining 55% of unexplained variance suggests that other factors not included in this model such as empathy, responsiveness, tangibility, or individual difference variables also influence customer satisfaction and warrant investigation in future research.

Examining individual predictors, assurance emerged as the stronger predictor of customer satisfaction ($\beta = 0.482$, $t = 6.912$, $p < 0.001$). The positive standardized beta coefficient indicates that for every one standard deviation increase in assurance perceptions, customer satisfaction increases by 0.482 standard deviations, holding reliability constant. This effect is both statistically significant at the $p < 0.001$ level and practically meaningful given its magnitude. The t-value of 6.912 substantially exceeds critical values, providing strong evidence against the null hypothesis of no relationship. These findings indicate that assurance dimensions encompassing security, confidentiality, accuracy, and trust—exert powerful influence on beneficiary satisfaction with automated health insurance services.

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Reliability also demonstrated a significant positive effect on customer satisfaction (β = 0.317, t = 4.256, p = 0.001), though its influence was weaker than assurance. The standardized coefficient indicates that for every one standard deviation increase in reliability perceptions, customer satisfaction increases by 0.317 standard deviations when controlling for assurance. While this effect is smaller in magnitude than assurance, it remains statistically significant and practically important. The t-value of 4.256 provides strong evidence of a genuine relationship. These findings confirm that system consistency, technical stability, and error-free operation significantly contribute to beneficiary satisfaction, supporting theoretical expectations regarding the importance of reliability in service quality frameworks.

The differential magnitudes of effects (β = 0.482 for assurance versus β = 0.317 for reliability) provide important insights into the relative importance of these dimensions within NSSF's automated health context. Assurance's stronger influence suggests that building trust, ensuring security, and establishing confidence in system outcomes may be more immediately impactful for satisfaction than achieving perfect technical reliability. This pattern may reflect that beneficiaries prioritize knowing their sensitive health information is protected and that system outputs are trustworthy over experiencing absolutely flawless technical performance. However, reliability's significant contribution demonstrates that technical performance still matters substantially; beneficiaries value consistent, stable system operation alongside trust and security.

These regression findings directly address the study's research objective by empirically demonstrating that both assurance and reliability in automated processing procedures significantly and positively influence customer satisfaction among NSSF beneficiaries in Ilala. The results support the theoretical framework derived from the SERVQUAL model, confirming that these service quality dimensions are indeed critical determinants of satisfaction in automated health insurance contexts. The strong model fit and significant predictors provide robust empirical evidence for the importance of these dimensions; offering clear direction for quality improvement initiatives.

4.5 Discussion

This section synthesizes and interprets the study findings in relation to the research objectives, theoretical framework, and existing empirical literature. The discussion examines how findings align with or diverge from previous research, explores theoretical implications, and highlights practical significance for improving automated health insurance services. The primary objective of this study was to examine the influence of assurance and reliability dimensions in automated processing procedures on customer satisfaction among NSSF beneficiaries accessing SHIB services in Ilala, Dar es Salaam.

4.5.1 Assurance as a Critical Determinant of Customer Satisfaction

The findings reveal that assurance constitutes the most critical determinant of customer satisfaction within NSSF's automated healthcare services, evidenced by its strong positive relationship (β = 0.482, p < 0.001) with satisfaction outcomes. This finding aligns closely with existing empirical evidence from multiple contexts while also revealing context-specific patterns worthy of detailed examination.

The strong relationship between assurance and satisfaction found in this study (β = 0.482) is notably consistent with findings from Mboya et al.'s (2024) research in Tanzania's Court of Appeal, where assurance significantly predicted customer satisfaction (β = 0.196, p = 0.001) among court advocates using automated judicial services. While the effect size in the current study is larger, both studies demonstrate that Tanzanian users of automated public services prioritize trust, security, and confidence when evaluating their satisfaction. This convergence across different public service sectors (health insurance versus judicial services) suggests that assurance may constitute a particularly critical service quality dimension in Tanzanian contexts, possibly reflecting broader societal values emphasizing trust and interpersonal relationships even in technological interactions.

The finding that accuracy significantly influences customer satisfaction (M = 4.07) resonates with broader service quality literature emphasizing the importance of outcome reliability. Dagger et al., (2007) argued in their hierarchical service quality model that outcome quality the "what" of service delivery constitutes a primary dimension distinct from interaction and environment quality. In automated health insurance contexts, outcome quality manifests primarily through processing accuracy: whether claims are assessed correctly, eligibility determinations are accurate, and system outputs are reliable.

The current study's findings demonstrate that NSSF's automated system generally achieves strong accuracy perceptions, contributing positively to beneficiary satisfaction. This accuracy is particularly important in health insurance contexts where processing errors can have serious consequences for beneficiaries' access to healthcare services and financial protection.

