Marketing Public Connectivity: Addressing the Behavioral Adoption Gap in Indonesia's Rural Digital Services

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Abstract. This study addresses the persistent gap between digital infrastructure availability and actual utilization in Indonesia's rural and 3T (Frontier, Outermost, and Least Developed) regions. Drawing on the Theory of Planned Behavior (TPB), the Technology-Organization-Environment (TOE) framework, SERVQUAL, and the 7Ps marketing mix, the study develops a Behavioral Service Level Agreement (SLA) framework that integrates technical performance, behavioral utilization, and service-quality indicators. Using a mixed-methods approach, the study analyzes quantitative operational data from more than 13,000 broadband sites and qualitative insights from disruption tickets, helpdesk records, and institutional documents. Binary logistic regression indicates that average user count and traffic volume are stronger predictors of high utilization than conventional SLA metrics such as uptime and bandwidth. K-Means clustering identifies three policy-relevant site typologies: low SLA-low usage sites, balanced SLA-usage sites, and high SLA-low usage sites. The findings show that technically available infrastructure can remain underutilized when local awareness, digital literacy, administrative alignment, and perceived value are weak. The paper contributes a scalable Behavioral SLA framework for inclusive digital governance and proposes cluster-based interventions that connect 7Ps marketing strategies with SERVQUAL dimensions. The study extends public service marketing by shifting evaluation from access-based reporting toward meaningful use and outcome-oriented public value.

Keywords: Digital Adoption, Behavioral SLA, Rural Broadband, Public Service Marketing, 7Ps Framework, SERVQUAL, TPB, TOE, Inclusive Governance.

1 Introduction

Public digital infrastructure is critical for inclusive development, particularly in underserved regions. Indonesia's 3T (Frontier, Outermost, and Least Developed) areas have benefited from broadband deployments through the BAKTI initiative and the national digital transformation agenda [1, 2]. Despite the technical availability of services across more than 13,000 sites, actual utilization remains inconsistent. This

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raises the central question of what explains the gap between infrastructure availability and meaningful use.

The relevance of this problem is reinforced by global efforts to expand equitable digital access. The United Nations Sustainable Development Goals emphasize industry, innovation and infrastructure, reduced inequalities, and partnerships for inclusive development [3]. International digital-development indicators also show that connectivity policy is increasingly assessed not only by infrastructure coverage but also by adoption, intensity of use, and meaningful participation in digital ecosystems [4].

The academic gap addressed in this paper is that technical performance and behavioral adoption are often evaluated separately. Conventional SLA models tend to privilege measurable engineering indicators such as uptime, bandwidth, and latency, while technology-adoption studies examine attitudes, perceived usefulness, norms, and contextual readiness. This separation limits the ability of public agencies to explain why technically functional sites may still be socially underused.

To bridge this gap, the study integrates four complementary perspectives. TPB explains adoption through attitudes, subjective norms, and perceived behavioral control [5]. TOE adds organizational and environmental readiness to the analysis of digital implementation [6]. SERVQUAL provides service-quality dimensions, including tangibles, reliability, responsiveness, assurance, and empathy [7]. The 7Ps marketing mix frames public service delivery as a set of adaptable interventions involving product, place, promotion, people, process, physical evidence, and perceived value [8].

These frameworks are combined into a Behavioral SLA model. The model reconceptualizes SLA not only as a technical compliance instrument but also as a governance mechanism for monitoring whether digital public services are noticed, trusted, accessed, and repeatedly used by citizens. This view aligns with Public Value theory and New Public Service, which emphasize citizen outcomes, co-production, and service responsiveness rather than administrative output alone [9, 10]. It is also consistent with recent public service marketing scholarship on co-creation, inclusive innovation, personalization, and hyper-local engagement [11, 12].

The contribution of this study is threefold. First, it conceptualizes Behavioral SLA as a bridge between technical service performance and behavioral utilization. Second, it empirically tests the relative role of technical and behavioral indicators using operational data from rural broadband sites. Third, it translates cluster results into targeted public marketing interventions that can support BAKTI, Kominfo, and related institutions in designing outcome-oriented digital inclusion programs.

2 Research Methods

2.1 Research Design, Data and Variables

A mixed-methods approach was adopted to connect operational performance metrics with contextual evidence on adoption barriers. Quantitative data were derived from BAKTI operational reports covering January-December 2024 across more than 13,000 broadband sites [1]. The core technical variables were uptime and bandwidth, while the behavioral variables were average user count and traffic volume. Qualitative data were

drawn from disruption logs, helpdesk tickets, and institutional records to interpret why some technically functioning sites produced low user engagement.

High service utilization was treated as a binary outcome for logistic regression based on the utilization classification used in the operational dataset. In this study, high utilization denotes sites classified as high-use in the administrative records through combined user-count and traffic-volume activity, rather than through technical SLA compliance alone. Because the source data did not include an independent survey-based threshold, the outcome is interpreted as an operational utilization category. Uptime captured service availability, bandwidth captured technical capacity, average user count represented the breadth of actual adoption, and traffic volume represented intensity of use. This operationalization allowed the study to compare conventional SLA indicators with behavioral indicators within the same model.

2.2 Analytical Procedure

The quantitative analysis included descriptive statistics, chi-square tests, correlation analysis, and binary logistic regression using SPSS. Logistic regression was selected because the dependent variable was binary and because the model estimates the odds that a site belongs to the high-utilization category. K-Means clustering in Python was then applied to the SLA and behavioral variables to identify policy-relevant site typologies.

The three-cluster solution was retained as an operational typology because it produced a parsimonious and interpretable segmentation for policy use: sites with infrastructure and usage gaps, sites with balanced performance and usage, and sites with adequate technical performance but low adoption. Rather than claiming universal cluster optimality, the analysis uses the three clusters to translate quantitative patterns into actionable intervention categories for Behavioral SLA design. This interpretation is theoretically aligned with the study's distinction between access, service quality, and meaningful use. Future applications of the model should report additional validation diagnostics, such as elbow or silhouette inspection, when raw site-level data are available for replication.

2.3 Validity and Reliability

Sampling was purposive and focused on active, non-offline sites with at least three months of valid records. Metrics were operationalized using BAKTI indicators and prior technology-adoption literature. To strengthen validity, manual spot-checks were conducted on 50 randomly selected sites to compare automated log metrics with local conditions. Reliability of behavioral indicators, especially user count and traffic, was verified through repeated cross-checking against daily activity patterns.

The qualitative evidence was not used to claim statistical causality. Instead, it was used to explain the mechanisms behind the quantitative patterns, especially in cases where high technical availability did not translate into high utilization. This triangulation is important because administrative data can show where underuse occurs, while tickets and institutional records can indicate why it occurs.

3 Result and Discussion

3.1 Technical SLA and Behavioral Utilization

The results show that conventional technical indicators were not sufficient to explain high utilization. Uptime and bandwidth had weak associations with usage, whereas behavioral indicators showed stronger predictive value. Average user count had a correlation of r = 0.26 with utilization, and traffic volume had a correlation of r = 0.09. The logistic regression results are presented in Table 1.

Table 1. Logistic regression results predicting high service utilization

Variable	Coefficient (B)	Odds Ratio	p-value
Uptime (%)	0.05	1.05	0.180
Bandwidth (Mbps)	-0.12	0.89	0.220
Average User Count	0.89	2.43	0.001**
Traffic Volume (KB)	0.46	1.59	0.010**

Note: ** indicates statistical significance at $p < 0.01$.

Table 1 indicates that average user count and traffic volume were statistically significant predictors of high service utilization. An increase in average user count increased the odds of high utilization by approximately 2.43 times ($p = 0.001$), while traffic volume increased the odds by approximately 1.59 times ($p = 0.010$). In contrast, uptime and bandwidth were not significant predictors, with p-values of 0.180 and 0.220, respectively. These results support the central argument that behavioral engagement, not merely technical availability, is a key determinant of effective digital service use in underserved regions.

This finding does not mean that uptime and bandwidth are unimportant. Rather, it suggests that technical availability is a necessary but insufficient condition for meaningful utilization. Once a minimum level of connectivity exists, adoption depends on whether citizens know about the service, trust it, have the skills to use it, perceive it as useful, and receive support from local institutions. This interpretation is consistent with TPB and TOE, which emphasize perceived control, usefulness, institutional readiness, and environmental support as conditions for technology use [5, 6, 13].

3.2 Cluster Typology and Behavioral Adoption Gap

K-Means clustering revealed three site typologies. Cluster A consisted of low-SLA and low-usage sites, indicating simultaneous infrastructure and behavioral gaps. Cluster B represented balanced SLA and usage, suggesting effective sites where technical service quality was matched by actual adoption. Cluster C consisted of high-SLA but low-usage sites, highlighting the behavioral adoption gap in which functional infrastructure remains underused.

The most important implication lies in Cluster C. These sites cannot be improved only through additional technical maintenance because the main problem is not service

availability but insufficient adoption. Qualitative insights from disruption tickets, helpdesk records, and institutional documents point to recurring barriers such as low digital literacy, weak local facilitation, limited awareness of available services, absence of local champions, and administrative misalignment. These barriers help explain why technically functional broadband sites may fail to produce meaningful community use.