The strong trust levels observed in this study (M = 4.05) also align with Ahmed et al.'s (2021) research in Islamic banking, which demonstrated that service quality significantly mediates relationships between institutional credibility and customer satisfaction. While their study focused on Shariah compliance rather than technological automation, the underlying dynamics are instructive: customers in high-stakes service contexts (financial services and health insurance)

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prioritize institutional trustworthiness when evaluating satisfaction. When customers trust that institutions will protect their interests, handle their sensitive information appropriately, and deliver promised outcomes, satisfaction increases substantially. The parallel between banking and health insurance contexts suggests that assurance mechanisms operate similarly across service sectors involving sensitive personal information and significant financial or health consequences.

Interestingly, the current study's strong findings regarding assurance's importance contrast somewhat with (Mgaya and Gwahula, 2024) hospital study in Tanzania, where empathy emerged as the strongest predictor of satisfaction, followed by reliability, with assurance showing weaker effects. This divergence may reflect important contextual differences between hospital services and health insurance administration. Hospital contexts involve direct interpersonal interactions where empathy (caring and individual attention) becomes salient; while health insurance administration operates primarily through automated systems where interpersonal empathy is less relevant but trust in institutional processes becomes paramount. This contextual variation underscores the importance of adapting service quality frameworks to specific service delivery contexts rather than assuming uniform dimension importance across all healthcare-related services.

From a theoretical perspective, these findings strongly support the SERVQUAL model's identification of assurance as a core service quality dimension. Parasuraman et al.'s (1988) original conceptualization emphasized that assurance encompasses "knowledge and courtesy of employees and their ability to inspire trust and confidence." While the current study's automated context lacks traditional employee interactions, the core psychological construct—trust and confidence in service delivery remains central. The findings suggest that in automated systems; assurance dimensions require reconceptualization to emphasize data security, algorithmic accuracy and trust in automated processes rather than traditional interpersonal courtesy. This adaptation represents an important theoretical contribution, extending the SERVQUAL framework to contemporary digital service contexts while maintaining its core insights about the psychological importance of trust and confidence in service experiences.

4.5.2 Reliability's Significant but Weaker Influence on Customer Satisfaction

While reliability demonstrated a significant positive relationship with customer satisfaction ($\beta = 0.317$, $p = 0.001$), its influence was notably weaker than assurance. This finding reveals important nuances in how different service quality dimensions operate within automated health insurance contexts and aligns with several patterns observed in existing literature while also revealing context-specific dynamics.

The descriptive statistics provide insights into why reliability's influence is attenuated: the lowest mean score ($M = 3.62$) was recorded for system consistency and absence of technical failures, indicating that technical reliability issues constitute meaningful problems affecting user experiences. These findings closely parallel those of Mboya et al. (2024) in their Court of Appeal study, where reliability significantly predicted satisfaction ($\beta = 0.280$, $p < 0.001$) but with somewhat weaker effects than other dimensions. The consistency across studies suggests that technical reliability challenges may be systemic across Tanzania's automated public services, potentially reflecting broader infrastructure limitations and technical capacity constraints identified by Mboera et al. (2021) in their comprehensive review of digital health transformation in Tanzania.

Mboera et al. (2021) documented that Tanzania faces significant challenges in digital health implementation, including inconsistent electricity supply, variable internet connectivity, limited technical expertise, and insufficient maintenance resources. These infrastructure and capacity constraints directly affect system reliability, creating the occasional downtimes and technical failures that respondents in the current study reported experiencing. The fact that 10.9% of respondents disagreed that systems rarely experience technical failures, while 25.5% remained neutral, indicates that reliability problems are sufficiently common to affect approximately one-third of users. This pattern suggests that infrastructure improvements and technical capacity development represent necessary prerequisites for enhancing reliability dimensions of automated health services.

Despite its weaker relative influence, reliability's significant contribution ($\beta = 0.317$) should not be minimized. This effect size represents a meaningful proportion of explained variance and demonstrates that technical performance genuinely matters to beneficiaries. The finding aligns with Mgaya and Gwahula's (2024) research at St. Joseph Hospital, where reliability items showed factor loadings exceeding 0.900, indicating strong measurement quality and conceptual clarity. Their study emphasized that reliability the ability to perform promised services dependably and accurately—constitutes a fundamental requirement for customer satisfaction in healthcare contexts. Even when other dimensions perform well; reliability failures undermine overall satisfaction.

The finding regarding cross-platform reliability ($M = 3.98$) provides additional nuance. While this score is higher than the score for technical failure frequency, it still falls below assurance – related scores, suggesting that consistency across different access points and times remains an area requiring improvement. This finding is particularly relevant given Tanzania's diverse technological infrastructure. Beneficiaries may access NSSF systems through different devices (desktop computers at workplaces, personal laptops, tablets and smartphones); different locations (urban offices

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with stable internet and rural areas with variable connectivity) and different network conditions. Ensuring consistent, reliable performance across these varied contexts presents technical challenges that require sophisticated system design, robust testing protocols, and redundancy mechanisms.

The differential effects of assurance (β = 0.482) versus reliability (β = 0.317) raise interesting theoretical questions about dimension hierarchies in service quality models. Ladhari's (2009) comprehensive review of SERVQUAL research noted that reliability typically emerges as the most critical dimension across service contexts. However, the current study's findings suggest that in automated systems involving sensitive personal information and high-stakes outcomes (health insurance), assurance may supersede reliability in importance. This pattern might reflect a hierarchical need structure: users require basic assurance (trust, security and confidence) before reliability concerns become salient. If users fundamentally distrust a system or doubt its security; even perfect technical reliability may not generate satisfaction. Conversely, strong assurance can partially compensate for occasional reliability lapses, as users who trust the system's intentions and security may tolerate technical problems more readily.

This conceptualization aligns with Herzberg's two – factor theory of motivation; which distinguishes between hygiene factors (necessary to prevent dissatisfaction but insufficient to create satisfaction) and motivators (capable of actively creating satisfaction). Applied to automated health insurance, reliability may function more as a hygiene factor: when it falls below acceptable thresholds; it creates dissatisfaction but perfect reliability beyond baseline expectations may not substantially enhance satisfaction. In contrast, assurance may function more as a motivator: higher levels of trust, security and confidence actively create increased satisfaction beyond baseline levels. This theoretical integration suggests fruitful directions for future research examining dimensional hierarchies and nonlinear effects in service quality models.

4.5.3 Integrated Interpretation: The Complementary Roles of Assurance and Reliability

Examining assurance and reliability jointly provides the most comprehensive understanding of their influences on customer satisfaction. The overall positive mean perception (M = 3.97) and the significant regression model (R^2 = 0.450, F = 121.62, $p < 0.001$) demonstrate that together, these dimensions function as strong predictors of customer satisfaction in automated health insurance contexts. The model's ability to explain 45% of satisfaction variance represents substantial predictive power, particularly given that only two of five SERVQUAL dimensions were examined.

The findings align well with Fenny et al.'s (2021) comprehensive assessment of social health insurance schemes across Africa, which emphasized that successful schemes require both robust administrative reliability and strong beneficiary trust. Fenny and colleagues documented that African health insurance schemes face common challenges including administrative inefficiencies and communication gaps that undermine both reliability and assurance. However, they also identified successful examples where investments in automated systems, coupled with transparency initiatives and beneficiary education; substantially improved both efficiency and trust. The current study's findings suggest that NSSF has made progress on assurance dimensions while facing ongoing reliability challenges.

The complementary nature of assurance and reliability aligns well with theoretical predictions from the SERVQUAL model, which conceptualizes service quality as multidimensional and recognizes that different dimensions address different aspects of customer needs and experiences. Parasuraman et al. (1988) emphasized that comprehensive service quality assessment requires attention to multiple dimensions simultaneously as customers evaluate services holistically rather than focusing exclusively on single attributes. The current study's findings support this multidimensional perspective while revealing that dimensions may have differential importance within specific contexts.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study concludes that both factors are essential to satisfaction, with assurance covering security, confidentiality, accuracy and trust having a stronger influence. Beneficiaries expressed confidence in the system’s data protection and accuracy; indicating that NSSF has successfully built trust in its automated services. However, issues related to system reliability such as technical failures and performance inconsistencies were found to reduce satisfaction for some users; suggesting a need for improvement in system stability and technical support.

The study confirms the importance of assurance and reliability as key dimensions of service quality within automated health insurance systems. It highlights that assurance builds trust while reliability ensures consistent performance both of which are vital for user satisfaction. Practically, NSSF and similar organisations should maintain their strong assurance measures while focusing on improving reliability through better infrastructure, technical maintenance, and staff training. By addressing these areas; automated health services can achieve higher quality, increased customer satisfaction and greater confidence among beneficiaries.

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5.2 Recommendations

The study recommends that NSSF maintain its strengths in assurance by reinforcing data security, confidentiality and transparency within its automated health insurance services. This should include adherence to international security standards, regular audits and clear communication about data use and protection. Accuracy should also be safeguarded through validation checks and regular reviews to sustain the high level of trust and satisfaction among beneficiaries.

At the same time, NSSF should focus on improving reliability by enhancing system stability, introducing real-time monitoring and ensuring backup mechanisms to minimise technical failures. Strengthening technical capacity through staff training and recruitment alongside beneficiary education on system use; will further enhance service delivery. In the short term, resources should prioritise reliability improvements; followed by longer – term assurance enhancements to maintain trust and achieve consistent customer satisfaction.

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