This pattern challenges the dominant narrative in public connectivity programs that equates infrastructure deployment with program success. Deployment creates the possibility of inclusion, but inclusion is realized only when connectivity becomes part of daily educational, economic, administrative, and civic practices. Rural digital transformation therefore requires both reliable infrastructure and a locally embedded adoption strategy [14, 15].

3.3 Behavioral SLA Framework and Policy Intervention

The Behavioral SLA framework translates the empirical findings into intervention logic. Instead of treating all sites as technically comparable assets, the framework differentiates sites by the relationship between service performance and actual use. Table 2 summarizes the proposed cluster-based interventions and links each cluster to relevant 7Ps and SERVQUAL dimensions.

Table 2. Cluster-based Behavioral SLA intervention framework

Cluster	Core Problem	7Ps Focus	SERVQUAL Focus	Expected Outcome
A: Low SLA-low usage	Infrastructure and adoption gaps	Product; Place; Physical evidence	Tangibles; Reliability	Restore access quality and basic confidence
B: Balanced SLA-usage	Sustaining effective use	Process; People; Promotion	Reliability; Responsiveness	Maintain engagement and service continuity
C: High SLA-low usage	Behavioral adoption gap	Promotion; People; Perceived value	Assurance; Empathy	Activate demand and meaningful community use

Table 2 shows that Cluster A requires infrastructure recovery and visible service improvements because poor technical quality can undermine trust before adoption begins. Cluster B requires continuous engagement, feedback mechanisms, and process improvement to sustain effective use. Cluster C requires the strongest behavioral intervention: outreach, trusted local actors, user education, locally relevant content, and communication that demonstrates the value of the service for everyday needs.

The integration of SERVQUAL and the 7Ps makes the framework operational. SERVQUAL identifies the quality dimensions that shape user experience, while the 7Ps identify the managerial levers through which public agencies can intervene. For example, responsiveness and assurance can be strengthened through local digital ambassadors; empathy can be improved through culturally relevant training; and

perceived value can be improved by connecting the service to education, health, administrative access, and local economic activities.

For policy practice, Behavioral SLA can be operationalized through indicators such as monthly active users, user growth rate, traffic intensity, community training frequency, local champion presence, ticket response time, user satisfaction, and the number of locally relevant digital service activities. These indicators would complement, not replace, uptime and bandwidth. The objective is to redesign SLA contracts and monitoring dashboards so that public connectivity programs are evaluated by both availability and meaningful use.

3.4 Theoretical Implication

The study extends public service marketing by positioning adoption as a measurable part of service performance. It also extends SLA thinking by adding behavioral and public value dimensions to technical compliance. In theoretical terms, TPB explains individual-level willingness and perceived ability to use the service; TOE explains organizational and environmental readiness; SERVQUAL explains the perceived quality of the service encounter; and the 7Ps explain how institutions can design interventions to improve adoption.

This synthesis shows that the last-mile problem is not only a distribution problem but also a behavioral and institutional problem. By making behavioral utilization visible within SLA design, public agencies can move from infrastructure accounting toward outcome-oriented digital governance.

3.5 Limitation

This study has several limitations. First, it relies primarily on administrative and operational data, which may not fully capture citizen motivations, household-level constraints, or informal community practices. Second, the sample focuses on active sites with valid records, so findings may not represent inactive or persistently offline locations. Third, the analysis is observational and does not establish causal effects. Fourth, qualitative insights were derived from tickets and institutional records rather than direct interviews with end users. Future studies should combine operational logs with surveys, interviews, and longitudinal designs to test whether Behavioral SLA interventions produce sustained adoption gains.

4 Conclusion

Behavioral gaps in public service adoption require a paradigm shift from measuring access to understanding use. Technical performance remains necessary, but this study shows that it is insufficient for explaining meaningful utilization of rural digital services. Average user count and traffic volume were stronger predictors of high utilization than uptime and bandwidth, demonstrating that public connectivity programs must evaluate both infrastructure availability and behavioral engagement.

The proposed Behavioral SLA framework contributes to inclusive digital governance by integrating technical indicators, behavioral indicators, SERVQUAL dimensions, and 7Ps intervention logic. For policy, institutions such as BAKTI and Kominfo should consider usage-based KPIs, segmented outreach, local digital ambassadors, capacity-building programs, and monitoring dashboards that track community use. Future research should examine longitudinal effects, incorporate citizen narratives, and test Behavioral SLA models across other public service sectors, including education, health, online service-learning, digital finance, and GIS-supported rural transformation [16-18].

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